



Research

A Valid and Reliable Tool to Assess Nursing Professional Competences: The Nursing Professional Competence Scale

Hemşirelik Mesleki Yeterliklerini Değerlendirmede Geçerli ve Güvenilir Bir Araç: Hemşirelik Mesleki Yeterlik Ölçeği

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ABSTRACT

Objective: Nursing competence is a basic skill to fulfill the professional roles and responsibilities. Therefore, there is a need for studies to develop the valid and reliable measurement tools to identify the professional competences and competence levels expected from the nurses and evaluate them in the regular intervals. This study aims to develop a valid and reliable tool that could be used to assess the professional competence of the nurses.

Methods: The study has a methodological design. The population of this study included 3,133 nurses who worked at three training and research hospitals, one university hospital, and one private hospital in the Istanbul, and its sample included 902 nurses. The study used a Nurse Information Form and Nursing Professional Competence Scale Draft Form.

Results: The item-total score correlations ranged from 0.56-0.90. In the exploratory factor analysis, the Kaiser-Meyer-Olkin value was calculated as 0.970, and the Bartlett's test of Sphericity result was also significant [χ^2 (2211)=43301.45; $p<0.01$]. The Cronbach's alpha of the Nursing Professional Competence scale was calculated as 0.98.

Conclusion: The study found that the Nursing Professional Competence scale is a valid and reliable tool to use. The scale developed in this context could be used in the researches to determine the professional competences of the nurses, to identify the variables affecting the professional competences of nurses, and to examine the effects of nursing education programs on professional competences of the nurses.

Keywords: Nursing, competence, nursing professional competence, scale development

ÖZ

Amaç: Hemşirelik yeterliği, mesleki rol ve sorumlulukları yerine getirmek için gerekli olan temel bir beceridir. Bu nedenle hemşirelerden beklenen mesleki yeterliklerin ve yeterlik düzeylerinin belirlenmesine ve düzenli aralıklarla değerlendirilmesine yönelik geçerli ve güvenilir ölçme araçlarının geliştirilmesine yönelik araştırmalara ihtiyaç vardır. Bu çalışma hemşirelerin mesleki yeterliklerini değerlendirmede kullanılabilecek geçerli ve güvenilir bir araç geliştirmeyi amaçlamaktadır.

Gereç ve Yöntem: Araştırma bir metodolojik araştırma tasarımıdır. Bu araştırmanın evrenini İstanbul'da bulunan üç eğitim ve araştırma hastanesi, bir üniversite hastanesi ve bir özel hastanede görev yapan 3.133 hemşire, örneklemini ise 902 hemşire oluşturmuştur. Araştırmada Hemşire Bilgi Formu ve Hemşirelik Mesleki Yeterlik Ölçeği Taslak Formu kullanılmıştır.

Bulgular: Madde toplam puan korelasyonları 0,56 ile 0,90 arasında değişmektedir. Açımlayıcı faktör analizinde Kaiser-Meyer-Olkin değeri; 0,970 olarak hesaplanmıştır ve Bartlett Küresellik testi sonucu da anlamlı bulunmuştur [χ^2 (2211)=43301.459; $p<0,01$]. Hemşirelik Mesleki Yeterlik ölçeğinin Cronbach alfa değeri 0,98 olarak hesaplanmıştır.

Sonuç: Araştırma, Hemşirelik Mesleki Yeterlik ölçeğinin geçerli ve güvenilir bir araç olduğunu bulmuştur. Bu kapsamda geliştirilen ölçek, hemşirelerin mesleki yeterliklerini belirlemek, hemşirelerin mesleki yeterliklerini etkileyen değişkenleri belirlemek ve hemşirelik eğitim programlarının hemşirelerin mesleki yeterlikleri üzerindeki etkilerini ortaya koymaya yönelik araştırmalarda kullanılabilir.

Anahtar Kelimeler: Hemşirelik, yeterlik, hemşirelik mesleki yeterlik, ölçek geliştirme

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INTRODUCTION

Today, there are rapid and significant changes and developments in scientific, technological, sociodemographic, and economic fields; affecting the social, cultural, and economic aspects of a life. In addition to these changes and developments, factors including the increased chronic diseases, emergence of new diseases, diagnosis techniques, and treatment methods, shortened hospital stay, and growing need for the home care services also affect the healthcare systems (1,2).

Being competent means having a special knowledge, capacity, and ability to fulfill one's duty, adequateness (3) and being sufficiently qualified, skilled, or effective (4,5). Competence is a set of demonstrable characteristics and skills that enable a person to perform professional tasks in accordance with the relevant standards (6).

Nursing competence is the combination of a nurse's knowledge, skills, attitudes, values, and abilities required to perform professional nursing roles, and their ability to adapt that knowledge and those skills to a different circumstance (2,7). Nursing competence is considered acceptable professional performance on knowledge, attitude, and psychomotor levels according to the World Health Organization (WHO) (8), and effective application of a combination of the knowledge, skills and professional decisions in a professional performance and daily practices according to the International Council of Nurses (ICN) (9). Takase and Teraoka (10) defined nursing competence as a nurse's ability to effectively demonstrate a set of attributes such as: personal characteristics, professional attitude, values, knowledge, and skills, and to fulfill their professional responsibility through a practice.

Nursing competence helps to guarantee the high quality and effectiveness of healthcare and protect the social values and status of the nursing profession. Nursing core competencies include qualifications such as: willingness to serve, observation, judgment, and responsibility, as well as the basic behavioral characteristics such as care, communication, and collaboration, management, self-development, innovation and research, stress management, and mastery of the practical skills (7). Nursing competence also contains complex processes including the performance, leadership, professional development, diagnosis, planning, observation, motivation, cognitive ability (critical thinking, decision-making, analysis, judgment, thinking ability, etc.), social participation, communication, assertiveness, and personal perception (11,12). Nevertheless, nursing competence, which covers many features/skills, is

influenced by the several factors including knowledge, skills, attitudes, behaviors, and individual characteristics required for the effective performance of the nurses in a professional life and various clinical practices. Therefore, nurses should have the necessary individual characteristics (understanding, self-control, critical thinking, problem solving ability), professional attitudes and behaviors (assuming the professional responsibilities, being autonomous, being aware of the own limits, respecting the patient rights, promoting the continuous learning and following current knowledge and skills), and the ability to provide care based on a professional knowledge, skills and values (cooperating with the other healthcare professionals, developing an interpersonal relationships, education and training, managing nursing care, ensuring nursing safety and quality, and increasing nursing capacity), to be a competent professional member, and fulfill the professional roles and responsibilities (10,13).

Nursing competence is a basic skill to fulfill the professional roles and responsibilities. Additionally, it is notable for nurses to take their place effectively in the healthcare systems of the future and use their professional competences in the different application environments and situations to increase the quality of a nursing care (1,14-18). Therefore, it is important to determine the development process of the nursing competences for continuous professional development after obtaining a nursing license (7,13,16,19-21). In this context, there is a need for studies to develop valid and reliable measurement tools to identify the professional competences and competence levels expected from the nurses and evaluate them in the regular intervals.

METHODS

Aim

The purpose of this study is to develop a valid and reliable tool that may be used to evaluate the professional competences among the nurses.

Design

This is a methodological study.

Participants and Sampling

The population of the study consisted of 3,133 nurses working at three research and training hospitals, one university hospital, and one private hospital with the highest bed capacity in the Istanbul, Turkey. Studies report that a ratio of five or ten participants per item is sufficient to evaluate the validity and reliability of the assessment tool (22). In this study, the sample size was calculated based on the number of scale items, whereby the participant/item

ratio was determined as 10/1. In this context, the sample of the study consisted of 902 nurses who agreed to participate in the study and were selected using a random sampling method.

Instruments

The data were collected using the Nurse Information Form and the Nursing Professional Competence Draft scale.

Nurse Information Form: The form was developed by the researchers in line with the literature (1,10,15,23,24). It consisted of ten questions, including four questions about the nurses' sociodemographic characteristics (age, gender, marital status, education level) and the six questions about their professional characteristics (work place, work unit, nursing work experience, working time in current work place, current position, and working time).

Nursing Professional Competence Draft Scale: The draft scale was developed by the researchers at the two stages. First, an item pool was formed, and a draft scale was created. In this context, nurses' essential roles stipulated by the Nursing Regulations, published in the Turkish Official Gazette dated 08.03.2010 and numbered 27515; the nursing competences, roles and responsibilities published by ICN and WHO, and the international and national studies on the professional competences of the nurses were examined, and the expressions that could be used as scale items regarding the professional competences that the nurses should have were determined (1,9,10,15,18,23,25,26). Thus, an item pool with the 125 items reflecting the professional competences of the nurses was created. In the pool, there were 11 items for the "Care Needs" factor, 28 items for the "Care Planning, Implementation and Evaluation" factor, 11 items for the "Professional Ethical Practice" factor, 8 items for the "Teamwork" factor, 15 items for the "Professional Development" factor, 16 items for the "Communication" factor, 19 items for the "Health/Patient Education" factor, 7 items for the "Research and Development" factor, and 10 items for the "Critical Thinking and Analysis" factor. The numbers of items in the factors were determined considering the characteristics of each factor rather than the equality in quantity.

A total of 26 experts including the 16 nurse lecturers, three nurse educators, one nurse manager, and six clinic nurses were asked to evaluate the draft scale in terms of both the linguistic validity and the content validity. To get their opinions, one four-degree rating system (unsuitable, slightly suitable, suitable, and very suitable) was used for linguistic validity, and one two-degree rating system (unsuitable, suitable) was used for content validity (27). Additionally,

a "recommendation" section was added for each item in terms of both the linguistic validity and content validity.

According to the feedback obtained from the experts; each item of the draft scale was examined by the researchers. It was determined how many experts approved the options of each item. The minimum (min) content validity ratio for each item was accepted as 0.80 (27). Considering the content validity calculations for each item included in the draft scale, 42 items with content validity ratios <0.80 were removed from the draft scale, and five items were edited in terms of a language and expression, by considering the experts' recommendations. As a result, the total number of items in the draft scale was reduced from 125 to 83.

A pilot study was conducted having 100 nurses to evaluate the scale items in terms of a linguistic validity and content validity of the draft scale that was edited according to the expert opinions. The nurses were asked to evaluate the items using a four-point Likert type rating system [Always (4), Often (3), Sometimes (2), Never (1)]. No item was changed, eliminated, or deleted in line with the data obtained. The Nursing Professional Competence Draft scale, which was prepared as a four-point Likert type scale and consisted of 83 items, was made ready for the implementation (stage II) among the nurses who participated in the study. All the items in the scale are positive, and there is no reversely scored items. The increase in the mean score of the scale indicates the increase in the professional competences of the nurses.

Secondly, the validity and reliability of the Nursing Professional Competence Draft scale was tested. In this regard, the draft scale was applied to 902 nurses working at three research and training hospitals, one university hospital, and one private hospital in the Istanbul. Then, the validity and reliability study and psychometric evaluation of the draft scale were performed. The item-item and item-total correlations of the draft scale were analyzed with an item analysis using the data obtained from this evaluation. After the item analysis, exploratory factor analyses were performed to determine the scale factors. Internal consistency analysis was conducted to evaluate the internal consistency of the items related to the factors, that were identified in the factor analysis.

Data Collection

Data were collected between February and May 2019. A total of 26 experts were asked to evaluate the Nursing Professional Competence Draft scale in terms of a linguistic validity and content validity. They were interviewed to receive their expert opinions, whereby they were explained

the purpose of the study, and sent the draft scale via E-mail. After they evaluated the draft scale in terms of a content validity and the linguistic validity, it was sent back to the researchers via E-mail. A pilot study for the draft scale, in which necessary arrangements were made in line with the expert opinions, was carried out with the 100 nurses by the researcher. The data regarding the Nursing Professional Competence Draft scale were collected by the researchers from the nurses who agreed to participate in the study.

Ethical Considerations

For conducting the study, ethical approval was obtained from the Social Sciences and Humanities Ethics Committee at Istanbul University (number: 2018/46, date: 05.03.2018), and institutional permissions where the study was conducted were received. The nurses who agreed to participate in the study were explained about the purpose of the study, emphasizing that the research data would not be used for any other purpose, and not be shared with the third parties, and then, their verbal and written consents were obtained.

Statistical Analysis

The data were analyzed using a Number Cruncher Statistical System 2007 (Kaysville, Utah, USA). Descriptive statistical methods [frequency, percentage, mean, standard deviation, median, min-maximum (max) values] were used to demonstrate the nurses' sociodemographic characteristics, professional characteristics, professional development, and distribution of the scale items. Item Analysis, Exploratory Factor Analysis, Kaiser-Meyer-Olkin (KMO) Measure of Sampling Adequacy, and Bartlett's Test of Sphericity were performed to evaluate the validity and reliability of the Nursing Professional Competence Draft scale. Pearson's correlation analysis was performed to assess the relationship between the scale scores (22).

RESULTS

Sociodemographic and Professional Characteristics of the Nurses

The mean age of nurses was 28.94 ± 7.8 (min: 19 and max: 59) years, 83.9% of them were female, 59.8% were single, and 60.8% had the undergraduate degrees. The mean work experience of the nurses was 7.04 ± 7.46 years, whereby they had been working for 4.54 ± 5.44 years at the same institution. Among the nurses, 46.7% were employed at the internal medicine units, 38.1% were employed at the surgical units, 76.3% were nurses in service, 12.1% were special branch nurses, and 8.8% were service charge nurses. The nurses had been working in the same position for 4.39 ± 5.20 years.

Validity and Reliability Studies of the Nursing Professional Competence Draft Scale

The results regarding the validity and reliability study of the Nursing Professional Competence Draft scale are presented under the headings of an Item Analysis (Table 1), Exploratory Factor Analysis (Table 2), KMO Measure of Sampling Adequacy, and Bartlett's test of Sphericity, Scale Factor Item Distributions (Naming) and Variance Values (Table 3), Internal Consistency (Table 3), and Scale Total and Factors Score Distribution.

Item Analysis

An item analysis was performed to examine all the items in a draft scale and eliminate those exhibited a relatively low correlation with the total scale score (22). In this analysis, the item-total score correlation was calculated for each item. Accordingly, the item-total score correlations ranged from 0.56-0.90 (Table 1).

Exploratory Factor Analysis

An exploratory factor analysis with the varimax rotation method was performed to determine the factor structure of a draft scale. The acceptable level for the scale items was set to be >0.40 (28).

At the first stage, a total of 12 items (8, 22, 23, 28, 29, 30, 72, 73, 74, 77, 78, 79) including those with the factor loading values <0.40 or those with the nursing professional competence scale factor loading values that were close to each other in the multiple factors (difference <0.10) were removed from the draft scale.

At the second stage, another exploratory factor analysis was applied for the remaining 71 items of the scale, and a total of four items (20, 45, 46, 52) including those with the factor loading values <0.40 or those with factor loading values that were close to each other in the multiple factors (difference <0.10) were also removed from the draft scale.

At the third stage, an exploratory factor analysis was applied once again for the remaining 67 items of the scale, whereby the items were divided into seven factors that accounted for 59.24% of the total variance, and whose factor loadings ranged from 0.422-0.741 (Table 2).

The eigenvalue was calculated as 26.673 for Factor 1, 3.361 for Factor 2, 3.051 for Factor 3, 2.034 for Factor 4, 1.696 for Factor 5, 1.529 for Factor 6, and 1.348 for Factor 7.

In the exploratory factor analysis, the KMO value was calculated as 0.970, and the Bartlett's test of Sphericity result was also significant [χ^2 (2211) = 43301.459; $p < 0.01$].

Table 1. Nursing Professional Competence Draft scale Item-total score correlations (n=902)

Factor number and item	Mean	SD	Item-total score correlation			
			Subgroup		Total scale	
			R	p	R	p
Factor 1	3.53	0.51	-	-	0.762	0.001**
I1	3.62	0.66	0.697	0.001**	0.485	0.001**
I2	3.56	0.62	0.830	0.001**	0.611	0.001**
I3	3.43	0.72	0.832	0.001**	0.648	0.001**
I4	3.34	0.78	0.771	0.001**	0.579	0.001**
I5	3.64	0.61	0.704	0.001**	0.528	0.001**
I6	3.60	0.63	0.797	0.001**	0.617	0.001**
I7	3.54	0.63	0.706	0.001**	0.601	0.001**
Factor 2	3.57	0.46	-	-	0.851	0.001**
I8	3.58	0.64	0.757	0.001**	0.646	0.001**
I9	3.60	0.61	0.767	0.001**	0.635	0.001**
I10	3.59	0.63	0.769	0.001**	0.603	0.001**
I11	3.48	0.67	0.718	0.001**	0.644	0.001**
I12	3.61	0.61	0.734	0.001**	0.608	0.001**
I13	3.56	0.62	0.722	0.001**	0.611	0.001**
I14	3.62	0.57	0.753	0.001**	0.630	0.001**
I15	3.60	0.62	0.773	0.001**	0.639	0.001**
I16	3.65	0.54	0.684	0.001**	0.556	0.001**
I17	3.62	0.56	0.651	0.001**	0.548	0.001**
I18	3.41	0.74	0.684	0.001**	0.608	0.001**
I19	3.53	0.63	0.756	0.001**	0.697	0.001**
I20	3.60	0.62	0.775	0.001**	0.681	0.001**
Factor 3	3.35	0.57	-	-	0.895	0.001**
I21	3.19	0.87	0.596	0.001**	0.536	0.001**
I22	3.21	0.77	0.677	0.001**	0.615	0.001**
I23	3.36	0.71	0.736	0.001**	0.689	0.001**
I24	3.46	0.71	0.742	0.001**	0.657	0.001**
I25	3.38	0.74	0.784	0.001**	0.673	0.001**
I26	3.40	0.71	0.798	0.001**	0.709	0.001**
I27	3.38	0.75	0.810	0.001**	0.713	0.001**
I28	3.32	0.76	0.804	0.001**	0.711	0.001**
I29	3.36	0.74	0.817	0.001**	0.704	0.001**
I30	3.29	0.78	0.806	0.001**	0.681	0.001**
I31	3.34	0.77	0.827	0.001**	0.718	0.001**
I32	3.36	0.75	0.829	0.001**	0.737	0.001**
I33	3.37	0.72	0.784	0.001**	0.717	0.001**
I34	3.46	0.68	0.689	0.001**	0.729	0.001**

Table 1. Continued

Factor number and item	Mean	SD	Item-total score correlation			
			Subgroup		Total scale	
			R	p	R	p
Factor 4	3.30	0.65	-	-	0.664	0.001**
I35	3.07	1.00	0.822	0.001**	0.516	0.001**
I36	3.25	0.81	0.875	0.001**	0.568	0.001**
I37	3.45	0.69	0.805	0.001**	0.539	0.001**
I38	3.43	0.74	0.718	0.001**	0.527	0.001**
Factor 5	3.55	0.51	-	-	0.767	0.001**
I39	3.57	0.60	0.807	0.001**	0.634	0.001**
I40	3.64	0.57	0.758	0.001**	0.561	0.001**
I41	3.55	0.62	0.842	0.001**	0.609	0.001**
I42	3.50	0.66	0.865	0.001**	0.677	0.001**
I43	3.49	0.66	0.815	0.001**	0.652	0.001**
Factor 6	3.55	0.43	-	-	0.897	0.001**
I44	3.51	0.64	0.712	0.001**	0.687	0.001**
I45	3.54	0.62	0.770	0.001**	0.741	0.001**
I46	3.55	0.60	0.748	0.001**	0.694	0.001**
I47	3.48	0.65	0.738	0.001**	0.726	0.001**
I48	3.62	0.58	0.749	0.001**	0.665	0.001**
I49	3.64	0.55	0.750	0.001**	0.651	0.001**
I50	3.63	0.56	0.748	0.001**	0.663	0.001**
I51	3.53	0.58	0.704	0.001**	0.626	0.001**
I52	3.55	0.56	0.726	0.001**	0.601	0.001**
I53	3.58	0.58	0.727	0.001**	0.592	0.001**
I54	3.59	0.57	0.717	0.001**	0.589	0.001**
I55	3.42	0.70	0.563	0.001**	0.508	0.001**
I56	3.58	0.60	0.673	0.001**	0.577	0.001**
I57	3.53	0.61	0.686	0.001**	0.610	0.001**
I58	3.51	0.63	0.719	0.001**	0.655	0.001**
I59	3.54	0.62	0.744	0.001**	0.675	0.001**
I60	3.53	0.62	0.698	0.001**	0.631	0.001**
Factor 7	3.32	0.58	-	-	0.744	0.001**
I61	3.28	0.80	0.740	0.001**	0.514	0.001**
I62	3.42	0.68	0.662	0.001**	0.544	0.001**
I63	2.91	1.04	0.687	0.001**	0.594	0.001**
I64	3.41	0.70	0.799	0.001**	0.686	0.001**
I65	3.42	0.71	0.827	0.001**	0.667	0.001**
I66	3.47	0.65	0.797	0.001**	0.649	0.001**
I67	3.36	0.78	0.798	0.001**	0.564	0.001**

**p<0.001, I: Item, r: Spearman's correlation coefficient, SD: Standard deviation

Table 2. Psychometric properties of the Nursing Professional Competence Draft scale (n=902)

Item	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Factor 6	Factor 7	T-value
	EFA	EFA	EFA	EFA	EFA	EFA	EFA	
11	0.636							20.65
12	0.724							28.70
13	0.696							28.43
14	0.668							23.85
15	0.555							20.78
16	0.609							25.66
17	0.454							21.53
18		0.609						25.93
19		0.641						26.32
110		0.691						25.89
111		0.541						23.04
112		0.602						24.00
113		0.621						23.14
114		0.655						24.97
115		0.690						25.99
116		0.628						21.39
117		0.547						19.77
118		0.511						20.95
119		0.581						25.34
120		0.647						26.03
121			0.438					16.93
122			0.480					20.77
123			0.533					23.81
124			0.634					24.42
125			0.705					26.51
126			0.704					27.87
127			0.717					28.66
128			0.696					28.40
129			0.739					29.41
130			0.737					28.38
131			0.722					29.84
132			0.701					30.11
133			0.630					27.58
134			0.426					22.71
135				0.632				24.11
136				0.741				29.99
137				0.712				24.59
138				0.563				19.04

Table 2. Continued

Item	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Factor 6	Factor 7	T-value
	EFA	EFA	EFA	EFA	EFA	EFA	EFA	
I39					0.588			25.18
I40					0.563			22.31
I41					0.690			27.64
I42					0.664			30.17
I43					0.586			26.91
I44						0.442		24.06
I45						0.501		27.23
I46						0.487		25.84
I47						0.424		25.74
I48						0.593		25.95
I49						0.624		25.80
I50						0.588		25.95
I51						0.571		22.99
I52						0.669		23.44
I53						0.694		23.12
I54						0.680		22.70
I55						0.422		15.99
I56						0.610		20.79
I57						0.611		21.18
I58						0.590		23.03
I59						0.572		24.74
I60						0.553		22.25
I61							0.633	17.94
I62							0.482	16.77
I63							0.597	14.51
I64							0.650	31.65
I65							0.707	33.49
I66							0.678	29.90
I67							0.729	27.17

I: Item, EFA: Exploratory Factor Analysis

Scale Factor Item Distributions (Naming) and Variance Values

The first factor consisted of seven items whose factor loadings varied between 0.454 and 0.724. It explained 39.810% of the total variance. The items in this factor were about the “nurses’ roles in learning a patient history, determining the patients’ needs, and getting opinions of the other healthcare team members.” Therefore, the factor was named as “Diagnosis” (Table 3).

The second factor consisted of the 13 items whose factor loadings varied between 0.511 and 0.691. It explained 5.016% of the total variance. The items in this factor were about the “nurses’ functions in making diagnosis, creating care plan, implementing care plan, ensuring patient safety, and evaluating care efficacy.” Therefore, the factor was named as “Implementation of Nursing Process” (Table 3).

The third factor consisted of 14 items whose factor loadings varied between 0.426 and 0.739. It explained 4.554% of

Table 3. Internal consistency, factor item distributions, and variance values of the Nursing Professional Competence Draft scale

Factor	Items	Variance %	Total variance %	Cronbach's alpha
Diagnosis	1, 2, 3, 4, 5, 6, 7	39.810	39.810	0.88
Implementation of nursing process	9, 10, 11, 13, 14, 15, 16, 17, 18, 19, 21, 24, 25	5.016	44.826	0.93
Health/patient education	12, 26, 27, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 57	4.554	49.380	0.95
Professional development	41, 42, 43, 44	3.035	52.415	0.82
Ethical practice	47, 48, 49, 50, 51	2.531	54.946	0.88
Critical thinking and teamwork	53, 54, 55, 56, 58, 59, 60, 61, 62, 63, 64, 65, 69, 70, 71, 75, 76	2.283	57.228	0.94
Research and development	66, 67, 68, 80, 81, 82, 83	2.012	59.240	0.88
Scale total				0.98

the total variance. The items in this factor were about the "nurses' responsibilities for planning the care with the patients and relatives and evaluating the patient satisfaction, determining and planning the training needs of healthy/ill individuals and providing and evaluating health/patient education." Therefore, the factor was named as "Health/Patient Education" (Table 3).

The fourth factor consisted of four items whose factor loadings varied between 0.563 and 0.741. It explained 3.035% of the total variance. The items in this factor were about the "nurses' contribution to the education of other healthcare team members, students, and new recruits." Therefore, the factor was named as "Professional Development" (Table 3).

The fifth factor consisted of five items whose factor loadings varied between 0.563 and 0.690. It explained 2.531% of the total variance. The items in this factor were about the "nurses' responsibilities of determining ethical dilemmas in patient care, acting in accordance with the patient rights, and taking precautions regarding patient rights violations." Therefore, the factor was named as "Ethical Practice" (Table 3).

The sixth factor consisted of 17 items whose factor loadings varied between 0.442 and 0.694. It explained 2.283% of the total variance. The items in this factor were about the "nurses' interpretation, critical thinking and analysis of patient needs, awareness of their own knowledge and skills, cooperation, emphasis on a teamwork in the professional practices, adaptation of lifelong learning and communication." Therefore, the factor was named as "Critical Thinking and Teamwork" (Table 3).

The seventh factor consisted of seven items whose factor loadings varied between 0.482 and 0.729. It explained 2.012% of the total variance. The items in this factor were about the "nurses' involvement in research activities, use of research outcomes in nursing care, and participation

in educational programs that support their professional development." Therefore, the factor was named as "Research and Development" (Table 3).

Internal Consistency

The item-total score correlations and the Cronbach's alpha internal consistency values were calculated for the factors in the seven-factor structure scale created after the exploratory factor analysis is being done.

An acceptable value for the internal consistency of the scale was determined as the 0.70 (29). The internal consistency analysis revealed that the item-total correlation coefficients and Cronbach's alpha reliability values of both the total scale and the factors were high.

The Cronbach's alpha values showing the internal consistency of the Nursing Professional Competence Draft scale were calculated as 0.98 for the total scale, 0.88 for diagnosis, 0.93 for implementation of the nursing process, 0.95 for health/patient education, 0.82 for a professional development, 0.88 for ethical practice, 0.94 for critical thinking and teamwork, and 0.88 for research and development (Table 3).

Scale Total and Factors Score Distribution

The items of the Nursing Professional Competence Draft scale were prepared in four-point Likert type form. The scale included three intervals between 1 and 4. Each interval was scored dividing the number of the intervals by the number of items (22,30), which was formulated as $3:4=0.75$, suggesting that each interval should cover a range of 0.75 points. Accordingly, the score intervals were as follows:

- 1-1.75: Never,
- 1.76-2.50: Sometimes,
- 2.51-3.25: Often,
- 3.26-4.00: Always.

DISCUSSION

An item analysis is performed to eliminate the scale items that exhibit relatively low correlation compared to the total scale. In the literature, it is desirable for a correlation between the variables not to be negative or low, as low item-total score correlation value decreases the scale reliability. Studies argue that a correlation value <0.30 indicates that the items are insufficient, whereas a value >0.40 indicates that the items have a good distinguishing feature (31). In the study, the item-total score correlation was calculated for an each item (Table 1), and this result suggests that the distinguishing feature of all scale items is good.

In the literature, an exploratory factor analysis is recommended to create a small number of conceptually meaningful new factors by bringing many interrelated variables together (32). Although there is no definite limit for the factor load values that explain the relationship of the items with a factor, Akgül (33) states that the lowest acceptable factor load value is 0.30, whereas the factor load values between 0.30-0.59 are accepted as a moderate and the values of ≥ 0.60 are considered as high. Büyüköztürk (32) qualifies a factor load value of ≥ 0.45 as a good criterion. In the study, the factor load value of all items was ≥ 0.45 , and 16 items with a factor load <0.40 were removed from the draft scale (Table 2).

In the present study, a principal component analysis, which is the most common and widely used technique for an exploratory data analysis in the literature and is relatively easy to interpret, was used in the exploratory factor analysis. In addition, axis rotation was performed to provide an independence during the factor analysis and clarity in the interpretation. Varimax Rotation Technique, one of the most frequently used vertical rotation techniques, was also used in the study (32). The Varimax Rotation Technique prioritizes the factor loading column to reach the simple structure and significant factors, whereby a rotation is performed so that the factor variances are at the highest level with the fewer variables. As a result of the analysis, the higher the total variance explained by the factors, the stronger the factor structures of the scale. The total variance explained is expected to be at least 30% in the single-factor scales and to be higher ($<40\%$ and 60%) in the multi-factor scales (28). In the study, the total variance explained by all the scale items was 59.24% (Table 2). Therefore, the scale had a strong factor structure.

As a result of the factor analysis, it is aimed to find a small number of independent, conceptually meaningful factors among the many related original variables that are difficult

to interpret (28). Therefore, the researchers decided that the scale consisted of the seven factors, by combining the items that were conceptually close to each other and had a highly positive and statistically significant relationship ($p < 0.001$) (Table 2).

In the literature, it is recommended to use the different analyzes in a scale development studies to evaluate whether the sample has a sufficient size for the data analysis. The KMO sample adequacy test was used in the present study. Studies argue that the KMO value should be between 0-1, whereby factor analysis could be applied if the KMO test result is >0.50 , and state that a KMO value between 0.70-0.80 indicates a moderate sampling adequacy, the value between 0.80-0.90 indicates a good sampling adequacy, and the value >0.90 indicates an excellent sampling adequacy. A significance result of the Barlett's test, another indicator for a sample suitability, suggests that the correlation matrix of the items in the draft scale is suitable for the factor analysis, in other words, reveals whether the correlation between the items in the draft scale is sufficient (31). In the present study, the KMO value and the Bartlett's test of the Sphericity results suggest that the sample size was sufficient for the factor analysis, whereby the correlation matrix of the items was excellent.

The naming of the factors emerging because of the exploratory factor analysis depends on the theoretical expectations and interpretations. Therefore, it is important to benefit from the opinions of the experts on the subject (33). The experts consulted while creating an item pool in the study were also interviewed to name the factors of the scale, and the relevant literature on this subject was examined and observed (1, 10, 15, 17, 18). In the study, nine of the factors predicted at the end of the literature review about the professional competences of the nurses were included in a draft scale. However, because of the analysis, it was found appropriate to combine the factors of Critical Thinking, Analysis, and Teamwork (17 items) under one factor. The draft scale has become a scale with seven factors (diagnosis, implementation of a nursing process, health/patient education, professional development, ethical practice, critical thinking and teamwork, and research and development) (Table 3). Similar results of this factor were reported in studies of Notarnicola et al. (1), Nilsson et al. (18) and Juntasopeepun et al. (20). This result is compatible with a theoretical framework.

Cronbach's alpha coefficient is a measure of the internal consistency and the homogeneity of the scale items. A scale consisting of the items with a high correlation with

each other also has a higher Cronbach's alpha coefficient (32). A Cronbach's alpha coefficient of $0.0 < \alpha < 0.39$ shows that the scale is not reliable, $0.40 < \alpha < 0.59$ indicates a low scale reliability, $0.60 < \alpha < 0.79$ indicates that the scale is reliable, and the $0.80 < \alpha < 1.00$ shows a high scale reliability (22). This value should be as close to 1 as possible (32). The Cronbach's alpha coefficients, which showed that the internal consistency of the Nursing Professional Competence scale in the study, were calculated as 0.98 for the total scale (Table 3). The acceptable value for the internal consistency of the scale is determined as 0.70 (29). This result, which shows that the total scale and factors' Cronbach' alpha values were >0.70 , indicates that the total scale and factors are consistent within themselves, whereby the internal consistency was excellent, suggesting a high scale reliability.

Study Limitations

Nurses may answer items of the scale as they think they should answer rather than they respond from their own experiences.

CONCLUSION

The Nursing Professional Competence scale was found to be a valid and reliable tool for the assessment of nurses' professional competences. The scale is a tool that could be easily applied by the researcher nurses and manager nurses. It could be used in research to determine the nurses' professional competences and its associated variables. Furthermore, it may also be used to examine the effects of nursing education programs on the professional competences of nurses in several areas including the diagnosis, implementation of nursing process, health/patient education, ethical practice critical thinking and teamwork. It is thought that this scale will be useful in determining the areas of the nurses' professional competence that are not sufficient or need to be improved.

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ETHICS

Ethics Committee Approval: For conducting the study, ethical approval was obtained from the Social Sciences and Humanities Ethics Committee at Istanbul University (number: 2018/46, date: 05.03.2018), and institutional permissions where the study was conducted were received.

Informed Consent: The nurses who agreed to participate in the study verbal and written consents were obtained.

Authorship Contributions

Surgical and Medical Practices: F.Ç., Concept: F.Ç., E.Ş., Design: F.Ç., E.Ş., Data Collection or Processing: F.Ç., Analysis or Interpretation: F.Ç., Literature Search: F.Ç., E.Ş., Writing: F.Ç., E.Ş.

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