ABSTRACT

Background: Nursing competence is an essential element in ensuring high-quality nursing care and positive patient outcomes. Valid and reliable assessment tools for assessing nurse competence are needed to help nurse supervisors measure whether nurses are performing their job well and to provide a baseline for improving the competences of nurses.

Purpose: This study was designed to develop and psychometrically validate the Competence Scale for Clinical Nurses (CSCN).

Methods: The CSCN was developed in three steps: (a) generalize assessment items from nursing competence-related scales and a review of the relevant literature, (b) determine the content validity of the developed scale, and (c) psychometrically test the developed scale. Five hundred nurses were recruited from a medical center in southern Taiwan. Exploratory and confirmatory factor analyses were executed to analyze construct validity and internal consistency reliability.

Results: The scale-content validity index was .87, as determined by five experts. Two thirds (63.29%) of the variance was explained by three factors: basic care skills (nine items), being dedicated to work (five items), and patient-centered and ethical considerations (four items). A second-order confirmatory factor analysis indicated that the data fit the model well. The Cronbach’s alpha coefficients for each of the three factors and the total scale were .84–.91.

Conclusions/Implications for Practice: The 18-item CSCN is a feasible and time-efficient tool for assessing competence in clinical nurses. Nursing supervisors may use this tool to explore nurses’ competency and routinely track the effect of continuing education on competence. Continuous evaluation of nurses’ clinical-based competence using the CSCN is recommended.

Key Words: clinical nurses, competence assessment instrument, factor analysis, instrument development, nurse competence.

Introduction

Better patient outcomes and higher quality of nursing care are the primary concerns of healthcare services. Nursing competence, an essential element in ensuring high-quality nursing care, has a positive influence on patient outcomes (Audet et al., 2018). Therefore, valid and reliable assessment tools that accurately assess nurse competence are needed to help nurse supervisors measure whether nurses are performing their job well and to provide a baseline for improving the competences of nurses (Axley, 2008).

The concept of “competence” was introduced and popularized in McClelland (1973), which advocated “testing for competence rather than intelligence.” McClelland pointed out that job performance success may be predicted by knowledge, skill, ability, and other characteristics, which the author identified as underlying, enduring personal characteristics or self-concepts, traits, and motives. McClelland also argued that these other characteristics have a primary influence on performance success. Boyatzis (1982), who extended and refined McClelland’s work, defined competence in line with Klemp (1980) as “an underlying characteristic of a person which results in effective and/or superior performance in a job” (Boyatzis, 1982, p. 21). Underlying characteristics include motive, traits, and skills as well as aspects of one’s self-image or social role and/or body of knowledge.

Building on Boyatzis’ framework, Spencer and Spencer (1993) defined competence as “an underlying characteristic of an individual that is causally related to criterion-referenced effective and/or superior performance in a job or situation” (p. 9). They posited that, in addition to desirable worker traits, competence also relates to worker performance in the workplace. Thus, all of the parts and pieces of competencies, including the integrated whole of knowledge, skills, and attitudes, are main factors and crucial determinants of performance (Spencer & Spencer, 1993).

Spencer and Spencer (1993) developed the “iceberg” model of competence level. They pointed out that the underlying characteristics of personality, which predict behavior in various situations, may be divided into five types, including the “below the waterline” (submerged) competences of traits, motives, and self-concept and the “above the waterline” (surface) competences of knowledge and skills. The submerged
characteristics are construed in this model to be the key predictors of high performance.

Competence in the context of healthcare professionals has been defined as the framework of skills that reflect knowledge, attitudes, and psychosocial and psychomotor elements, including performance, achievements, and self-assessment (Benner, 1984; World Health Organization, 2013). In addition, nurse competence refers to the professional knowledge, skills, behavioral attitudes, motivations, and personal traits that individuals must possess to provide nursing services successfully and must have to be competent in their job (Cowen et al., 2007; Spencer & Spencer, 1993). Insufficient nurse competence (e.g., communication, patient-centered care, and nursing skills) may leave nurses unable to handle the more complicated aspects of nursing work and vulnerable to making mistakes when providing nursing care to patients, resulting in high work-related stress and medical errors (Chiu et al., 2009; Costello et al., 2019; Sportsman, 2010).

Key components of clinical nurse competence comprise professional skills, communication and ethical considerations, and role accomplishments (Meretoja et al., 2004; Muller, 2013; Sterner et al., 2020). However, the instruments currently available for measuring competence in Taiwanese nurses tend to be tedious and not user friendly (Lin et al., 2004; Pai et al., 1999). In addition, the results of recent studies conducted in Western countries may not be suitable for application in the Taiwanese nursing community (Muller, 2013; Nilsson et al., 2018) because of differences in culture and healthcare systems. Thus, the aim of this study was to test the psychometric properties of the Competence Scale for Clinical Nurses (CSCN) developed to measure clinical competence in nurses working in Taiwan.

**Methods**

**Step 1: Literature Review**

On the basis of Spencer and Spencer’s concept of competence, nursing competence-related scales and published studies were reviewed to identify the key competence-related items for clinical nurses (Flinkman et al., 2017; Hsu & Hsieh, 2013; Wangensteen et al., 2015). The first version of the self-administered CSCN was developed with 43 items and divided into the three dimensions of professional knowledge and skills (10 items), behavioral skills (29 items), and performance (four items). Scoring in the 43-item CSCN uses a 7-point Likert scale design that ranges from 1 = extremely unsuitable to 7 = extremely suitable, with higher scores indicating higher levels of nurse competence.

**Step 2: Content Validity Examination**

The panel of five experts invited to assess content validity included four nursing PhDs with at least 5 years of clinical practice experience and one expert with a master’s degree and 27 years of experience in clinical practice. The content validity index (CVI) for each item (I-CVI) and for the entire scale (S-CVI/Ave) were applied in this step. The 23 items with CVI values < .80 were revised. The S-CVI/Ave value for the final revised version of the 43-item CSCN was .87, which met the requisite criteria (Lynn, 1986; Polit & Beck, 2006). To improve readability, the experts recommended semantic modification for three items.

Afterward, the CSCN was administered to five clinical practice nurses to assess the clarity, readability, and completeness of the 43 scale items. They expressed having no trouble answering the questionnaire, which they completed in 8–10 minutes.

**Step 3: Psychometric Test**

A cross-sectional design was applied to examine the validity and reliability of the CSCN. Convenience sampling was performed to recruit clinical nurses who work in a hospital. Eligible participants were licensed nurses who were > 20 years old, had worked for the study hospital for at least 3 months (0.25 year), and were willing to participate. Nurses who worked in the operating or ambulatory ward, worked as nursing practitioners, worked as case managers, or had worked in the study hospital for less than 3 months were excluded. All eligible nurses in the study hospital were invited to participate in the study.

**Data Collection**

After approval had been obtained from the institutional review board of the study hospital (104-7158C), the researcher contacted the nursing director of the hospital and the head nurse of each unit and then requested eligible nurses to sign the consent form and complete the questionnaire, which they received via email or text message. The nurses were assured that nonparticipation would not affect their present or future employment, that they had the right to withdraw from the study without any penalty, that there was no risk from participating in the study, and that their responses would be treated in confidence. After completing the questionnaire, the participating nurses received a small gift (value: approximately 3 U. S. dollars) as a token of appreciation. Participants took approximately 15 minutes to complete the questionnaire.

**Participants**

Six hundred eligible participants were recruited from a medical center in southern Taiwan between October 2015 and January 2016. Data were collected via WebQuest with a response rate of 83.3%. The data of 500 participants were applied in the subsequent factor analysis. The participants were separated into two even-/odd-numbered groups (Costello & Osborne, 2005), with those in the odd-numbered group (n = 250) sorted for testing construct validity using exploratory factor analysis (EFA) and those in the even-numbered group (n = 250) tested using confirmatory factor analysis (CFA).

Most participants were female (n = 483, 96.6%), single (n = 300, 60%), and bachelor educated (n = 429, 85.8%). The average age was 31.69 years (SD = 6.00, range = 22–50 years). The participants had an average of 9.63 years of clinical practice experience (including both study hospital and
other hospital experience; \( SD = 6.59, \) range = 0.25–30 years) and had an average of 8.32 years of clinical practice experience (\( SD = 6.48, \) range = 0.25–29 years).

Data Analysis
IBM SPSS 22.0 (IBM Inc., Armonk, NY, USA) was applied to execute the statistical analyses. An item–total correlation was performed to evaluate items for retention in the scale. The criteria for deleting items were as follows: (a) skewness and kurtosis > 2.0 and (b) an item–total correlation of either < .30 or > .70 (Pituch & Stevens, 2016).

EFA using the principal axis factoring method with oblimin rotation was employed to examine construct validity in this study. The number of factors was determined using a screen plot and an eigenvalue higher than 1.0 (Cattell, 1966). Factor loading with an absolute value > .60 and meaningful explanation were used to determine whether an item was retained or not (Pituch & Stevens, 2016).

A second-order CFA was employed to examine construct validity in this study. Structured equation modeling with the maximum likelihood method was used to establish the parameters in the factor loading, factor variance–covariance, and unique matrices (Arbuckle, 2014). The acceptable values of model fit indices for a CFA model included normed fit index > .90, goodness-of-fit index > .90, comparative fit index > .90, root mean square error of approximation < .08, and a factor loading of each item loaded on the subscale of > .50 (Kline, 2015; Schumacker & Lomax, 2016).

The Cronbach’s \( \alpha \) coefficient was used to determine the internal consistency reliability of each domain and the overall scale, with a value > .70 indicating good reliability for a newly developed instrument (Nunnally & Bernstein, 1994).

Results

Item Analysis
Six items (Items 10, 17, 18, 20, 27, and 38) were deleted because their skewness and kurtosis exceeded 2.0, and 15 items (Items 1, 3, 11, 13–16, 21, 23–26, 28, 29, and 37) were deleted because their item–item correlation coefficients exceeded .70 \((r > .70)\). Thus, 22 items remained in the CSCN for construct validity testing.

Construct Validity
Before performing the EFA to establish construct validity, the Kaiser–Meyer–Olkin and sphericity tests were performed. The Kaiser–Meyer–Olkin value of .95 (> .6) and the significance of the approximation of the chi-square distributions in the Bartlett’s test of sphericity at \( p < .001 \) indicate that the data were suitable for factor analysis (Pituch & Stevens, 2016). Three factors were extracted after initial rotation. Three items (Items 30, 32, and 34) were deleted because of low factor loading, and one item (Item 19) was deleted because of cross-loading < .10. The final solution yielded an 18-item, three-factor construct.

The accumulated total variance of the 18-item CSCN was 63.29%. Factor 1 (clinical care skills), which assesses the respondent’s ability to apply professional knowledge, nursing procedures, and resources in patient care, consists of nine items and accounted for 51.20% of the variance. Factor 2 (being dedicated to work), which assesses the respondent’s ability to execute behaviors in line with organizational requirements and to engage in nursing work, consists of five items and accounted for 7.14% of the variance. Factor 3 (patient-centered and ethical considerations), which assesses patient safety issues, particularly in terms of medical ethics and nursing standards while working with patients, consists of four items and accounted for 4.95% of the variance (Table 1).

The three subscales had a moderate-to-high correlation with each other. The clinical care skills subscale was found to correlate positively with both the “being dedicated to work” subscale \((r = .57, p < .001)\) and the “patient-centered and ethical considerations” subscale \((r = .72, p < .001)\). Moreover, the being dedicated to work subscale was found to correlate positively with the patient-centered and ethical considerations subscale \((r = .54, p < .001)\).

On the basis of the EFA results for the factor structure, a second-order factor of CFA was conducted, with results indicating that all of the 18 items were significantly loaded (> .5) on their corresponding factors \((p < .001)\). The first-order factors (i.e., clinical care skills, being dedicated to work, and patient-centered and ethical considerations) were all significantly loaded \((p < .001)\) on the second-order factor (competence). The fit indices were minimum discrepancy per degree of freedom \(= 2.279 (\chi^2)\), comparative fit index = .95, normed fit index = .91, goodness-of-fit index = .95, and root mean square error of approximation = .07 (95% CI [.061, .082]), indicating the model fits the data well. Therefore, all of the 18 items were retained in the final CNCS (Figure 1).

Internal Consistency Reliability
Cronbach’s alpha was computed to assess internal consistency in the three subscales and the overall score of the CSCN based on the 250 participants in the CFA group. The following values for Cronbach’s alpha were calculated:

- \( \alpha = .91 \) for the total CSCN scale,
- \( \alpha = .90 \) for “clinical care skills,”
- \( \alpha = .84 \) for “being dedicated to work,” and
- \( \alpha = .89 \) for “patient-centered and ethical considerations.”

Thus, the 18-item CSCN total score and the three CSCN subscales were judged to possess sufficiently high internal consistency (see Table 2).

Discussion
After the three steps of instrument development, including literature review (generating items), content validity examination, and psychometric testing, the 18-item CSCN was finalized for measuring nurse competence in clinical practice. The S-CVI/Ave was .87, and good agreement was obtained among the five experts with regard to the appropriateness.
of the instrument. Three-subscale-factor structures may be cross-validated using EFA and CFA (Costello & Osborne, 2005), and the CSCN may be scored globally or independently using the three subscales based on the results of the second-order CFA (Noar, 2003). The Cronbach’s α coefficients for the overall scale and the three subscales were all > .80, indicating that the CSCN has excellent reliability (Nunnally & Bernstein, 1994). These results support the 18-item CSCN as a reliable and valid tool for measuring the clinical practice competences of nurses.

The clinical care skills subscale assesses ability to apply professional knowledge, nursing procedures, and resources in patient care. Nursing process via professional services is related to critical thinking ability. Therefore, providing patients and caregivers with professional knowledge and professional services was retained in the CSCN, which is consistent with previous studies (Akamine et al., 2013; Lin et al., 2004; Liu & Aungsuroch, 2018). To enhance quality of care and decrease medical errors, teamwork resource management in the nursing profession is emphasized by the Taiwanese government (Ministry of Health and Welfare, 2020). Thus, utilizing resources with quality of communication was revised from an independent factor and grouped into the basic care skills subscale in this CSCN. These three fundamental skills explained most of the variance, indicating that the scale addresses the critical components of nurse competence in clinical practice.

With the aging population, easy access to healthcare services, and progressive technological and standard operating procedures (Yang et al., 2019), positive attitudes toward tasks will help encourage nurses to focus greater effort on continued learning to better cope with their dynamic workplaces and perform complicated work well (Truitt, 2011). Therefore, the “being dedicated to work” subscale was identified in this study as a component of nurse competence and was retained in the CSCN. The content of this subscale relates to the

### Table 1
The 18-Item Competence Scale for Clinical Nurses and Pattern Matrix of the Exploratory Factor Analysis (N = 250)

| 18-Item Competence Scale for Clinical Nurses | Factor Loading (Pattern Matrix) |
|--------------------------------------------|---------------------------------|
| Factor 1: clinical care skills             | Factor 1 | Factor 2 | Factor 3 |
| 5. I can use existing resources and plan appropriate nursing activities. | .851 | .569 | .436 |
| 8. I can continuously trace the questions and requirements of patients. | .828 | .586 | .467 |
| 12. I can express my opinion according to my professional judgment. | .822 | .552 | .429 |
| 7. I can understand the objective of the clinical test/examination as well as the normal values. | .790 | .481 | .504 |
| 4. I can execute nursing activities according to the nursing standards. | .780 | .468 | .554 |
| 6. I can provide information on the drug effects, side effects, and precautions of the case. | .768 | .460 | .552 |
| 22. I can work together with the medical team to formulate related nursing care plans. | .761 | .569 | .378 |
| 2. I can properly execute conventional nursing activities (e.g., administration, examination, dressing, transfusions, blood preparation). | .753 | .404 | .705 |
| 9. I can adjust the priority of work according to the situation. | .737 | .430 | .581 |
| Factor 2: being dedicated to work           | Factor 1 | Factor 2 | Factor 3 |
| 40. I am willing to accept temporary tasks assigned by the supervisor. | .504 | .834 | .366 |
| 41. I will fully cooperate with the requirements of the organization. | .564 | .814 | .502 |
| 42. I can actively participate in on-the-job training courses. | .555 | .713 | .300 |
| 31. I can quickly adapt to a new unit (such as a rotating training system). | .449 | .619 | .134 |
| 43. I am willing to be engage continuously in nursing work. | .426 | .619 | .211 |
| Factor 3: patient-centered and ethical considerations | | | |
| 36. I can follow the confidentiality provisions related to the disease information of the case. | .593 | .403 | .872 |
| 39. I am responsible for my own decision and behaviors. | .591 | .463 | .806 |
| 33. I can maintain the privacy of the case. | .623 | .460 | .786 |
| 35. When executing care activities, I can follow the standards to avoid damage to the case. | .634 | .367 | .775 |
| Eigenvalue | 9.215 | 1.285 | .890 |
| Explained variance | 51.20 | 7.14 | 4.95 |
| Total scale | 63.29 | | |
degree to which nurses are enthusiastic about executive behaviors, which relates to motivation. Accordingly, the “being dedicated to work” subscale earned the highest score of the three subscales.

Patient-centered safety attitude is emphasized because of hospital accreditation requirements and the global need to reduce the number/incidence of malpractice lawsuits (Chang et al., 2012). The comprehensive issues of patient-centered care, covering the nurse–patient relationship, patient rights, and informed consent, are currently highlighted in many different nursing education modules (Ministry of Health and Welfare, 2020; Numminen et al., 2016). Therefore, the “patient-centered and ethical considerations” subscale includes four items that comprise an important component of clinical practice. As the content of this subscale was found to be heavily influenced by external factors (e.g., recognition of patients and local culture), it earned the lowest score of the three subscales.

The CSCN has fewer items and factors than either the “nursing competence questionnaire” (Pai et al., 1999) or the “Taiwanese version of nursing competence” (Lin et al., 2004), both of which were developed to measure competence in nurses in Taiwan and address scopes of nurse competence that significantly overlap with the CSCN. For

### Table 2

**Description and Cronbach’s Alpha of Each Factor and Total Scale (N = 250)**

| Subscale                                      | Item | Mean  | SD   | α    |
|-----------------------------------------------|------|-------|------|------|
| Clinical care skills                          | 9    | 5.76  | 0.48 | .90  |
| Being dedicated to work                       | 5    | 5.84  | 0.72 | .84  |
| Patient-centered and ethical considerations   | 4    | 5.22  | 0.86 | .89  |
| Total score                                   | 18   | 5.72  | 0.71 | .91  |
example, three factors (teaching, communication, and caring) of the “nursing competence questionnaire” and four factors (caring, communication/coordination, teamwork, and teaching) of the “Taiwanese version of nursing competence” were grouped into the clinical care skills subscale of CSCN, which assessed the ability of respondents to apply professional knowledge, nursing process, and resources in patient care. Therefore, the CSCN may be a more user-friendly tool than these already-published instruments.

Conclusions
This study was conducted to develop a valid instrument for assessing nursing competence. The CSCN showed good face validity, credibility, and reliability and may be useful to nursing supervisors in evaluating nurse competence. However, as the CSCN was developed particularly for clinical nurses working at medical centers, applicability to other health-related professionals may be limited. Future work may apply the CSCN to a diverse range of hospital types. Regular evaluation of nurses’ clinical-based competence by nursing supervisors using the CSCN is recommended.

Nursing competence is a key component in nursing care. The 18-item CSCN is feasible and less time-consuming for clinical practice. Nursing supervisors may use this tool on a routine basis to explore nurses’ competence and track the effect of continued education on competence.

Acknowledgment
The authors wish to thank all of the nurses who participated in the study.

Author Contributions
Study conception and design: CCK, YHL
Data collection: HLC, LHY, WIC
Data analysis and interpretation: CCK, HLC, IJP
Drafting of the article: LHY
Critical revisions of the article: IJP

References
Akamine, I., Uza, M., Shinjo, M., & Nakamori, E. (2013). Development of competence scale for senior clinical nurses. Japan Journal of Nursing Science, 10, 55–67. https://doi.org/10.1111/j.1742-7924.2012.00210

Arbuckle, J. L. (2014). Amos 23.0 user’s guide. IBM SPSS.

Aude, L. A., Bourgault, P., & Rochefort, C. M. (2018). Associations between nurse education and experience and the risk of mortality and adverse events in acute care hospitals: A systematic review of observational studies. International Journal of Nursing Studies, 80, 128–146, https://doi.org/10.1016/j.ijnurstu.2018.01.007

Axley, L. (2008). Competency: A concept analysis. Nursing Forum, 43(4), 214–222. https://doi.org/10.1111/j.1744-6198.2008.00115.x

Benner, P. (1984). From novice to expert, excellence and power in clinical nursing practice. Addison-Wesley Publishing Company.

Boyatzis, R. E. (1982). The competent manager. A model for effective performance. Wiley.

Cattell, R. B. (1966). The screen test for the number of factors. Multivariate Behavioral Research, 1(2), 245–276. https://doi.org/10.1207/s15327906mbnr0102_10

Chang, H.-J., See, L.-C., Chou, M.-J., Shen, Y.-M., & Lin, S.-R. (2012). Work performance and job stress among clinical nurses while implantation of global budget payment system in Taiwan. Chinese Journal of Occupational Medicine, 19(1), 15–28. https://doi.org/10.30027/CJOM.201201.0003 (Original work published in Chinese)

Chiu, Y.-L., Chung, R.-G., Wu, C.-S., & Ho, C.-H. (2009). The effects of job demands, control, and social support on hospital clinical nurses’ intention to turnover. Applied Nursing Research, 22(4), 258–263. https://doi.org/10.1016/j.apnr.2008.02.006

Costello, A. B., & Osborne, J. W. (2005). Best practice in exploratory factor analysis: Four recommendations for getting the most from your analysis. Practical Assessment, Research & Evaluation, 10(7), Article 7.

Costello, H., Cooper, C., Marston, L., & Livingston, G. (2019). Burn-out in UK care home staff and its effect on staff turnover: MARQUE English national care home longitudinal survey. Age and Ageing, 49(1), 74–81. https://doi.org/10.1093/ageing/afz118

Cowan, D. T., Wilson-Barnett, J., & Norman, I. (2007). A Europe survey of general nurses’ self-assessment of competence. Nurse Education Today, 27(5), 452–458. https://doi.org/10.1016/j.nedt.2006.08.008

Flinkman, M., Leino-Kilpi, H., Numminen, O., Jeon, Y., Kuokkanen, L., & Meretoja, R. (2017). Nurse competence scale: A systematic and psychometric review. Journal of Advanced Nursing, 73(5), 1035–1050. https://doi.org/10.1111/jan.13183

Hsu, L. L., & Hsieh, S. I. (2013). Development and psychometric evaluation of the competency inventory for nursing students: A learning outcome perspective. Nurse Education Today, 33(5), 492–497. https://doi.org/10.1016/j.nedt.2012.05.028

Klemp, G. O. (1980). Assessment of occupational competence. National Institute of Education.

Kline, R. B. (2015). Principles and practices of structural equation modeling (4th ed.). Guilford Press.

Lin, C.-F., Lu, M.-S., & Kang, W.-L. (2004). Competencies for the generalist nurse: A comparison between ICN and Taiwanese version. New Taipei Journal of Nursing, 8(2), 11–22. https://doi.org/10.6540/NTJN.2004.2.002 (Original work published in Chinese)

Liu, Y., & Aungsviroch, Y. (2018). Current literature review of registered nurses’ competency in the global community. Journal...
of Nursing Scholarship, 50(2), 191–199. https://doi.org/10.1111/jnu.12361

Lynn, M. R. (1986). Determination and quantification of content validity. Nursing Research, 35(6), 382–386.

McClelland, D. C. (1973). Testing for competence rather than for "intelligence.". American Psychologist, 28(1), 1–14. https://doi.org/10.1037/h0079092

Meretoja, R., Isoaho, H., & Leino-Kilpi, H. (2004). Nurse competence scale: Development and psychometric testing. Journal of Advanced Nursing, 47(2), 124–133. https://doi.org/10.1111/j.1365-2648.2004.03071.x

Ministry of Health and Welfare. (2020). Healthcare quality and patient safety goals (2020–2021). https://www.patientsafety.mohw.gov.tw/Content/zMessagess/contents.aspx?&SiteID=1&MmmID=6217330317401756&MSID=107103644652033374 (Original work published in Chinese)

Muller, M. (2013). Nursing competence: Psychometric evaluation using rash modelling. Journal of Advanced Nursing, 69(6), 1410–1417. https://doi.org/10.1111/jan.12009

Nilsson, J., Engström, M., Florin, J., Gardulf, A., & Carlsson, M. (2018). A short version of the nurse professional competence scale for measuring nurses’ self-reported competence. Nurse Education Today, 71, 233–239. https://doi.org/10.1016/j.netd.2018.09.028

Noar, S. M. (2003). The role of structural equation modeling in scale development. Structural Equation Modeling, 10(4), 622–647. https://doi.org/10.1207/S15328007SEM1004_8

Numminen, O., Ruoppa, E., Leino-Kilpi, H., Isoaho, H., Hupli, M., & Meretoja, R. (2016). Practice environment and its association with professional competence and work-related factors: Perception of newly graduated nurses. Journal of Nursing Management, 24(1), E1–E11. https://doi.org/10.1111/jonm.12280

Nunnally, J. C., & Bernstein, I. H. (1994). Psychometric theory (3rd ed.). McGraw-Hill.

Pai, Y.-C., Hsu, N., & Wang, P. (1999). Relationships of self-assessed nursing competencies and individual characteristics in a medical center. Nursing Research (Taiwan), 7(3), 209–220. https://doi.org/10.7081/NR.199906.0209 (Original work published in Chinese)

Ptuch, K. A., & Stevens, J. P. (2016). Applied multivariate statistics for the social sciences: Analysis with SAS and IBM’s SPSS (6th ed.). Routledge.

Polit, D. F., & Beck, C. T. (2006). Essentials of nursing research: Methods, appraisal, and utilization. Lippincott Williams & Wilkins.

Schumacker, R. E., & Lomax, R. G. (2016). A beginner’s guide to structural equation modeling (4th ed.). Lawrence Erlbaum Associates.

Spencer, L. M., & Spencer, S. M. (1993). Competence at work: Models for superior performance. Wiley.

Sportsman, S. (2010). Competency education and validation in the United States: What should nurses know? Nursing Forum, 45, 140–149. https://doi.org/10.1111/j.1744-6198.2010.00183.x

Sterner, A., Säfström, E., Palmér, L., Ramstrand, N., & Hagiwara, M. A. (2020). Development and initial validation of an instrument to measure novice nurses’ perceived ability to provide care in acute situations—PCAS. BMC Nursing, 19, Article No. 13. https://doi.org/10.1186/s12912-020-0406-3

Truitt, D. L. (2011). The effect of training and development on employee attitude as it relates to training and work proficiency. SAGE Open, 1(3), 1–13. https://doi.org/10.1177/2158244011433338

Wangensteen, S., Johansson, I. S., & Nordström, G. (2015). Nurse competence scale: Psychometric testing in a Norwegian context. Nurse Education in Practice, 15(1), 22–29. https://doi.org/10.1016/j.nepr.2014.11.007

World Health Organization. (2013). Transforming and scaling up health professionals’ education and training. https://www.who.int/publications-detail/transfoming-and-scaling-up-health-professionals%E2%80%99-education-and-training

Yang, P.-H., Chen, M.-H., Chen, L.-C., & Lin, S.-Y. (2019). Explore the correlated factors between workload perception and intent to stay among nurses in a medical center. The Kaohsiung Journal of Nursing, 36(1), 1–11. https://doi.org/10.6692/KJN.201904_36(1).0001 (Original work published in Chinese)