ORIGINAL ARTICLE

Psychometric Testing of Instrument the Nurse Professional Competence (NPC) in Indonesia

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ABSTRACT

Introduction: Professional competence is an important aspect of nursing education for improving the quality of care and safety. The Nurse Professional Competence (NPC) scale has been used internationally to assess professional competence for nursing students and registered nurses. Hence, there is an urgent need to evaluate the psychometric testing of the NPC scale in the Indonesian context. The study aimed was to adapt and validate the Indonesian version of NPC short form. **Methods:** The English of NPC short-version was translated into the Indonesian language guided by the World Health Organization (2018). To assess the validity and reliability, a confirmatory factor analysis (CFA) with Partial Least Square (PLS)-Structural Equation Modelling (SEM) and content validity index (CVI) was used. Six experts assessed the content and face validity. **Results:** The Indonesian NPC final version had excellent content validity (I-CVI = 0.83-1.00 and S-CVI/ Ave = 0.96). The construct validity and reliability were the satisfactory results with the average variance extracted $\geq$ 0.50, Fornell-Lacker criterion, and factors-loadings meeting the assumption (discriminant validity well established), and composite reliability revealed values $\geq$ 0.70 (high internal consistency reliability). **Conclusion:** The NPC scale was translated, culturally adapted, and instrument validated to produce an Indonesian version with 32 items. The NPC Indonesian version is valid and reliable, and that its application could evaluate nursing students' professional competence in Indonesia.

Keywords: Professional competence, Nursing student, Validation studies

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INTRODUCTION

The Indonesian nursing education competencies have been revised several times (1), but studies show that new graduates did not achieve the desired outcome of the National Nursing Competency Examination (2-5). Low competence among nursing students and registered nurses (RN) have been linked to increased patient morbidity and mortality (6-8). Global problems have necessitated the recruitment of new graduates with a high level of competency and adaptability to provide excellent patient care and safety (8, 9). Institutions of nursing education take a critical role in the developing professional competence and producing competent nurses (5, 6, 10, 11).

The Association of Indonesian Nurse Education (2021) recently announced the nursing graduates' competencies in the 21st century, such as skills in critical thinking, problem-solving, effective communication and collaboration, creativity, digital literacy adaptability, leadership skills, and personal development. Professional competence is defined as integrating one's knowledge, skills, and attitude into one's work as a health professional (1). Professional competence has become the core competency of nursing education globally and it is a critical aspect of ensuring the quality of care and safeguard of a patient in clinical practice (9, 12-14). Importance of measuring professional competence is undeniably crucial in nursing education (13, 15). Students nurses' self-assessed competence differs from that measured by examination, which presents a challenging for nursing education institutions to manage. As a result, self-evaluation has become a vital learning outcome to ensure patient safety (16).

Evaluating professional competence can be used to help students improve their performance and fulfill the professional requirements (13). A new curriculum of nursing education could be a solution to adapting the future demand by increasing students' professional competence that focuses on person-centered care, safety, and improving quality of care (15). A valid and reliable tool is needed to measure the professional competence in higher nursing education by national and

international professional standards (13). Several studies have established the Nurse Professional Competence (NPC) as a valid and reliable instrument for assessing professional competence for RN and nursing students in a global setting (6, 9, 13, 15, 17). The NPC could also be used to evaluate and improve the quality of nursing education programs (13, 16) and serve as a tool for self-reflection to develop students' competencies (7). However, there is a scarcity of research in nursing education related to validating professional competence assessment at the Bachelor nursing degree in Indonesia. As a result, the hardships in properly assessing professional competence must be addressed. To fill the knowledge gap, the aim of this study was to adapt and validate the NPC short form (NPC-SF) for the Indonesian context. This study also demonstrates the validity and reliability test.

MATERIALS AND METHODS

Study Design and Participant Recruitment

A descriptive quantitative study was conducted with a purposive sampling method. This study was performed at a Bachelor of Nursing Programme from a private university in Indonesia that offered both academic and nursing profession programmes. The participant was recruited in the Bachelor's nursing programme based on the following criteria: Indonesian students with clinical experience, aged 18 years, and able to comprehend the Indonesian language. The Institutional Review Board approved the study, the University of Malaya (UM.TNC2/UMREC-273) and approved by Indonesian Ministry of Affairs (No. 460.02/077/DV). This study was granted approval from Bachelor of Nursing, both academic and nursing profession programmes. The data were collected for two months, from August to September 2018. In total, 357 nursing students consisted of 231 students in the academic program and 126 students in the nursing profession programme, participated in this study. Before data collection, each participant provided informed consent. All participants were informed verbally and in writing that their participation was voluntary and would not impact their grades. They also can stop participating at any time they want. The first author did not participate in academic and profession programme learning activities. Anonymity was used throughout the data analysis and data presentation to protect the confidentiality of the participants in this study.

Instrument of Measurement

The NPC-SF is a short-form of self-administered questionnaire of NPC derived from the 35 items to measure the professional competence among RN and nursing students. The dimensions of the NPC-SF consist of six areas of competence, including Nursing Care, Value-based Nursing Care, Medical and Technical Care, Care Pedagogics, Documentation and Administration of Nursing Care, Development, Leadership, and Organization of Nursing Care. The NPC-SF questionnaire

has the advantages of taking less time to administer than the NPC with 88 items. The NPC-SF was validated by the original authors in Sweden and in Australia (7, 18) for Bachelor nursing students. Each item is rated on a 4-point Likert scale, with 1 indicating '*to a very low degree*' and 4 indicating '*to a very high degree*'. The answer alternative 4-point scale could improve the students' response rate to answer the questions. According to Nilsson et al. (2018), the construct validity of the NPC-SF was investigated using principal component analysis (PCA) and confirmatory factor analysis, with the factor solution explaining 54% of total variance. Internal consistency reliability values greater than 0.70 were discovered in six competency areas (18). Several studies also revealed the internal consistency of the NPC-SF was high across all competence areas with the α values ranging 0.79-0.87 (16). Cronbach's alpha values for the competence areas varied from 0.83-0.89, while the total scale was 0.96 (7).

Translation and Adaptation Process the instrument NPC-SF

Before finalizing the Indonesian version of the NPC-SF scale (NPC-SF-I), it was translated using WHO guidelines (20), such as forward and backward translation, an expert panel, pre-testing and an interview of cognitive. To achieve equivalence, the authentic inventory was translated independently by a professional English translator and content experts in the conceptual and linguistic aspects of the Indonesian context. The instrument was throughly examined by a panel of experts comprised of five nurse educators and one professor who are experts in instrument development. Each expert clarified and provided information for each item on the scale. They were given a chance to provide feedback and suggestions for changes to the items. A a result, they were advised to use a 4-point scale because it is the easiest for respondents to fill out and understand the questions. They arrived at concensus was reached, and the final copy of the scale was created. Two additional experts translators, both fluent in Indonesian and English, translated the reconciled version from Indonesian to English.

Twelve students were selected to answer the draft of the NPC-SF-I in the pre-testing. In the cognitive interview process, they were asked following their response to the questionnaire to comment on the wording and content of sentence structure, the semantic quality, and time of administration. They were asked to rate whether the words, sentences, and instructions of the NPC-SF-I " not appropriate", "appropriate", "very appropriate" and to comment on any wording and sentences which need to be amended. We found that 80% of the participants commented that the questionnaire was "appropriate" and another 20% commented that the questionnaire was "very appropriate." They also prefer 4-point scales as responses choice and they stated that it was accessible to understand, simple, and relevant to Indonesian

nursing competency. None of them commented that any wording and sentence need to be amended. As a result, the NPC-SF-I was finalized and there was no need for the team of experts to amend the NPC-SF-I draft. The instrument assumed its appropriate target language version and validated the conceptual and literal interpretations of Indonesian version.

Statistical Analysis
IBM SPSS statistics version 23.0 (SPSS Inc, an IBM company, Chicago, IL, USA was used to analyze the data. For all test, statistical significance level was set to less than 0.05. The categorical variables were presented as percentages and frequencies in the demographic characteristics of participants. The Kolmogorov Smirnov test was used to determine the normality of data and the confirmatory factor analysis was performed using PLS-SEM version 3. The CFA was used to assess the questionnaire's data quality and construct validity. The validity test in this study included face validity, content validity, construct validity, convergent validity, and discriminant validity. Furthermore, the internal consistency of reliability was measured using composite reliability, Fornell Lacker, and cross-loadings.

RESULT

Participants
The study approached 371 potential participants and 357 of them responded (response rate of 96.22%). The majority of the participants were of Javanese ethnicity (84.31%), female gender (77.3%) with a mean age of 20.72±1.8 years. The majority of the respondents' marital status was single (98.31%) and came from an academic nursing programs (64.70%). Table I displays the participants' characteristics of the study. As for the description of the standard deviation, we show it in Table I.

Table I: Demographic Characteristic of Participants (n=357)

Characteristics	Frequency	Percentages (%)
Age		
Age	20.72[a]	1.89[b]
Gender		
Female	276	77.33
Male	81	22.34
Ethnicity		
Javanese	301	84.31
Non Javanese	56	15.69
Grade Point Average (GPA)		
< 3.00	43	12.04
≥ 3.00	314	87.96
Marital Status		
Married	6	1.69
Single	351	98.31
Nursing Program		
Academic	231	64.70
Profession	126	35.30

[a] mean, [b] standard deviation

Table II: Reflective outer model of the Nurse Professional Competence Indonesian Version

Construct	Item	Factor loadings	CR > 0.70	AVE ≥ 0.50
CP	Item 1	0.65	0.87	0.58
	Item 2	0.75		
	Item 3	0.78		
	Item 4	0.80		
	Item 5	0.80		
DANC	Item 1	0.67	0.89	0.51
	Item 2	0.70		
	Item 3	0.74		
	Item 4	0.77		
	Item 5	0.74		
	Item 6	0.71		
	Item 7	0.72		
	Item 8	0.67		
DLONC	Item 1	0.76	0.86	0.60
	Item 2	0.80		
	Item 3	0.79		
	Item 4	0.75		
MTC	Item 1	0.75	0.88	0.60
	Item 2	0.75		
	Item 3	0.78		
	Item 4	0.79		
	Item 5	0.80		
NC	Item 1	0.74	0.87	0.58
	Item 2	0.77		
	Item 3	0.75		
	Item 4	0.80		
	Item 5	0.76		
VBNC	Item 1	0.67	0.86	0.56
	Item 2	0.79		
	Item 3	0.78		
	Item 4	0.76		
	Item 5	0.73		

Note: CP= Care Pedagogics; DANC =Documentation and Administration Nursing Care; DLONC = Development, Leadership & Organization Nursing Care; MTC = Medical and Technical Care; NC= Nursing Care; VBNC= Value based Nursing Care; CR = Composite Reliability; AVE = Average Variance Extracted

NPC-SF-I Face and Content Validity
Six experts in nursing and management of higher education were asked to evaluate the scale's content and face validity. We asked experts to rate each item on its relevance and appropriateness in the following manner: 1 denotes that '*it is not relevant*', 2 denotes that '*it is somewhat relevant*'; 3 denotes that '*it is quite relevant*', and 4 denotes that '*it is highly relevant*'. The content validity index (CVI) was determined by dividing the number of items rated higher than 3 by the total number of the expert (21, 22). The CVI was made up of the content validity of individual items (I-CVI) as well as the overall scale (S-CVI). The I-CVI was determined by dividing the total number of experts number who gave a rating by the number of experts giving rating either 3 or 4 (relevant). The majority of researchers classified the S-CVI into two types; S-CVI/ UA which is the proportion of items on a scale that receive a relevance rating of three or four from all experts, and S-CVI/ Ave, which represents the average of the I-CVI scores including all items on the scale (22). The NPC-SF-I produced I-CVI values ranged from 0.83 to 1.00 and the S-CVI/Ave =0.96. Three items were deleted based on the experts' consider that they did not meet the standard competencies of Indonesian nursing education and practice, such as "*independently*

administered prescriptions". They also considered that two items were only suitable for RN not for nursing students such as "*teach, supervise and assess students*" and "*supervise and train co-workers/ staff*". Each expert advocated using a simple responses with a 4-point Likert scale and a brief statement rather than a lengthy one. The face validity of the items was also determined by having twelve students respond to the items and critically evaluate their insights. The NPC-SF-I final version was consistent with the Indonesian context, and it was capable of assesing the professional competence development of nursing students. In this study, the NPC-SF-I version had an excellent content validity.

NPC-SF-I Confirmatory Factor Analysis
The NPC-SF-I reflective outer model was acceptable for all of the items of six latent constructs, including care pedagogics (CP); documentation and administration nursing care (DANC); development, leadership & organization nursing care (DLONC); medical and technical care (MTC); nursing care (NC); and value-based nursing care (VBNC). The majority of the factor-loadings were more than 0.70, the composite reliability was > 0.80, and the AVE was ≥ 0.50. The highest factor-loading is 0.80 from four constructs, including CP, DLONC, MTC and NC. While the lowest factor-loading is 0.65 from item construct of CP. Thus, all items are significant to measure professional competence among nursing students. The results of construct and items of NPC-SF-I were described (Table II). The psychometric properties of NPC-SF-I is presented in Table III.

Table III: Psychometric Properties of the Nurse Professional Competence Scale Indonesian Version

Con-structs	AVE	CR	Cron-bach Al-pha	CP	DA NC	DLO NC	MTC	NC	VB NC
							Fornell-Larcker		
1.CP	0.58	0.87	0.81	**0.76**					
2. DANC	0.51	0.89	0.86	0.75	**0.71**				
3. DLONC	0.60	0.86	0.77	0.60	0.70	**0.77**			
4.MTC	0.60	0.88	0.83	0.60	0.62	0.51	**0.77**		
5.NC	0.58	0.87	0.82	0.53	0.54	0.52	0.49	**0.76**	
6.VBNC	0.56	0.86	0.80	0.65	0.66	0.59	0.55	0.60	**0.75**

Note: AVE = Average Variance Extracted; CR = Composite Reliability; CP= Care Pedagogics; DANC =Documentation and Administration Nursing Care; DLONC = Development, Leadership & Organization Nursing Care; MTC = Medical and Technical Care; NC= Nursing Care; VBNC= Value based Nursing Care.

DISCUSSION

A confirmatory factor analysis with PLS-SEM was used to assess psychometric properties such as internal consistency reliability (composite reliability), convergent validity (average variance extracted, and discriminant validity). Because the normality of the data distribution was not assumed, non-normal data could be analyzed using a non-parametric method and a larger number of indicator variables (26). To ensure validity and reliability, as well as to achieve consistency, the reflective measurement model was used. In general, higher values indicate greater reliability, for example, values between 0.60 and 0.70 are regarded as" acceptable", while values between 0.70 and 0.90 are classified satisfactory to good" (24).

Cronbach's alpha is also another way of measuring of internal consistency reliability that utilizes the same threshold as composite reliability but yields lower values (24). Furthermore, the reflective measurement model emphasizes the importance of convergent and discriminant validity (23, 26). The average variance extracted (AVE) should be 0.05 or greater to determine convergent validity (23). The Fornell-Larcker criterion and cross-loadings was used to assess the discriminant validity (23, 24, 27). To evaluate the Fornell-Larcker criterion, the square root of AVE must be higher than the correlation coefficients of each construct, while cross-loadings should be larger than its loadings of all remaining constructs (23-25).

The finding showed that the NPC-SF-I has adequate psychometric properties among Indonesian nursing students. The outer loadings scale ranged from 0.65 to 0.80 for the constructs. The indicator value, which is preferred to be 0.70 or higher (28), could be found in the outer loadings. The loading factors for all of the items in this study were satisfactory. The composite reliability (CR) value ranged from 0.86 to 0.89 revealed high internal consistency reliability for six latent constructs of CP, DANC, DLONC, MTC, NC, and VBNC. Furthermore, convergent validity was well established, with AVE values ≥ 0.50 for all NPC-SF-I items ranging from 0.51 to 0.60.

Discriminant validity was well established by demonstrating that the square root of AVE exceeds the correlation between the latent constructs. If the square root of AVE in the bold diagonal value is greater than the association values in its row and column, discriminant

validity is achieved (25, 28). Cross-loadings were used to determine discriminant validity, and it was discovered that all indicator loadings with their associated latent constructs of CP, DANC, DLONC, MTC, NC, VBNC are higher than their loadings with the remaining constructs. As a result, the discriminant validity of the NPC-SF-I was well established (25).

This study's sample size met the requirement of a good number with total participants is 357. According to Comrey and Lee, the sample size has categorized into six based on the number of items times to 5 or 10 subjects (19). The normality data was analyzed using the Kolmogorov-Smirnov test, revealing 0.01 (p<0.05). This indicates that the data were not normally distributed, and PLS-SEM was used to perform confirmatory factor analysis. The confirmatory factor analysis was used PLS-SEM to guarantee the construct's validity and reliability (26).

The current study's findings were consistent with the previous studies (7, 16, 18). It also proved that the NPC-SF was valid and reliable as a tool for assessing professional competence among nursing students. Furthermore, NPC-SF can be used to evaluate the efficacy of educational programs in nursing education and improve their quality (13, 16). The translation and adaptation of NPC-SF-I revealed alternative responses to questions using a 4-point Likert scale in this study. The CVI calculation and comments of experts who suggested reducing the three answer choice were taken into account. Three items of questions were removed because they did not to correspond to the standard of competency in Indonesian nursing education and practice, for example, "independently administered prescriptions", "teach, supervise and assess students" and "supervise and train co-workers/ staff". In addition, the respondents stated that answering the question is simple, which increased their intention for completing the questionnaire. The authors were granted permission to modify the answer choice based on the cultural context and situation in Indonesia's nursing education and practice. It was also consistent with the previous publication that used the NPC for measuring professional competence among nursing students with a 4-point Likert scale (6, 7, 13, 15-18, 29).

The NPC-SF can be used with other tools to measure critical thinking and research utilization in the nursing profession (7). Furthermore, NPC-SF was used as a tool in nursing education to develop the professional competence of nursing students (7, 18). The current study has the ability to assess its validity and reliability using CFA that resulted in a high levels. The NPC-SF-I consist of 32 items divided into six subscales and it has been validated, including new context-appropriate items for Indonesian nursing students' culture and population. In this study, the response rate of participants to fill in the questionnaire was high. As a result, the NPC-SF-I has been properly adapted for Indonesian nursing education and practice. The limitation of this study was that the representativeness of the population limited the study's scope. This study might not have been generalized to other nursing schools in Indonesia because it was carried in only one nursing school.

CONCLUSION

This study contributes to the adaptation and validation of the NPC-SF scale in Indonesian context. The findings indicate that the NPC-SF-I is a valid and reliable instrument for assessing professional competence among nursing students. It has the potential to promote the professionalism in nursing education and practice. It also track the development of a nursing student's professional competence from academic into clinical practice.

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