A Scale Development Study: Nursing Competency Perception Scale

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Abstract

Aim: Training and employment of competent nurses are among the priorities of nursing. This study was conducted to develop a valid and reliable measurement tool for determining the competency perceptions of senior nursing students.

Methods: The methodological study was carried out with 372 senior nursing students who studied in nursing departments of two universities in Istanbul between January and March 2018. The item pool of the scale was created with the learning outcomes within the scope of the "Quality and Safety Education for Nurses" project in the United States of America. After content validity, the scale consisted of 55 items and six main dimensions. Data were collected using a questionnaire, including a personal information form and the Nursing Competency Perception Scale. Data analysis was performed using descriptive statistics, exploratory and confirmatory factor analysis, Pearson correlation analysis, t-test in dependents groups, and Cronbach's alpha coefficient.

Results: As a result of exploratory and confirmatory factor analysis, 39 items with a 6-factor structure were retained to form the Nursing Competency Perception Scale. These factors showed senior nursing students' competency perceptions in patient-centered care, teamwork and collaboration, evidence-based practice, quality improvement, safety, and informatics. Cronbach's alpha coefficient was between 0.77 and 0.90. There was no statistical difference between the test–retest measurements in the six dimensions ($P > .05$). Pearson correlation coefficients from 0.71 to 0.90 were found in the six main dimensions ($P < .001$).

Conclusion: The Nursing Competency Perception Scale is a valid and reliable tool for determining the competency perceptions of senior nursing students and new graduate nurses with no professional experience.

Keywords: Nursing education, nursing students, professional competence, validity and reliability

Introduction

The training and employment of a competent nursing workforce are expected from nursing schools and healthcare institutions, with the quality and safety of healthcare systems becoming a global phenomenon.[1-3] Therefore, determining the competency levels of future nurses towards quality and safe healthcare is essential in terms of improving lacking or inadequate competencies.

Providing quality and safety efforts in healthcare systems started with a report titled "To Err is Human: Building a Safer Healthcare System" published by the Institute of Medicine, United States of America. This report stated that healthcare services were unsafe, healthcare professionals made preventable medical errors, resulting in high mortality and cost.[4] The second report published in 2001 with the title of "Crossing the Quality Chasm: A New Health System for the 21st Century" stated that the restructuring of the healthcare system and changes in the education of healthcare professionals were necessary.[5] The third report published in 2003 titled "Health Professions Education: A Bridge to Quality" highlighted the need for a workforce that provides patient-centered care, works in interdisciplinary teams, uses evidence-based practices, quality improvement approaches, and information systems.[6] "Patient Safety Curriculum Guide for Health Professionals" published by the World Health Organization in 2011, reported the teaching topics and methods for incorporating quality and safety in the healthcare curricula.[7] Thus, the search for a competent workforce for quality and safe healthcare, which started in the USA, is among the priorities of all countries now.

Nurses, who communicate deeply with patients and families and constitute the most crowded professional group in the hospital, have a determinant effect on the quality and safety of healthcare. In other words, the quality and safety of healthcare vary according to the level of competency of nurses. Therefore, transforming the nursing programs based on quality and safety education is an essential step to improve the quality and safety of healthcare.[7-9] In 2005, nursing leaders formed the "Quality and Safety Education for Nurses (QSEN)" initiative in the USA to improve the quality and safety of healthcare. The QSEN framework consists of six competencies: patient-centered care, teamwork and collaboration, evidence-based practice, quality improvement, safety, and informatics. In addition, a set of knowledge, skills, and attitudes for each of the six competencies are determined as learning outcomes.[10] The project has become the QSEN Institute over time by carrying out the following studies: integrating the QSEN competencies into nursing pre-licensure programs; sharing resources on official web site; determining the QSEN competencies at a graduate level; instilling the competencies in textbooks, licensing, accreditation, and certification standards; organizing conferences and symposiums.[11,12] Today, the QSEN Institute has become a global initiative, integrating quality and safety competencies into nursing programs in other countries outside the USA, such as Korea, China, and Sweden.[8,13,14] In Turkey, nursing programs are structured within the scope of the National Core Education Program in Nursing (NCEPN). Although patient safety, employee safety, and quality management are mandatory content in NCEPN, the subject content for quality and safe healthcare is limited.[15] Therefore, there is a need to integrate quality and safety competencies into national nursing programs alongside the existing NCEPN.

Determining the level of competencies based on self-reported among students is essential during nursing education to produce nurses providing quality and safe healthcare. There is no valid and reliable measurement tool for determining the nursing students' competencies based on quality and safety in the national literature. The Nursing Students Competency Scale, which has proven valid and reliable in Turkish, generally evaluates students' perceptions of professional competency. This scale no based on quality and safety competencies.[16] This study is essential because of presents the first national data on the QSEN competencies, shedding light on future studies and providing an opportunity for nursing programs to improve students' quality and safety competencies.

Material and Methods

Design and Aim

The methodological study was conducted to develop a valid and reliable measurement tool in determining the competency perceptions of senior nursing students. This study searched for an answer to the question "Is the Nursing Competency Perception Scale a valid and reliable measurement tool?" In addition, this study was reported considering the COSMIN standards (Consensus-based Standards for the Selection of Health Measurement Instruments-Study Design checklist for patient-reported outcome measurement instruments).

Participants

This study was carried out in the nursing departments of a public university and a foundation university in Istanbul from January 2018 to March 2018. Evaluation of QSEN competencies within the scope of NCEPN showed that NCEPN generally focuses on competencies of patient-centered care, teamwork, and collaboration, includes a moderate level of competency in evidence-based practice, and covers other competencies to a limited extent. Therefore, the population consisted of senior nursing students who had more experiences and observations of QSEN competencies during the internship that were particularly limited in NCEPN.

Instruments

Data were collected using a self-reported questionnaire, including a personal information form and Nursing Competency Scale. A personal information form was to question five personal characteristics. These characteristics included age, gender, type of high school, general weighted average, and the level of professional readiness.

The Nursing Competency Perception Scale was ready for the data collection according to the scale development process.

Generation of Preliminary Items

The preliminary items were generated based on the framework of QSEN for undergraduate nursing education, which consists of 176 learning outcomes focused on developing knowledge, skills, and attitudes under six core competencies.[11]

The translation process of the framework of QSEN followed the forward-back translation protocol.[17,18] A standard forward-back translation from the source language (English) to the target language (Turkish) of the QSEN framework was provided by two bilingual translators. Firstly, two translators translated the learning outcomes from English to Turkish. The authors checked the first translation for nursing concepts and appropriate terminology. Then, translators produced the back translation into English. The authors reviewed and compared the back translation and the original version of learning outcomes in terms of conceptual and content equivalence. Also, this review included the use of proper tense and verbs to ensure semantic equivalence. As a result of this process, the Turkish version of the QSEN framework was produced.

Based on the Turkish version of the QSEN framework, the learning outcomes reflecting the national nursing education and healthcare system constituted the item pool. In developing the item pool, the authors considered the key features that the items to have only one verb, to be clear and understandable, and to be written using simple tenses.[19] The item pool, which consisted of 68 items, was grouped as 23 items for "patient-centered care," 13 items for "teamwork and collaboration," 8 items for "evidence-based practice," 7 items for "quality improvement," 9 items for "safety," and 8 items for "informatics." Responses to each item were measured using a 5-point Likert scale, with "1=strongly disagree" and "5=strongly agree."

Content Validation of the Preliminary Scale

To determine the content validity of the preliminary scale consisting of 68 items, a panel of seven experts from the assessment and evaluation, nursing fundamentals, nursing management, and nursing education reviewed the item pool. Using the Davis technique, the expert panel rated each item in terms of relevance to the underlying construct on a 4-point scale, with "1=not relevant," "2=somewhat relevant," "3=quite relevant," and "4=highly relevant." The item-level content validity index (CVI) is computed as the number of experts giving a rating of either 3 or 4, divided by the number of experts in the

panel. The scale-level CVI was calculated as the mean CVI of all items on the scale. The lower limit of acceptability for CVI is .80.[19]

As a result of content validity, 18 items with an item-level CVI lower than .80 were removed, and five items containing double meaning were revised as separate items. Also, six items were revised to improve comprehensibility and sentence flow. The CVI of the remaining items ranged between 0.87 and 1.00 and the scale-level CVI was 0.96. The intraclass correlation coefficient among experts was 0.92. The consensus among experts that the item pool is related to the basic concept is a valid criterion for content validity.[18,19] The CVI was higher than 0.80 at the item level and was 0.96 at the scale level, and the intraclass correlation coefficient among experts was 0.92, indicating acceptable content validity.

Preliminary Survey

The preliminary scale was administered to 20 senior nursing students who were like the study sample to evaluate the comprehensibility of the scale items and the usability of a self-administered questionnaire. Based on the preliminary results, the final tool, which was tested the validity and reliability in this study, was finalized as 55 items and six main dimensions.

Data Collection

The class schedule was used to determine when each class started and ended. The first researcher invited nursing students to complete the self-administered questionnaires at the end of the class or during class breaks. Questionnaires were distributed to all nursing students. The completed questionnaires were collected by waiting for the completion time which was approximately 10-15 minutes.

Overall, 372 nursing students, out of 412, accepted participating in this study and completed the questionnaire in full (response rate: 90.2%). In methodological studies, an appropriate sample size is defined as 5-10 times the number of items in the scale or at least 300 samples.[20,21] The sample size was about five times the number of items and was over 300 in this study, indicating an acceptable sample size.

Data Analysis

Statistical analyses were performed using the Statistical Package for the Social Sciences 22 version (IBM SPSS Corp.; Armonk, NY, USA) and the AMOS version 25.0 at a significance level of $P < .05$. Participants' characteristics were analyzed using frequency, percentage, mean, and standard deviation (SD).

Validity means what and how accurately the measurement tool measures. Factor analysis is the most frequently used method for construct validity, which is one of the types of validity.[19,22] Factor analysis carries a set of assumptions including outliers, multicollinearity and singularity, univariate and multivariate normality, and adequate sample size.[20,23] Mahalanobis distance, which is used to determine outliers in this study, is an effective measurement that finds the distance between the point and a distribution.[23] Singularity and multicollinearity are determined by examining the correlation and partial correlation matrices.[21,23] Univariate and multivariate normality are determined with the measures of skewness and kurtosis, and Bartlett's test of sphericity.[20,23,24] Adequate sample size is determined by the Kaiser–Meyer–Olkin (KMO) value for all items, and the measure of sampling adequacy (MSA) index for each item.[20,24,25] Tukey's

additivity test is used to determine whether item scores for the main dimension are summable.[21]

There are two types of factor analysis: exploratory and confirmatory. Exploratory factor analysis (EFA) is used to explore the underlying factor structure.[22,24] In this study, principal component analysis with varimax rotation was used for EFA. Also, EFA was performed separately for the main dimensions, with checking communalities, and factor loadings. Confirmatory factor analysis (CFA) is used to verify the explained factor structure.[22,24] General parameters such as chi-square (χ^2/df), comparative parameters such normed fit index (NFI), non-normed fit index (NNFI), incremental fit index (IFI), comparative fit index (CFI), root mean square error of approximation (RMSEA), absolute parameters such as goodness of fit index (GFI), adjustment goodness of fit index (AGFI), residual parameters such as root mean square residual (RMR), standardized root mean square residual (SRMR) were considered as goodness-of-fit-indexes for CFA in this study.

Reliability is the degree of consistency and stability of the measurement tool. In this study, internal consistency reliability and test–retest reliability were used. For test-retest reliability, there must be a period of 2-4 weeks between test and retest measurements and must be matched with at least 30 samples.[18,26] Two weeks after the test measurement, retest measurement was performed with 42 students using the same data collection method. To match the sample, the students wrote the last two digits of their surname and school number on the questionnaire in this study. Pearson's correlation analysis and t-test independent groups were used to evaluate test–retest reliability. Internal consistency means the extent to which items within an instrument measure the same concept.[19,22] In this study, internal consistency reliability was assessed with Cronbach's alpha coefficient and item-total correlation coefficient.

Ethical Considerations

The Non-Invasive Research Ethics Committee, Istanbul Medipol University approved the study protocol (Date: October 25, 2017, Decision number: 431) and the authors received written permission from the institutions prior to data collection. In addition, the authors received written permission from Dr. Mary Dolansky, one of the QSEN consultants, via e-mail for using the QSEN framework. The students were informed about the study topic and instruments, and written consent was obtained.

Results

Participants' Characteristics

The mean age of senior nursing students was 21.9 years (range: 20-34, SD:1.2), whereas more than half of the students were 21 years or younger (58.9%). Many students were female (%82.2). Of the students; 63.9% were graduation from Anatolian High School, 45.6% had a grade point average between 2.50 and 2.99. Nearly two-fifths rated the level of professional readiness between 5 and 7 scores, out of 10 (59.8%).

Determining the Suitable of Dataset for Factor Analysis

As a result of Mahalanobis distances, 34 outliers were removed from the sample. The analysis process continued with a sample size of 338 ($P < .001$). In the visual examination, the correlation coefficient between the items ranged between 0.56 and 0.72 in the correlation

Table 1. Kaiser–Meyer–Olkin Sample Measurement Values and Bartlett's Sphericity Test Values of the Main Dimensions of the Nursing Competency Perception Scale (n=338)

Main Dimensions	KMO Value	Bartlett's Sphericity Test	df	P
Patient-centered care	0.89	2269.05	120	<.001
Teamwork and collaboration	0.90	1925.41	78	<.001
Evidence-based practice	0.83	554.37	15	<.001
Quality improvement	0.83	537.67	10	<.001
Safety	0.84	850.24	21	<.001
Informatics	0.89	1363.57	21	<.001

matrix and was <0.20 in the partial correlation matrix. The measures of skewness and kurtosis of all items were ≤|2|, and Bartlett's test of sphericity values of all main dimensions were statistically significant ($P < .001$). The sample measurement values of KMO were between 0.83 and 0.90 in the main dimensions; MSA indexes of items were between 0.81 and 0.95 (Table 1). Tukey's additivity test of all main dimensions was statistically significant ($P < .001$).

Exploratory Factor Analysis

In the first factor model for *patient-centered care* with 16 items, the total explained variance was 62.13% by four factors with eigenvalues greater than 1. Three items were removed with a low item-total correlation coefficient of <0.40, a low communality of <0.40, and a difference of <0.10 between its primary and secondary factor loadings. In the second factor model, a total of 13 items were retained for the following two factors, accounting for 53.51% of the total explained variance: (1) management of individualized care (7 items), and (2) considering of individual diversities (6 items).

In the first factor model for *teamwork and collaboration* with 13 items, the total explained variance was 55.16% by two factors with eigenvalues greater than 1. Three items were removed with a difference of <0.10 between their primary and secondary factor loadings. In the second factor model, a total of 10 items were retained for the following two factors, accounting for 57.82% of the total explained variance: (1) effective communication and collaboration (6 items), and (2) awareness of duties, powers, and responsibilities (4 items).

In the first factor model for *evidence-based practice* with 6 items, the total explained variance was 50.96% by a factor with an eigenvalue greater than 1. Two items were removed with a low communality of <0.40. In the second factor model, 4 items explained 60.16% of the variance.

In the factor model for *quality improvement* with 5 items, the total explained variance was 58.35% by a factor with an eigenvalue greater than 1.

In the factor model for *safety* with 7 items, the total explained variance was 51.35% by a factor with an eigenvalue greater than 1. Two items were removed with a low communality of <0.40. In the second factor model, 5 items explained 60.34% of the variance.

In the factor model for *informatics* with 8 items, the total explained variance was 58.35% by a factor with an eigenvalue greater than 1. One item removed with a low communality of <0.40. In the second factor model, 7 items explained 63.50% of the variance.

As a result of EFA, eleven items were removed with a low item-total correlation coefficient of <0.40 (1 item), a low communality of <0.40 (6 items), and a difference of <0.10 between its primary and secondary factor loadings (4 items). For the remaining 44 items, item-total correlation coefficients varied from 0.50 to 0.72, communality was found to be between 0.41 and 0.72, and factor loadings ranged from 0.52 to 0.84 (Table 2).

Confirmatory Factor Analysis

In the first model, the main dimensions were addressed: patient-centered care, teamwork and collaboration, evidence-based practice, quality improvement, safety, and informatics. In the second model, 5 items were removed from three main dimensions based on the modification indexes: patient-centered care (2 items), safety (1 item), and informatics (2 items). In the third model, the common error variance was assigned between 2nd and 5th items, 15th and 16th items, 23rd and 24th items, and 32nd and 34th items (Figure 1). The goodness-of-fit index values showed a positive improvement through the developed models. Among these values, a downward tendency was determined in χ^2/SD (1.58-2.89) RMSEA (0.04-0.06), RMR (0.00-0.01), SRMR (0.012-0.038), and an upward tendency was observed in NFI (0.93-0.99), NNFI (0.95-0.99), IFI (0.96-0.99), CFI (0.96-0.99), GFI (0.95-0.99), and AGFI (0.93-0.97). The goodness-of-fit index values of the final model are presented in Table 3.

Internal Consistency Reliability

Item-total correlation coefficients of all items were higher than 0.50 because of CFA. The Cronbach's alpha coefficients were as follows: 0.87 for patient-centered care, 0.86 for teamwork and collaboration, 0.77 for evidence-based practice, 0.81 for quality improvement, 0.79 for safety, and 0.90 for informatics (Table 4).

Stability Reliability

There was no statistically significant difference between test and retest mean scores in all main dimensions (t: −0.315-1.500; $P > .05$). Also, there was a positive and significant correlation between test and retest mean scores in all main dimensions (r: 0.71-0.90; $P < .001$) (Table 5).

Finalization of the Scale

Based on the validity and reliability testing, 39 items with six main dimensions were finalized for the Nursing Competency Perception Scale. Each item was rated on a 5-point Likert scale from strongly agree (5) to strongly disagree (1). The main dimensions scores are calculated as the arithmetic mean by summing the scores of all items and then dividing by the number of items. The total score ranges from 1 to 5, with scores close to 5 indicating a high competency perception towards the relevant main dimension.

Discussion

Quality and safe health care service is possible with a competent nursing workforce. Based on this view, QSEN Institute provides a framework for nursing schools by determining the knowledge, skills, and attitudes towards nurses' basic competencies in order to provide

Table 2. Factor Loadings, Item-Total Correlation Coefficients, and Communalities of Nursing Competency Perception Scale Items as a Result of Exploratory Factor Analysis (n=338)

Main Dimensions	Items	Factor Loadings		Communalities	Item-Total Correlation Coefficients
		First Factor	Second Factor		
Patient-centered care	Item 2		0.82	0.69	0.57
	Item 3		0.78	0.66	0.62
	Item 4		0.53	0.64	0.55
	Item 5		0.74	0.56	0.65
	Item 6		0.52	0.50	0.58
	Item 7		0.63	0.53	0.65
	Item 9	0.65		0.56	0.60
	Item 10	0.64		0.44	0.63
	Item 11	0.68		0.42	0.64
	Item 12	0.63		0.55	0.54
	Item 13	0.60		0.49	0.54
	Item 15	0.72		0.41	0.59
	Item 16	0.68		0.43	0.54
Teamwork and collaboration	Item 18	0.61		0.42	0.50
	Item 19	0.63		0.51	0.60
	Item 20		0.80	0.68	0.59
	Item 21		0.75	0.68	0.67
	Item 22		0.82	0.70	0.57
	Item 23	0.80		0.67	0.60
	Item 24	0.77		0.62	0.55
	Item 25		0.62	0.47	0.53
	Item 26	0.65		0.49	0.57
	Item 29	0.64		0.49	0.57
Evidence-based practice	Item 30	0.79		0.63	0.61
	Item 32	0.77		0.60	0.58
	Item 33	0.77		0.60	0.58
	Item 34	0.75		0.56	0.54
Quality improvement	Item 36	0.74		0.54	0.59
	Item 37	0.77		0.59	0.61
	Item 38	0.71		0.50	0.55
	Item 39	0.78		0.61	0.62
	Item 40	0.81		0.65	0.66
Safety	Item 41	0.81		0.66	0.68
	Item 42	0.81		0.65	0.67
	Item 43	0.76		0.57	0.60
	Item 45	0.73		0.54	0.59
	Item 46	0.75		0.56	0.61

(*Continued*)

Table 2. Factor Loadings, Item-Total Correlation Coefficients, and Communalities of Nursing Competency Perception Scale Items as a Result of Exploratory Factor Analysis (n = 338) (*Continued*)

Main Dimensions	Items	Factor Loadings		Communalities	Item-Total Correlation Coefficients
		First Factor	Second Factor		
Informatics	Item 48	0.80		0.64	0.72
	Item 49	0.83		0.69	0.76
	Item 50	0.69		0.48	0.59
	Item 51	0.81		0.66	0.73
	Item 52	0.83		0.69	0.76
	Item 53	0.84		0.72	0.77
	Item 55	0.73		0.53	0.63

to develop a valid and reliable measurement tool in determining the competency perceptions of senior nursing students based on the QSEN framework.

In this study, some parameters were considered in determining the suitability of the data set for factor analysis. Outliers determined using Mahalanobis distance negatively affect factor analysis results in a data set.[23] Correlation coefficients ranging from 0.30 to 0.80 in the correlation matrix and very weak in the partial correlation matrix mean that there is no problem of multicollinearity and singularity in the data set.[21,23] The skewness and kurtosis of items within the

significant Bartlett's sphericity value indicates multivariate normality ($P < .05$).[20,23,24] The KMO value and MSA index should be at least 0.60 and above 0.90 is interpreted as a perfect sample size.[20,24,25] Also, the Tukey additivity test is statistically significant ($P < .05$), indicating that the scale is suitable for a total score.[21] Therefore, it was concluded that more reliable results were by removing outliers from the data set, main dimensions were suitable for the total score, and the data set was suitable for factor analysis.

In this study, item-total correlation coefficient, factor loading, and communality were considered for the EFA. The item-total correlation
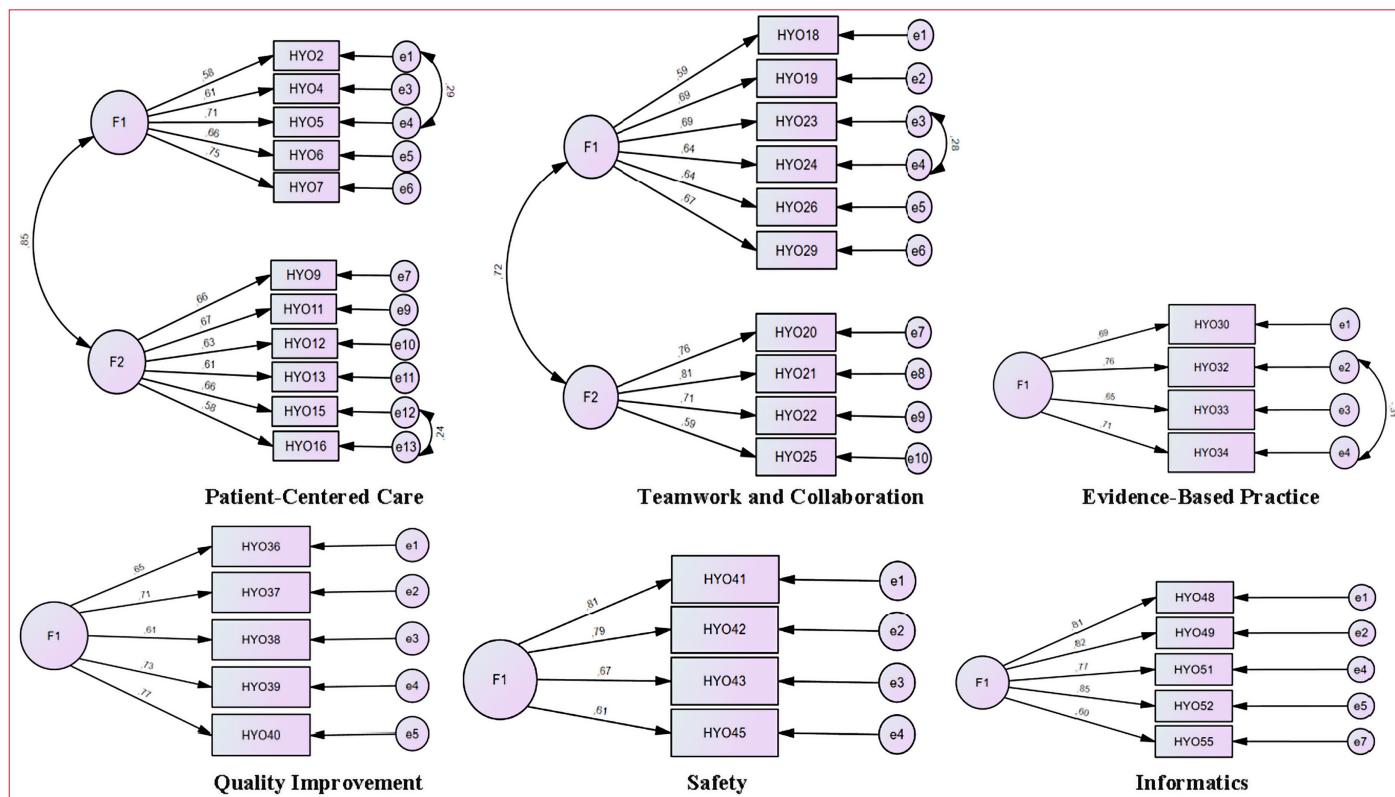

Figure 1. Confirmatory factor analysis results of the main dimensions of the nursing competency perception scale. Patient-centered care teamwork and collaboration evidence-based practice quality improvement safety informatics.

Table 3. The Goodness of Fit İndices of the Main Dimensions of the Nursing Competency Perception Scale as a Result of Confirmatory Factor Analysis (n=338)

Goodness of Fit Indices	Patient-Centered Care	Teamwork and Collaboration	Evidence-Based Practice	Quality Improvement	Safety	Informatics
χ^2/df	2.04	1.91	1.58	2.45	2.21	2.89
NFI	0.93	0.94	0.99	0.97	0.99	0.99
NNFI	0.95	0.96	0.99	0.97	0.98	0.99
IFI	0.96	0.97	0.99	0.98	0.99	0.99
CFI	0.96	0.97	0.99	0.98	0.99	0.99
RMSEA	0.05	0.05	0.04	0.06	0.06	0.04
GFI	0.95	0.96	0.99	0.98	0.99	0.99
AGFI	0.93	0.94	0.97	0.95	0.96	0.97
RMR	0.01	0.01	0.00	0.01	0.00	0.00
SRMR	0.03	0.03	0.01	0.02	0.01	0.01

NFI, normed fit index; NNFI, non-normed fit index; IFI, incremental fit index; CFI, comparative fit index; RMSEA, root mean square error of approximation; GFI, goodness of fit index; AGFI, adjustment goodness of fit index; RMR, root mean square residual; SRMR, standardized root mean square residual.

Table 4. Distribution of Nursing Competency Perception Scale Main Dimensions, Factor Loading, Item-Total Correlation Coefficients, and Cronbach's Alpha Coefficients (n=338)

Main Dimensions	Items	Factor Loadings	Item-Total Correlation Coefficients	Cronbach's Alpha Coefficients
Patient-centered care	1st-11th items	0.58-0.75	0.52-0.67	0.87
Considering of individual diversities	1, 2, 3, 4, 5	0.58-0.75	0.52-0.67	0.79
Management of individualized care	6, 7, 8, 9, 10, 11	0.58-0.67	0.53-0.62	0.80
Teamwork and collaboration	12th-21st items	0.59-0.81	0.51-0.68	0.86
Effective communication and collaboration	12, 13, 17, 18, 20, 21	0.59-0.69	0.51-0.66	0.82
Awareness of duties, powers, and responsibilities	14, 15, 16, 19	0.59-0.81	0.51-0.68	0.80
Evidence-based practice	22, 23, 24, 25	0.69-0.76	0.59-0.73	0.77
Quality improvement	26, 27, 28, 29, 30	0.61-0.77	0.55-0.66	0.81
Safety	31, 32, 33, 34	0.61-0.81	0.54-0.69	0.79
Informatics	35, 36, 37, 38, 39	0.60-0.85	0.72-0.78	0.90

Table 5. Comparison of Test–Retest Scores of the Main Dimensions of the Nursing Competency Perception Scale (n=42)

Main Dimensions	Test Mean Scores	Retest Mean Scores	t-test	P	r	P
Patient-centered care	4.52 ± 0.38	4.54 ± 0.42	−0.764	.450	0.82	<.001
Teamwork and collaboration	4.28 ± 0.35	4.30 ± 0.34	−1.423	.162	0.90	<.001
Evidence-based practice	4.26 ± 0.48	4.35 ± 0.53	1.500	.141	0.71	<.001
Quality improvement	4.39 ± 0.40	4.40 ± 0.47	−0.315	.755	0.78	<.001
Safety	4.35 ± 0.41	4.38 ± 0.41	−0.813	.421	0.76	<.001
Informatics	4.29 ± 0.45	4.34 ± 0.42	−1.044	.303	0.77	<.001

coefficient, which is defined as the correlation between an item score and the total score without that item, should be greater than 0.30 and positively.[26] In this study, it is considered a value greater than 0.40 for the item-total correlation coefficient. As a result of EFA, the item-total correlation coefficients ranging from 0.50 to 0.72 indicate that the items measure the targeted feature. Communality, which is defined as the amount of variance that an item shares with other items, should be between 0.30 and 0.50.[20,23] In this study, it is considered a value greater than .40 for the communality. As a result of EFA, the communalities varying between 0.41 to 0.72 mean that items were adequate. Factor loading, which indicates the extent of relevance of variables in explaining a construct, should be greater than 0.50. Factor loadings between 0.30 and 0.59 indicate medium adequate, and greater than 0.60 indicate high adequate.[20,21,24,25] As a result of EFA, the factor loadings ranging from 0.52 to 0.84 indicate that the items were of medium-high adequate. Items with cross-loadings having less than a 0.10 difference from an item's highest factor loading should be removed.[22,24] In this study, the removal of 4 items with cross-loadings is by the literature. The explained variance rate as a result of the EFA reflects the power of the factor structure, the acceptable level is between 40% and 60%.[20,21,23,24] The explained variance rate of all main dimensions showed adequate, varying between 53.3% and 63.5%.

General model fit is traditionally tested by a chi-square degree of freedom. The χ^2/df ratio of 5 or less is indicative of an acceptable model fit, while 3 or less indicates an excellent model fit.[21,25,28] In this study, all dimensions showed an excellent fit in terms of χ^2/df ratio. In the evaluation of comparative model fit indices, NFI, NNFI, and IFI being ≥0.90, CFI being ≥0.95 and RMSEA being ≤0.08 indicate an acceptable fit; NFI, NNFI, and IFI values ≥0.95, CFI ≥0.97, and RMSEA ≤0.05 are interpreted as an excellent fit.[22,24,28] Among main dimensions, quality improvement and safety in terms of RMSEA, patient-centered care, and teamwork and collaboration in terms of NFI showed an acceptable fit. Other main dimensions showed an excellent fit in terms of NFI, NNFI, IFI, CFI, and RMSEA. Of the absolute model fit indices, GFI and AGFI being ≥0.85 reflected an acceptable fit, and these values being ≥0.90 are indicative of an excellent fit.[22,24,28] In this study, all dimensions showed an excellent fit in terms of GFI and AGFI. Of the residual model fit indices, RMR and SRMR of 0.08 or less are indicative of an acceptable model fit, while 0.05 or less indicates an excellent model fit.[22,24,28] In the current study, all dimensions showed an excellent fit in terms of RMR and SRMR.

The stability of the scale is accepted if the correlation coefficient between test-retest scores is 0.70 and more and positive.[26] Therefore, the scale had stability in all dimensions as there is no significant difference between the test-retest scores and there is a strong or very strong positive correlation.

For internal consistency to be accepted, Cronbach's alpha coefficient should be greater than 0.70. Also, Cronbach's alpha coefficient between 0.80 and 0.90 indicates good internal consistency, and greater than 0.90 indicates excellent internal consistency.[24,25] In this study, the main dimensions of patient-centered care, teamwork and collaboration, quality improvement, and informatics have good internal consistency, while the main dimensions of safety and evidence-based practice have internal consistency at an acceptable level.

Conclusion

According to the results of this study, the Nursing Competency Perception Scale was valid and reliable to measure the competency perceptions of senior nursing students. This scale reflects the QSEN framework, which is the roadmap for nursing undergraduate programs in the USA and consists of 176 learning outcomes within 6 competencies. It is useful for determining the level of competencies, especially for senior nursing students or new graduates with no professional experience, thereby guiding nursing schools and health institutions. Re-evaluation of validity and reliability with larger sample sizes and nursing students from different countries may contribute to the development of the scale.

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