Development and Cross-Validation of the Nurse's Positive Energy of Retention Instrument (NPERI): A Confirmatory Analysis

Chiu-Chu Lin, RN, PhD
School of Nursing, Kaohsiung Medical University
Kaohsiung, Taiwan
chiuchu@kmu.edu.tw

Disclosure Statement

- Author names
  Chiu-Chu Lin, PhD, RN; Chia-Chen Wu, MSN, RN

- Learner objectives
  1. The learners could learn the process of developing and testing an instrument.
  2. The learner can utilize the instrument verified in this study to assess the nurses' positive energy of retention.

- Funding Statement
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- No Conflict-of-interest

Outline

- Background & Purpose
- Methods
  - *Phase 1: Instrument Development*
  - *Phase 2: Psychometric Evaluation*
- Results
- Discussion
- Conclusion and Implication
- Future Directions

Background-1

- The shortage of nurses caused by a high rate of turnover is a worldwide issue.
- Improving the retention of nurses is necessary to reduce this shortage.

Background-2

- Previous studies focused on exploring *the negative external factors* that cause nurses to leave and from which to find the strategies to ameliorate these negative factors.
- Few studies have examined *internal factors* related to nurse retention.
- Research has indicated that *personal psychological factors* are also the important factors contributing to the intention to stay in nursing.

Background-3

- Based on the findings from our prior qualitative study, psychological characteristics are attributes of **“positive energy”** that may enable nurses to face workplace challenges and contribute to nurses’ retention.

- There needs an assessment tool to identify the nurses’ intrinsic psychological attributes which inspire their willingness to remain in nursing.

Purpose

To develop and psychometrically test a new instrument for measuring nurses' positive energy of retention (**NPER**).

Methods

- Nurse's Positive Energy of Retention Instrument **(NPERI)** was established through the following steps.

Phase 1: Instrument Development

Step 1: Item generation
Step 2: Content validity and Face validity
Step 3: Pilot testing

Phase 2: Psychometric Evaluation

Step 4: Exploratory factor analysis
Step 5: Confirmatory factor analysis
Step 6: Cross validation

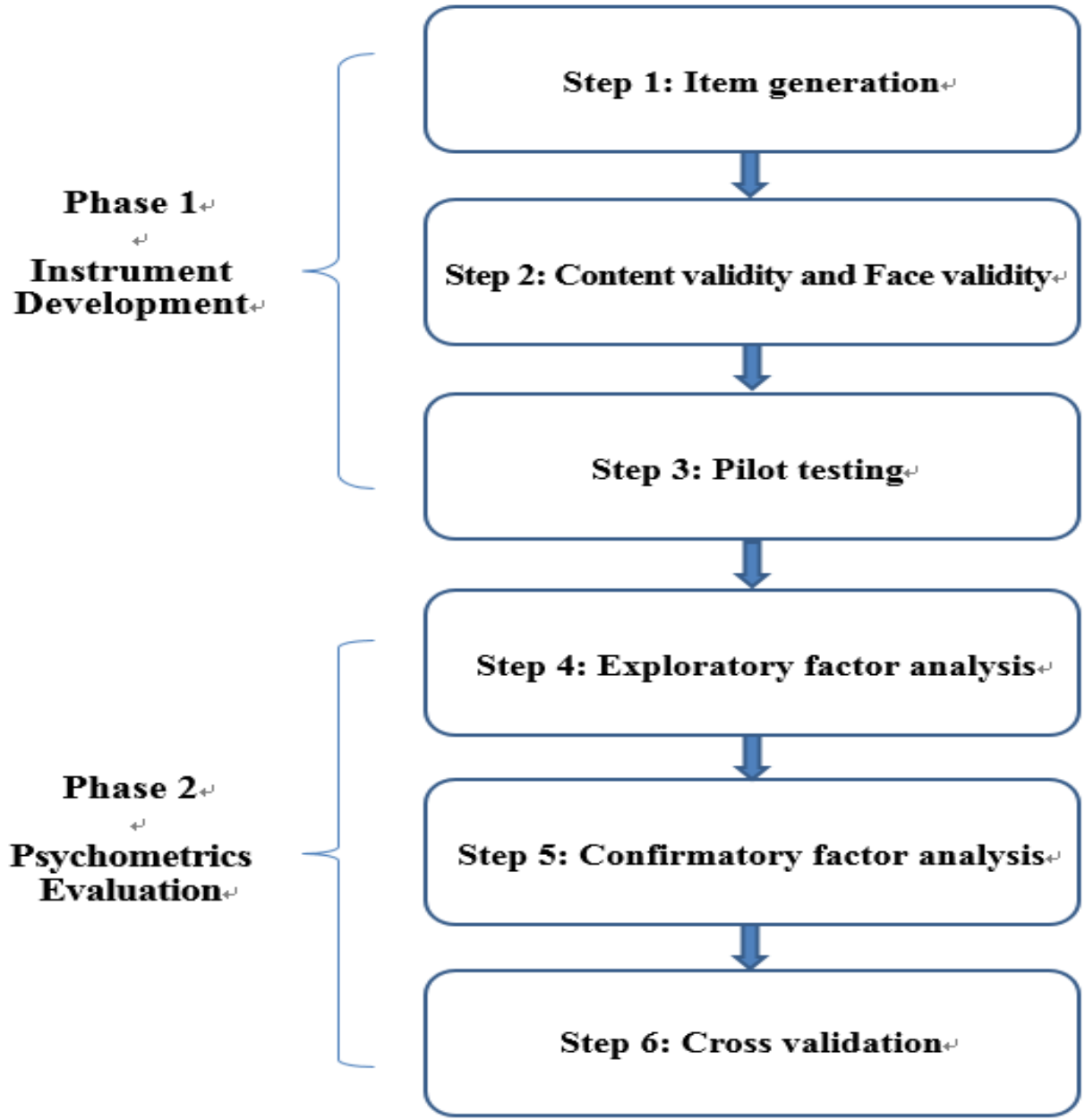

Figure 1 Process of developing and validating the NPERI

Phase 1: Instrument development

Step 1: Item generation

Step 2: Content validity and Face validity

◆ Content validity

Established by a 9-member expert panel

--five nurse leaders, three senior clinical nurses and one university professor with expertise in instrument development

First round: Total CVI score was 0.81

four items were removed due to low relevance or lack of clarity; three items were added

Second round: Total CVI score was 0.91

one item removed due to low relevance

➢ **67 items remained (*i.e., the second version*)**

Step 2: Content validity and Face validity

◆ Face validity

- Five registered nurses assessed the clarity, precision, comprehension, and ease of response to the 67 statements.

- Three items were reworded based on the nurses' recommendations.

Step 3: Pilot testing

- Approval to conduct the study from Institutional Review Board (KMUH-IRB-20130354)
- 145 nurses were recruited from two medical centers and one regional hospital in Taiwan
- **Item analysis**

  -The corrected item-total correlation ranged from 0.47 to 0.92

  -There was no item deleted based on the 0.3 item-total correlation criteria

- After thoroughly checked by the research team, 6 items were removed because of duplicated meaning or inappropriate wording, resulting in a draft version with **61-item version (*i.e., the third version*).**

Phase 2: Psychometric Evaluation

Psychometric Evaluation

Direct care nurses (N= 947) were divided into three samples based on the time of entry into the study.

- ***Step 4: Exploratory factor analysis***
  Sample 1 (n1=392) were used for item analysis and EFA.

- ***Step 5: Confirmatory factor analysis***
  Sample 2 (n2=287) were used for CFA.

- ***Step 6: Cross validation***
  Sample 3 (n3=268) were used for cross-validation of the modify model derived from Sample 2 data.

Results

Sample

- Female (97.9%, n =927)
- Married (62.8%, n =595)
- The mean age was 30.3 years (SD = 7.2), with a range from 20 to 59 years.
- Over three-quarters reported having completed college (79.9%).
- The mean year of work experience was 7.9 years (SD = 7.5), with a range from 3 months to 35 years.
- There was no any significant difference among the three samples.

Exploratory Factor Analysis (EFA)-1

- The KMO value was 0.96
- Bartlett's test of Sphericity was statistically significant ($\chi 2 = 12456$, df = 1378, $p < 0.001$)
- After the principal component analysis (PCA) and oblique promax rotation, 33 items were eliminated from the 61-item version *(i.e., the third version)* because of factor loadings less than 0.5 (Table 1).

➜**28 item remained** ***(i.e., the fourth version)***

Exploratory Factor Analysis (EFA)-2

- After examining the various factor solutions, three-factor solution provided the most meaningful factor pattern.

  Three factors

  -- proactive and persevering characteristics

  -- nursing professional identity

  -- passion

- 28 items (*i.e., the fourth version*)
- 61.87 % of the total variance

Table 1 Three-factor solution for the 28 item version of the Nurse's Positive Energy of Retention Instrument (NPERI)

Item No.	Statement	Eigenvalue	Factor loading	Cronbach's α	Variance explained (%)
Factor 1: Proactive and Persevering characteristics		14.95		0.95	52.08%
1	I earn and grow from the setbacks and pressures from nursing jobs.		.865		
2	The training from works could improve myself.		.840		
3	When being faced with multiple pressures, I review and adjust my life goals.		.828		
4	I would seek resources actively in order to deal with the clinical predicaments.		.782		
5	I consider my job as a learning opportunity and a challenge.		.766		
6	I am willing to challenge the predicaments and solve problems.		.757		
7	I would switch to positive aspect when facing the negative events.		.736		
8	It's a pleasure for me to accept the challenges brought on by nursing.		.734		
9	Nursing jobs allow me to grow.		.698		
10	I can overcome predicaments and challenges from works.		.670		
11	I could positively accept the challenges of the ever-changing situations of patients.		.596		
12	The personality of persistence allows me not be fearful of the setbacks.		.554		
13	I demand myself to keep up with the continued upgrade of the nursing profession.		.538		

Table 1 Three-factor solution for the 28 item version of the Nurse's Positive Energy of Retention Instrument (NPERI) (cont.)

Item No.	Statement	Eigenvalue	Factor loading	Cronbach's α	Variance explained (%)
Factor 2: Nursing professional identify		2.02		0.90	5.80%
14	It's valuable to help patients ease the pain from diseases, recover to health and to provide palliative care.		.889		
15	It's a sense of achievement to assist patients to learn self-care skills.		.813		
16	The patients' recovery is a significant encouragement.		.757		
17	It's a pleasure for me to serve as the patients' advocate.		.659		
18	Patients' and family's trust makes me more willing to devote myself to nursing.		.657		
19	Positive feedback is the motivation for me to stick to nursing .		.652		
20	I would be the first option for patients or their family to inquire when having any question.		.612		
21	I improve my own ability through self-learning.		.522		
Factor 3: Passion		1.47		0.93	3.99%
22	I am passionate about nursing and willing to keep staying in the nursing field.		.882		
23	I view nursing as a lifetime occupation.		.857		
24	I often excessively concentrate on nursing .		.735		
25	I like taking care of patients.		.683		
26	There is much pleasure in clinical work.		.681		
27	Doing nursing jobs is of my will.		.671		
28	I bear a lot of passion for nursing.		.634		

Table 2 Summary of a three-factor model

Factor (Numbers of item)	Definition	Variance
Factor 1 ***Proactive and persevering characteristics* (13)**	Certain unyielding personalities that keep nurses from withdrawing from difficulties and promote active use of internal resources to face frustrations and overcome difficulties.	52.08%
Factor 2 ***Nursing professional identity* (8)**	Nurses regard nursing as meaningful and valuable work.	5.80%
Factor 3 ***Passion* (7)**	How nurses love nursing and wholeheartedly engage in nursing work.	3.99%
Factor loading: 0.522 - 0.889 Total scale: 61.87 % of the total variance		

Confirmatory Factor Analysis (CFA)-1

- The validation of the 28-item instrument *(i.e., the fourth version)* involved two stages of CFA.

  - **Sample 2** data was used to determine whether the three-factor model identified from the EFA fit the data or required modification.

  - **Sample 3** data was further used to cross-validate the modified model.

Confirmatory Factor Analysis (CFA)-2

- Fig. 2 shows the results of the modified factor model
  - Each item significantly loaded on its factor ranging from 0.60 to 0.89.

  - The **modified model with 24 items** *(eliminating four items: item2,10, 21, 25)* **(*i.e., the final version*)** fit the data notably better than the null models (Table 3) indicating satisfactory goodness of fit. (RMSEA=0.064, CFI=0.95, GFI=0.87, TLI=0.95)

Table 3 Summary of the Model Fit Indices for All CFA Models

Model	X^2	*df*	CFI	GFI	TLI	RMSEA
Sample 2 Data Set (N=287)						
Null model (28 items)	1033.59	347	0.90	0.79	0.89	0.085
Modified model (24 items)	538.99	249	0.95	0.87	0.95	0.064
Sample 3 Data Set (N=268)						
Cross-Validation (24 items)	1209.49	549	0.94	0.84	0.94	0.047

Note.

Null model = The original 3-factor model; Modified model = Four items were deleted from the original model

$\chi 2$ = Chi-Square Test (i.e., Minimum Fit Function); CFI = Comparative Fit Index; GFI = Goodness-of-Fit Index; RMSEA= Root-Mean-Square-Error of Approximation.

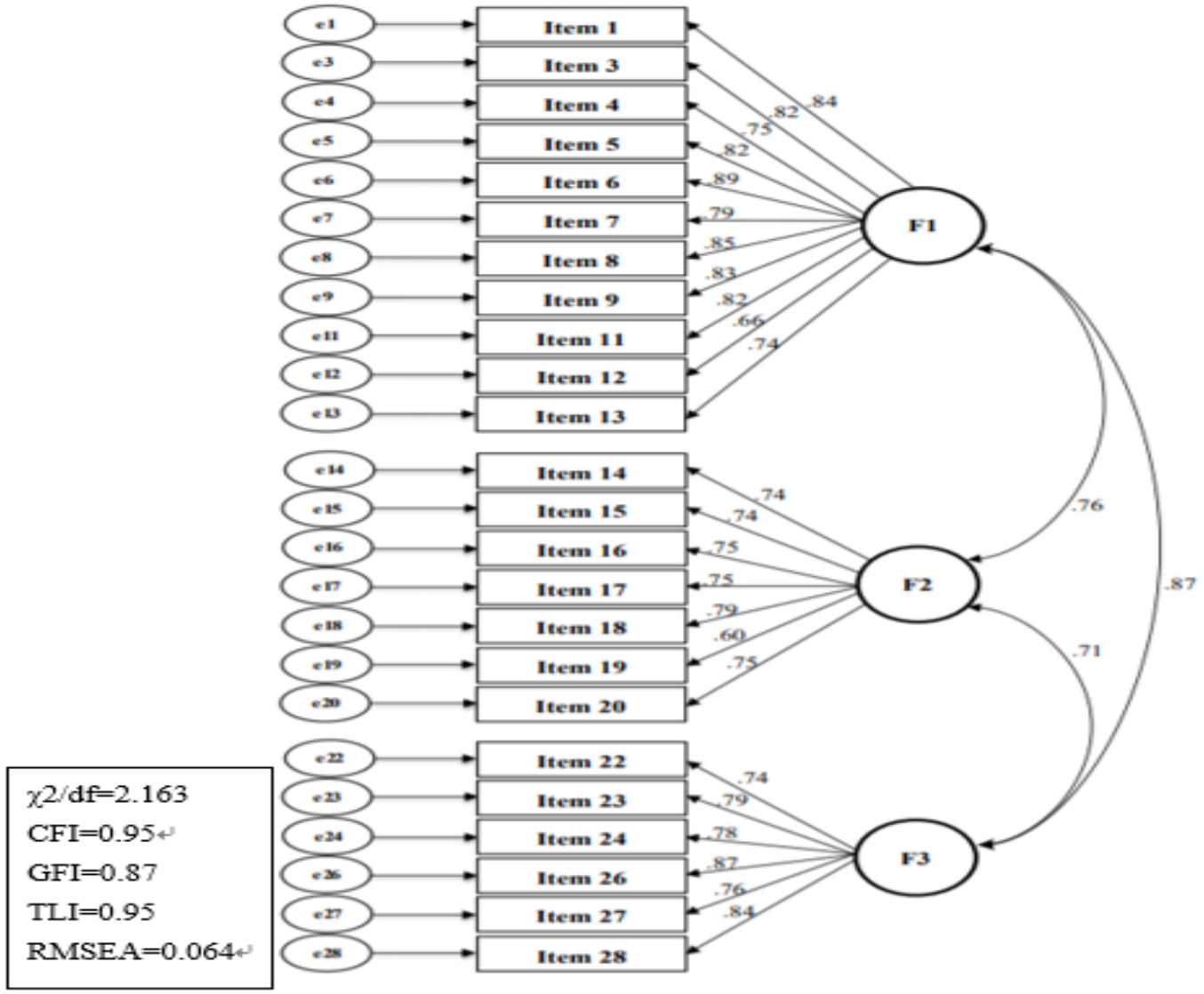

Figure2 CFA model

Note.

F1, Proactive and persevering characteristics; F2, Nursing professional identify;
F3, Passion

Confirmatory Factor Analysis (CFA)-3

- Sample 3 data was used to further verify the fitness of the modified model with 24-item (*i.e., the final version*), results demonstrated that the modified model had fair fit *(RMSEA=0.047, CFI=0.94, GFI=0.84, TLI=0.94)*

- Reliability

  Cronbach's coefficient alpha for the final 24-item version was 0.96 and subscales was 0.95, 0.89 and 0.92 separately.

Discussion

Discussion-1

- According to the results of EFA, the NPERI was downsized from prior 6 factors to 3 factors.
- Although the names (concepts) representing these three factors verified from EFA are somewhat different from those six themes derived from the prior qualitative research (i.e., *sense of mission*, *achievement*, *passion*, *meaning of nursing*, *personal characteristics*, *and intrinsic coping*),
- These three factors have a close theoretical connection with the original six themes (factors).

Table 4 Comparison 3-factor structure with 6 themes

Themes derived from prior qualitative study	Factors extracted from EFA	Definition	Numbers of item
Personal characteristics	Proactive and persevering characteristics	Certain unyielding personalities that keep nurses from withdrawing from difficulties and promote active use of internal resources to face frustrations and overcome difficulties.	13
Intrinsic coping			
Achievement	Nursing professional identity	Nurses regard nursing as meaningful and valuable work.	8
Sense of mission			
Meaning of nursing			
Passion	Passion	How nurses love nursing and wholeheartedly engage in nursing work.	7

Discussion-2

- Three factors structure of the NPERI-24 was verified by CFA and cross-validation reflecting the rigorous process.
- The sample in the study was recruited from *northern, central and southern Taiwan* covering *different levels of hospitals* (*i.e., medical centers and regional hospitals*).
- Multi-setting sampling achieve sample heterogeneity, and the sample representative could be recognized. Accordingly, this instrument may be used in other populations.

Discussion-3

The Cronbach's alpha coefficients

- good internal consistency for a newly constructed instrument.
- The high Cronbach's alpha coefficients implies that some items may be redundant.

Conclusion
&
Implication

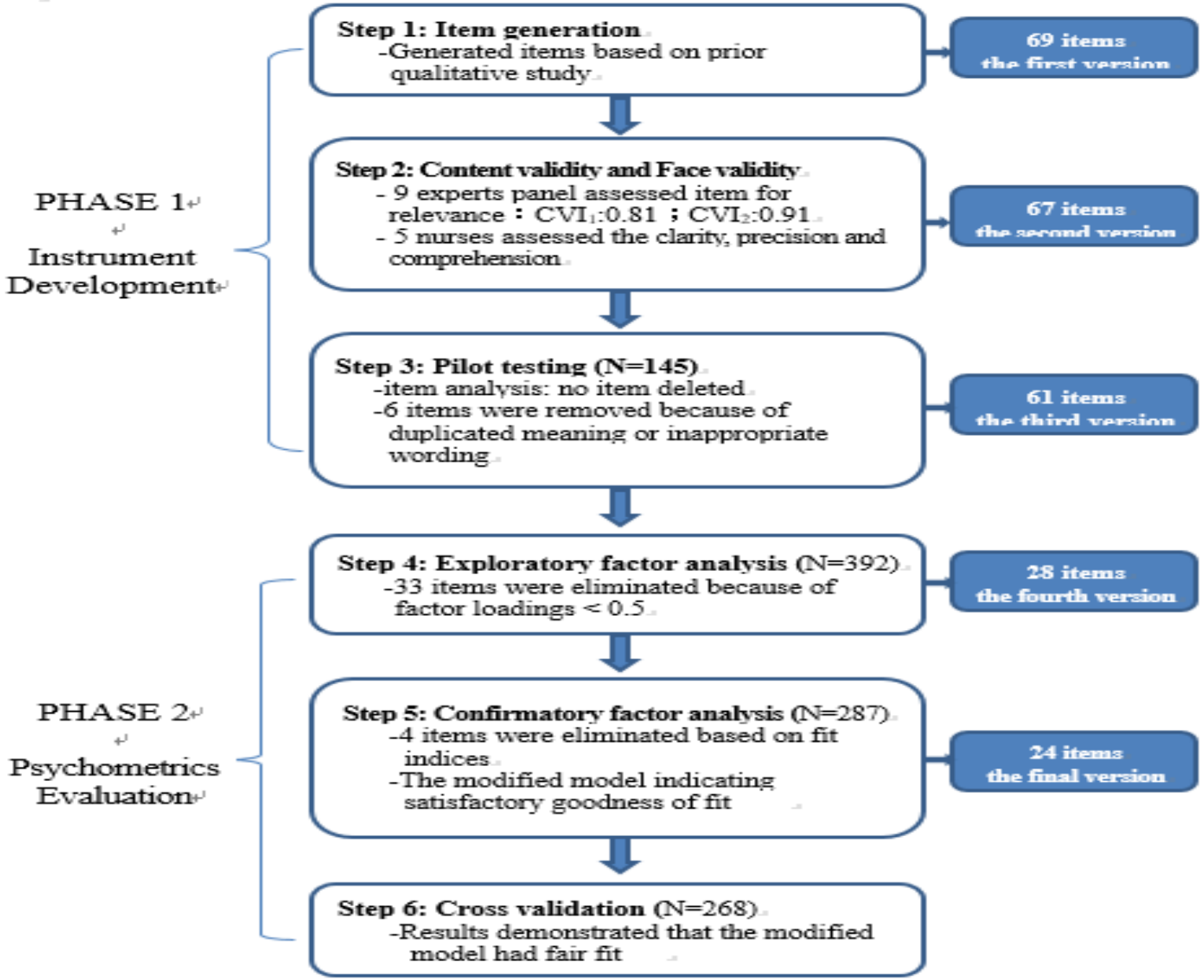

Figure 3 Process of developing and validating the NPERI

Conclusion

- The 24 items highly loaded onto the NPER factors
- There was a fair fit for the three-factor structure to measure the Nurse's Positive Energy of Retention
- Cross-validation provided further evidence for the construct validity of the NPERI
- Psychometric properties indicate the NPERI is a valid and reliable instrument to assess nurses' retention positive energy.

Implications for nursing

- NPERI can be served as an assessment tool to identify attributes of nurses' positive energy of retention from which recruit nurses who are more likely to get involved and remain in the nursing.

- The rigorous process to develop and validate the NPERI provides useful information for researchers who attempt to establish a new instrument.

Future Directions

- To examine whether some items can be combined or deleted to shorten the instrument.
- To evaluate the ecological validity of the NRPEI, nurse populations from different cultures is required.
- To conduct a longitudinal study to examine the predictive validity of the NRPEI is recommended.

Thank You
For Your Attention !