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Development of the Nurses' Attitude Scale Toward the Risks in the Work Environment

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Abstract

Background: Health-care services, especially hospital environments, are considered to be "very hazardous" and risky work environments. Some problems related to employee health that arise due to the risks encountered in hospitals reduce job productivity, and cause financial loss, increased accidents while putting patients receiving care at risk.

Aim: This study aimed to develop a valid and reliable measurement instrument to determine nurses' attitude toward the risks in the work environment.

Method: It is a methodological study conducted with 504 nurses working in a university hospital, a Ministry of Health hospital and 2 private hospitals. The data were collected using the 8-question Personal Information Form and the 63-item draft version of "Nurses" Attitudes toward Work Environment Risks Scale." Descriptive statistics, Pearson's correlation, Cronbach's alpha internal consistency, Exploratory Factor Analysis, Confirmatory Factor Analysis (CFA), t-test, and Intraclass Correlation Coefficient analysis were used to evaluate data.

Results: As a result of the item total score correlation analysis, the draft scale was reduced to 43 items with values <.40. Then, as a result of exploratory and CFA, it was seen that the scale had 2 factor structure divided into subscales as "institutional approach" and "individual approach." Cronbach's alpha coefficient was found 0.94 for the overall scale, while it was 0.94 for the institutional approach subscale and 0.88 for the individual approach subscale. The scale is a 5-point Likert scale and higher scores indicate a positive attitude.

Conclusion: In this study, it was determined that the "Nurses' Attitudes toward Work Environment Risks Scale" is a valid and reliable measurement instrument, and it can be used to determine the attitudes of nurses working in hospitals.

Keywords: Attitude, nurse, risk, scale, work environment

Introduction

The fact that individuals have to work for reasons such as meeting their socioeconomic needs, improving their quality of life, being more useful to society and maintaining their lives require them to spend most of their day in a workplace, and working in a safe work environment is considered the most natural right to life.[1] Although various studies related to occupational health and safety are being carried out today, it is seen that the practices carried out in accordance with these studies vary according to the sectors.[2]

Health-care services, especially hospital environments, are considered to be "very hazardous" and risky work environments.[3] Some problems related to employee health that arise due to the risks encountered in hospitals reduce job productivity, and cause financial loss, increased accidents while putting patients receiving care at risk.[4,5]

In many studies conducted on the risks and risk exposure levels in the work environment, it has been stated that nurses are the most affected group among health-care professionals.[6-12] The American Nurses Association launched a movement called "Healthy Nurse, Healthy Nation™ Grand Challenge" in 2017, and has published 2 reports for 2017-2018 and 2018-2019; and according to the results from 2019, they reported that nurses are significantly exposed to risks in the work environment.[13,14] The attitude toward the measures to be taken is of great importance as well as risk identification.

The attitude is at the source of all types of individuals' behavior. The concept of attitude in general shows the tendency of individuals to react to any phenomenon or object

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around them.[15,16] In addition to measures that institutions should take to prevent risks, there are also many that people should apply individually. There are studies which indicate that nurses do not take adequate precautions against the dangers and risks they encounter in addition to those mention that they take individual measures related to occupational safety and employee health at an adequate level; however, the measures taken by institutions are inadequate.[17-24]

When the literature was examined, it was seen that there are a limited number of studies aimed at determining the perception of nurses toward the risks they face in the work environment in Türkiye. At the international level, although there are studies aimed at determining attitudes, there have been no studies using data collection tools that have been validated. Since it is assumed that attitude toward taking measures provide more information than individuals' own perceptions, it is essential to have standard measurement instruments to determine the functioning of the employee safety culture in healthcare institutions and employees' attitude toward occupational risks to conduct implementations. In this context, this study was carried out to develop a valid and reliable measurement instrument to determine nurses' attitude toward the risks in the work environment from a comprehensive point of view, both in the institutional and individual aspects, taking into account all potential risks that they may encounter.

Aim

The study aimed to develop a valid and reliable scale to determine nurses' attitude toward the risks in the work environment.

The Question of the Research

Is the scale, which was developed to determine the attitude of nurses to the risks in the work environment, a valid and reliable instrument?

Methods

Research Type

This study was carried out using a methodological design.

Time and Place

The study was carried out with nurses working in 4 hospitals, as 1 University Hospital (UH), 1 Ministry of Health Hospital (SBH) and 2 Private Hospitals (PH), one of which has been internationally accredited. The validity and reliability data of the study were collected between March and April 2019.

The Universe and Sample

The universe of the study was composed of 888 nurses working in the institutions where the study was conducted (UH: 272, MHH: 296, PH1: 60, PH2: 260). Since the main criteria for selecting nurses involve working in an institution for at least 3 months and being a bedside nurse, those who are not directly involved in the processes of care, diagnosis, and treatment were not included in the study.

In the development of data collection instruments, individual in-depth interviews were conducted with 30 nurses who are working in the hospitals that constitute the research universe, of whom 10 from each hospital group (UH, MHH, and PH) to create an item pool. In determining the nurses to be interviewed, the criteria of having a different educational background and experience, working in different units and positions, and volunteering to participate in the interview were taken into account using maximum diversity sampling.

In the scale development, a draft scale was applied twice with an interval of 15 days to a total of 50 nurses who were included in the sample group and agreed to participate in the test-retest analysis (17 UH, 23 MHH and 10 PH). However, analysis was carried out with 44 nurses.

In validity and reliability study, considering the theoretical knowledge suggesting that "the sample size should be at least 5-10 times the number of items,"[25,26,27] it was planned to reach 630 nurses calculating 10 times of the draft items (63 Items). The questionnaire was distributed to 674 nurses and collected from 547, yet the data of 504 were included in the analysis. The response rate of the research was 81%, and 8 times the number of items in the draft scale was reached.

Data Collection Instruments

A semi-structured interview form was used for the qualitative phase carried out to create an item pool. The form included 8 questions aimed at questioning the views and experiences of the participants regarding the risks in the work environment and determining their individual characteristics.

In accordance with the data obtained from individual in-depth interviews, a 300-question item pool was created. This item pool was reduced to 80 items by the research team, and submitted to the opinion of 14 academicians work in management and other disciplines in nursing. Once the expert opinion was received, items which were similar and considered unimportant (17 items) were eliminated, and the scale was finalized into a 63-item instrument. A questionnaire containing introductory information (age, gender, education, institution, and unit) was created before the validity and reliability of the draft scale, and pre-implementation was performed with 20 nurses. As a result of the pre-implementation, respondents reported that 2 items were unclear, and relevant changes were made.

Nurses' Attitudes Toward Work Environment Risks Scale is a 5-point Likert type scale (strongly disagree-1, disagree-2, partially agree-3, agree-4, and strongly agree-5), and there are no negatively-scored items. To calculate overall scale score, scores of 43 items are added up to obtain a raw score between 43 and 215, and the raw score is divided by the number of items (by 43) to obtain a scale score ranging between 1 and 5. The subscales are scored using the same method. Higher scores indicate a more positive attitude.

Data Collection

Nurses who were suitable for interview according to the eligibility criteria for in-depth interviews were selected in accordance with the opinion of nurse managers. Face-to-face interviews were conducted with nurses who agreed to participate in the study. Before the interview, necessary information was provided to each participant, and audio recording was performed after obtaining participants' permission. Audio recordings were transcribed by the researcher on computer and then analyzed. An item pool was created as a result of thematic analysis.

For the validity and reliability, preliminary interviews were conducted with the managers of the institutions, and hospitals were visited on

the days determined for MHH and UH. The data collection tool was distributed to those who volunteered to participate after the necessary information was provided, and it was collected by the researcher during regular visits. Data collection tools were distributed in PH accompanied by a nurse educator and collected by the researcher after 15 days. In the other PH, data collection tools were given to nursing service managers and were collected after 10 days.

Data Evaluation

After the data were transferred to the computer environment by the researcher, the Statistical Package for the Social Sciences 15 (SPSS 15) package program (SPSS Inc., Chicago, IL, USA) and "Linear Structural Relations" 8.71 (LISREL) were used to analyze the data through consulting a statistical consultant. The Davis technique and content validity index were used for content validity (evaluation of expert opinions) during reliability and validity studies. Exploratory and confirmatory factor analysis (CFA) were used for construct validity, Pearson's correlation was used for item analysis (item total score analysis, item-subscale, and subscale-overall scale analysis), the Cronbach's alpha coefficient was used for internal consistency of the overall scale and the subscales, and dependent samples t-test and Intraclass Correlation Coefficient (ICC) analysis were used to compare test-retest scores for time invariance. The study was reviewed according to the COSMIN guideline.

Ethical Considerations

Ethics committee approval was received for this study from the Ethics Committee approval for this study was received from Abant İzzet Baysal University Clinical Research Ethics Committee. (Date: 08.06.2017, Approval Number: 2017/80). After obtaining written permission from all the institutions where the research would be conducted, the data collection process was started and the participants were asked to fill out the informed consent form. The principles outlined in the Declaration of Helsinki for human investigations were followed for this study.

Results

Introductory Characteristics of the Participants

During the validity and reliability, it was determined that 80.6% of nurses were female, 51.8% were aged between 23 and 30, and 60.1% held a bachelor's degree. When the occupational characteristics were examined, it was determined that 40.1% of nurses had been working for 5 years and less, and 42.1% were working in the Ministry of Health Hospital.

Content Validity

The draft scale (80 items) was submitted to the opinion of 14 experts in nursing and the comprehensibility and relevance of the items were evaluated. The Davis technique was used to evaluate expert opinions, and experts were asked to review the items as "(a) The item is appropriate, (b) The item should be slightly revised, (c) The item should be revised extensively, and (d) The item is inappropriate." According to the Davis technique, since items with a Content Validity Index (CVI) lower than 0.80 should be eliminated, 7 items (11, 12, 13, 14, 15, 16, and 20) from the draft scale were removed. Ten similar items were also removed in accordance with expert recommendations, and the final version of the 63-item draft scale was created. The CVI for the overall scale was found 0.96.

Pre-implementation

Pre-implementation was performed on 20 nurses who had the same characteristics as the sample group and were outside the sample group, and the comprehensibility of the items was evaluated and the 2 items were found to be incomprehensible. The draft scale was finalized by making changes to these 2 items and implementation phase of the 63-item scale was started for validity and reliability analysis.

Item Analysis

The correlation coefficient values of the 20 items (1, 2, 3, 4, 6, 7, 8, 9, 10, 11, 12, 34, 35, 36, 47, 55, 57, 40, 60, and 61) of 63-item scale were found to range between $r=-0.31$. and 0.32, which were at low levels (<0.40). The item-total reliability coefficients of the other 43 items ranged between r: 0.40 and 0.63, and it was found to be significant at a very advanced level ($P < .001$). Since the reliability coefficient was set at 0.40 and above, 20 items with lower values (r: < 0.40) were removed from the scale, and the analyses were continued with 43 items.

Item analyses were performed for the 2-factor and 43-item scale, whose items were not eliminated after the exploratory factor analysis (EFA) and were found to be fit according to the CFA, and the reliability coefficients of the item total correlation of all items ranged between $r=0.40$ and 0.70, which was positive and statistically significant at a very advanced level ($P < .001$). Considering the relationship between the items and subscale scores, the reliability coefficient was found to range between r: 0.54 and 0.77 for institutional approach subscale, while it was between r: 0.51 and 0.72 for individual approach, which were statistically significant at a very advanced level ($P < .001$, Table 1).

The relationship between the scores of 2 subscales of Nurses' Attitudes Toward Work Environment Risks Scale and the overall scale scores was evaluated using "Pearson's correlation analysis," and the reliability coefficient was found to be r: 0.94 for the institutional approach, and r: 0.74 for the individual approach, which were positive and statistically significant at a very advanced level ($P < .001$).

Construct Validity

EFA results; Principal Components Analysis, and Varimax rotation were used in the EFA of 43 items conducted with half of the data (odd-numbered data) to determine the factor structure. In the analyses conducted with different number of factors, it was found that the best structure is 2-factor. The Kaiser-Meyer-Olkin (KMO) coefficient was found 0.93 in the EFA performed for the 43-item Nurses' Attitudes Toward Work Environment Risks Scale, and the result of the Barlett's test was found to be significant at a very advanced level ($\chi^2=5980.73$, df = 903, $P \leq .001$, Table 2).

In the EFA, the eigenvalues in the 2-factor structure were 13.69 and 4.50. The variance explained by the factors was 25.11% and 17.19%, and the 2 factors explained 42.30% of the total variance. According to the content of the items, the first subscale was named as "Institutional approach" and the second was named as "Individual approach." In EFA, there were no items loaded poorly or cyclical. Factor loadings of 43 items included in the scale ranged between 0.40 and 0.80.

CFA results; to test the validity of the 2-factor structure determined in the EFA, CFA was performed with the other half of the data (even-numbered data), and the compliance values are given in Table 3. The

Table 1. Item Total and Item Subscale Correlations of Nurses' Attitudes Toward Work Environment Risks Scale for the Second Phase with 43 Items (n=504)

New number	First number	Items (43 items)	Item total score		Item subscale	
			r	*P*	*r*	*{*
		Factor 1: Institutional Approach				
1	13	Studies aimed at reducing risks are carried out regularly in our institution	.60	<.001	.69	<.001
2	14	Employees know what to do when faced with risky situations	.59	<.001	.63	<.001
3	15	Risk analysis studies are carried out in our institution with the participation of employees	.63	<.001	.68	<.001
4	16	Unit-specific measures against risks are taken in our institution	.65	<.001	.73	<.001
5	17	Employees have a high level of awareness toward occupational safety practices	.61	<.001	.66	<.001
6	18	Employee health screenings are carried out regularly in our institution	.53	<.001	.60	<.001
7	19	Our institution focuses on solving the problems rather than punishing or blaming those who make mistakes	.65	<.001	.70	<.001
8	20	Mandatory occupational safety training conducted in the institution are useful	.56	<.001	.58	<.001
9	21	Topics related to risk management are included in orientation training in our institution	.53	<.001	.61	<.001
10	22	Required protective materials and equipment are provided by our institution (safety glasses, masks etc.)	.58	<.001	.59	<.001
11	23	Our institution does not avoid expenses allocated to ensure the safety of employees	.68	<.001	.77	<.001
12	24	The maintenance and repair of all equipment in our institution is carried out on time	.65	<.001	.72	<.001
13	25	Our institution hires competent employees who can use technical equipment and devices	.66	<.001	.70	<.001
14	26	Proper placement/repair of equipment and materials (monitors, cabinets, etc.) in the unit is taken into consideration	.60	<.001	.61	<.001
15	27	Safety measures are taken to prevent violence in our institution	.70	<.001	.74	<.001
16	28	In our institution, waste treatment is performed in accordance with standards/ regulations	.62	<.001	.66	<.001
17	29	Studies are conducted in our institution in order to prevent radioactive hazards for employees	.67	<.001	.70	<.001
18	30	Precautions are taken for patients who need isolation in our institution	.60	<.001	.62	<.001
19	31	Preventive measures are promptly taken to protect employees against epidemics	.67	<.001	.66	<.001
20	32	Materials and medicines are stored in accordance with our institution's procedures	.60	<.001	.59	<.001
21	33	Chemotherapy administration standards are applied in our institution	.54	<.001	.54	<.001
22	58	My manager tries to solve problems related to risks encountered in the workplace	.58	<.001	.62	<.001
23	59	My manager takes into consideration employees' suggestions regarding workplace risks	.60	<.001	.63	<.001
24	62	The risks faced by employees are a priority for managers	.63	<.001	.65	<.001
25	63	My manager provides the necessary support for effective individual safety measures	.59	<.001	.60	<.001
		Factor 2: Individual Approach		<.001		<.001
26	5	During my practice, I take into account that the hospital setting carries biological risks	.40	<.001	.52	<.001
27	37	Although it takes time to take preventive measures, I follow procedures	.41	<.001	.59	<.001
28	38	I do not delay my health screenings	.46	<.001	.56	<.001

(*Continued*)

Table 1. Item Total and Item Subscale Correlations of Nurses' Attitudes Toward Work Environment Risks Scale for the Second Phase with 43 Items (n = 504) (*Continued*)

New number	First number	Items (43 items)	Item total score		Item subscale	
			r	*P*	*r*	*{*
29	39	I conduct research on risks about which I do not have sufficient information	.50	<.001	.61	<.001
30	41	I care about whether the quality and safety of protective equipment is sufficient	.44	<.001	.55	<.001
31	42	I would not hesitate to report an incident/work accident	.46	<.001	.62	<.001
32	43	I use a treatment tray with a tool box for sharp objects during my practice	.41	<.001	.53	<.001
33	44	I follow the procedure when I am exposed to sharp object injury	.50	<.001	.69	<.001
34	45	I pay attention to hand hygiene when treating multiple patients	.43	<.001	.62	<.001
35	46	I take all preventive measures for those who have infectious diseases	.43	<.001	.63	<.001
36	48	I think that as long as we comply with the standards, we are protected from infections	.45	<.001	.53	<.001
37	49	I pay attention to the proper use of chemical products in accordance with the regulations	.51	<.001	.72	<.001
38	50	I follow the procedures when preparing medications	.42	<.001	.67	<.001
39	51	I pay attention to proper body mechanics while doing my job	.45	<.001	.59	<.001
40	52	I engage in social/physical activities to cope with my stress	.41	<.001	.57	<.001
41	53	I would consider receiving psychological help if necessary	.41	<.001	.56	<.001
42	54	I take care to protect my personal space in my relationship with patients/relatives	.40	<.001	.62	<.001
43	56	I arrive to night shifts well-rested	.40	<.001	.51	<.001

*Overall alpha value obtained in case the item is removed was found 0.94. *P*, significance value, *r*, Pearson's correlation coefficient.

factor loadings of the items with subscales were found to range between 0.41 and 0.74 (Figure 1).

Test-Retest Analysis

The difference between the mean scores obtained from the first and second implementations on 50 nurses from the study sample, with 2 weeks intervals, was compared using dependent-samples t-test, and there was no statistical difference between the 2 mean scores obtained from 2 different measurements ($P > .05$; Table 3). In addition, the compatibility between the scale scores in the 2 measurements was evaluated using intraclass correlation coefficient, and the reliability coefficient was found .90 for the overall scale, which was highly significant ($P < .001$). In the subscales, the reliability coefficient was 0.91 for institutional approach and 0.84 for individual approach, which was found to be significant at a very advanced level ($P < .001$, Table 4).

Internal Consistency Reliability Coefficients

Cronbach's alpha was used for internal consistency, which is one of the reliability indicators of the overall Nurses' Attitudes toward Work Environment Risks Scale and its subscales, and it was found 0.94 for the overall scale while it was 0.94 for institutional approach subscale and 0.88 for individual approach subscale.

Discussion

The first stage in the scale development studies is the creation of a large pool of items that are selected taking into account the purpose of measurement and are considered appropriate for inclusion.[28] In addition to the relevant scientific resources and theoretical framework used to create an item pool[25] information can be obtained from a sample reflecting the characteristics of the intended population on which the instrument will be applied.[29] The information obtained from the interviews conducted using the qualitative research method can be used to develop questionnaire and scale items.[30] In recent years, there has been an increasing trend toward the use of quantitative and qualitative data together in nursing research.[31] In this study, in-depth individual interviews were conducted with 30 nurses working in MHH, UH and PH, and an item pool was created in accordance with the literature. It is usually suggested to create an item pool containing 3 or 4 times the number of items requested in the scale draft, and it is emphasized that the larger the pool of items, the better the understanding is adopted.[29,28] In this study, a similar approach was adopted and the study of creating the item pool was started with 300 items and was reduced to 80 items as a result of the detailed examination by the researchers.

Content validity is defined as "the indicator of whether the items are quantitatively and qualitatively sufficient to measure the behavior (characteristic) to be measured."[30] "Submission for expert opinion" is one of the most frequently used and effective approaches in determining the content validity.[32-34] Expert reviews are used to determine whether the items in the draft scale reflect the characteristic to be measured, and whether the items are clear and understandable, etc. Expert opinions can be interpreted statistically and validity can be tested.[33,34] In this study, as a result of the evaluation performed by

Table 2. Exploratory Factor Analysis Results of Nurses' Attitudes Toward Work Environment Risks Scale (n=252)

New Number	First Number	Draft Scale Items	Factor 1	Factor 2
1	13	Studies aimed at reducing risks are carried out regularly in our institution	0.72	
2	14	Employees know what to do when faced with risky situations	0.59	
3	15	Risk analysis studies are carried out in our institution with the participation of employees	0.71	
4	16	Unit-specific measures against risks are taken in our institution	0.76	
5	17	Employees have a high level of awareness toward occupational safety practices	0.62	
6	18	Employee health screenings are carried out regularly in our institution	0.61	
7	19	Our institution focuses on solving the problems rather than punishing or blaming those who make mistakes	0.70	
8	20	Mandatory occupational safety training conducted in the institution are useful	0.57	
9	21	Topics related to risk management are included in orientation training in our institution	0.59	
10	22	Required protective materials and equipment are provided by our institution (safety glasses, masks, etc.)	0.55	
11	23	Our institution does not avoid expenses allocated to ensure the safety of employees	0.80	
12	24	The maintenance and repair of all equipment in our institution is carried out on time	0.72	
13	25	Our institution hires competent employees who can use technical equipment and devices	0.69	
14	26	Proper placement/repair of equipment and materials (monitors, cabinets, etc.) in the unit is taken into consideration	0.55	
15	27	Safety measures are taken to prevent violence in our institution	0.77	
16	28	In our institution, waste treatment is performed in accordance with standards/regulations	0.66	
17	29	Studies are carried out in our institution to prevent the effect of radiation on employees	0.70	
18	30	Precautions are taken for patients who need isolation in our institution	0.54	
19	31	Preventive measures are promptly taken to protect employees against epidemics	0.63	
20	32	Materials and medicines are stored in accordance with our institution's procedures	0.48	
21	33	Chemotherapy administration standards are applied in our institution	0.49	
22	58	My manager tries to solve problems related to risks encountered in the workplace	0.62	
23	59	My manager takes into consideration employees' suggestions regarding workplace risks	0.64	
24	62	The risks faced by employees are a priority for managers	0.63	
25	63	My manager provides the necessary support for effective individual safety measures	0.61	
26	5	During my practice, I take into account that the hospital setting carries biological risks		0.49
27	37	Although it takes time to take preventive measures, I follow procedures		0.55
28	38	I do not delay my health screenings		0.47
29	39	I conduct research on risks about which I do not have sufficient information		0.59
30	41	I care about whether the quality and safety of protective equipment is sufficient		0.52
31	42	I would not hesitate to report an incident/work accident		0.57
32	43	I use a treatment tray with a tool box for sharp objects during my practice		0.47
33	44	I follow the procedure when I am exposed to sharp object injury		0.72
34	45	I pay attention to hand hygiene when treating multiple patients		0.68
35	46	I take all preventive measures for those who have infectious diseases		0.72
36	48	I think that as long as we comply with the standards, we are protected from infections		0.40

(*Continued*)

Table 2. Exploratory Factor Analysis Results of Nurses' Attitudes Toward Work Environment Risks Scale (n = 252) (*Continued*)

New Number	First Number	Draft Scale Items	Factor 1	Factor 2
37	49	I pay attention to the proper use of chemical products in accordance with the regulations		0.74
38	50	I follow the procedures when preparing medications		0.76
39	51	I pay attention to proper body mechanics while doing my job		0.59
40	52	I engage in social/physical activities to cope with my stress		0.53
41	53	I would consider receiving psychological help if necessary		0.52
42	54	I take care to protect my personal space in my relationship with patients/relatives		0.70
43	56	I arrive to night shifts well-rested		0.50
		Eigenvalue	13.69	4.50
		Variance explained by the factors (%)	25.11	17.19
		Total variance explained (%)	42.30	
		KMO	0.93	
		Bartlett's test. sd: 903 (χ^2/P)	5980.73/<.001	

KMO, Kaiser-meyer-olkin.

Table 3. Confirmatory factor analysis compliance values of nurses' attitudes toward work environment risks scale (n=252)

CFA Compliance Statistics	Compliance Values	Reference Values[26,40]	
		Acceptable Compliance	Perfect Compliance
Chi-square/p value	1910.59/.000 (*P* < .05)		
Degrees Of Freedom	857		
Chi-square value: Degrees of freedom	1910.59/857 = 2.23	It must be <3	
RMSEA/p	0.070 (*P* < .05)	0.050 and <0.050	0.080 and <0.08
SRMR	0.075	0.050 and <0.050	0.080 and <0.08
CFI	0.94	0.95 and above	0.97 and above
NNFI	0.94	0.90 and above	0.95 and above
GFI	0.74	0.85 and above	0.90 and above
AGFI	0.71	0.85 and above	0.90 and above

AGFI, adjusted goodness of fit index; CFA, confirmatory factor analysis; CFI, comparative fit index; NNFI, non-normed fit index; RMSEA, root mean square error of approximation; SRMR, standardized root-mean-square residual.

taking the opinions of 14 experts, 7 items of the draft scale with CVI <0.80[33] and 10 items which were found similar were removed, and a 63-item scale was finalized.

It is stated that it is useful to conduct a preliminary trial, which has been made available for implementation, on a target population with the same characteristics as the study sample.[26] In this research, 2 items were corrected as a result of pre-implementation.

Item analysis is defined as "operations performed to examine the contribution of the items to the scale."[33] The correlation between the overall score obtained by the participants and the score they obtained from each item is revealed in this phase. The level of "item total correlations" is an important criteria in choosing an item or evaluating its appropriateness.[28,26,27] Item total correlation is calculated using the "Pearson's correlation coefficient"[32] ranging between –1 and +1.[35] When the "total score correlation" of any item score is negative or lower than .20, it is stated that this item should be removed from the instrument. Resources suggest a minimum value of 0.25 and mention that 0.30 and above distinguishes individuals well while above 0.40 distinguishes very well.[32,33,26,35] In the item analysis of this scale, 20 items were removed due to low reliability coefficient (*r*: <0.40), and the reliability coefficient of the remaining 43 items were at an adequate level (0.40 and above).

It is necessary to know whether items are consistent with each other and to prove that all items measure the same characteristics.[34,36] One of the reliability indicators of the scale and its subscales is to

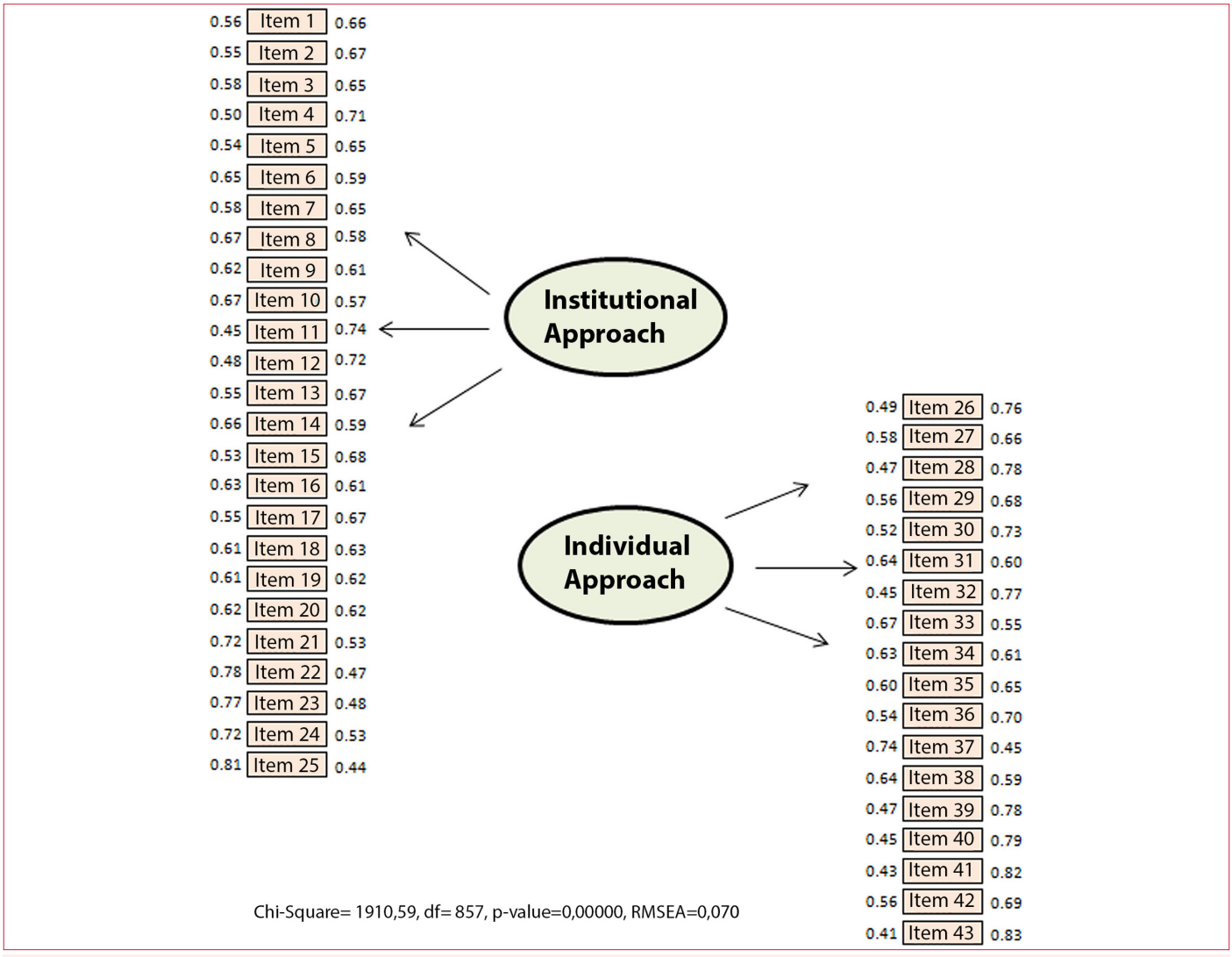

Figure 1. Confirmatory factor analysis results of the nurses' attitudes toward work environment risks scale.

determine internal consistency.[36] The most appropriate way is to calculate the "Cronbach's alpha reliability coefficient" on Likert-type scales.[34,27] The generally accepted value for the internal consistency coefficient is 0.70 and "values <0.40 indicate that the instrument is not reliable, values between 0.40 and 0.60 indicate low reliability, values between 0.60 and 0.80 indicate that it is considerably reliable and values between .80 and 1.00 indicate that it is highly reliable."[25,27] Internal consistency values of Nurses' Attitudes Toward Work Environment Risks Scale and its subscales were found to be highly (0.94, 0.94, and 0.88) reliable.

Table 4. Comparison and Correlations of Mean Test-Retest Scores Obtained from Overall Nurses' Attitudes Toward Work Environment Risks Scale and Its Subscales (n = 44)

Scale and Subscales	First Implementation	Second Implementation	*t**	*P*	ICC	*P*
Nurses' attitude scale toward the risks in the work environment (total)	68.10 ± 10.90	69.30 ± 10.83	1.225	.227	0.90	<.001
Subscales						
İnstitutional approach	61.91 ± 14.40	63.61 ± 13.29	1.422	.162	0.91	<.001
İndividual approach	76.70 ± 9.44	77.21 ± 10.43	0.452	.654	0.84	<.001

*Dependent t-test, degree of freedom: 43. *P*, significance value; ICC, intraclass correlation coefficient.

Another method is to determine the "test-retest" reliability.[33] This method enables to examine whether the measurement instrument is time-invariant, in other words, whether it shows stability.[3,25] In this study, t-test and ICC results in dependent groups used to test time invariance show that the scale meets the reliability criteria over time.

During the development of a multidimensional scale, evidence is obtained on issues such as the existence of subscales, their relationship to each other, and the variance explained by the subscales using factor analysis.[34] In EFA, the factor structure in the data is tried to be determined based on the observed variables, while in CFA, it is tested whether the theoretical structure determined by the researcher exists in the data.[26,33,34]

In this study, EFA was performed with half of the data (odd-numbered data) to determine the factor structure, and as a result of the analyses, it was found that the most suitable structure was 2-factor. To test the validity of the 2-factor structure determined by EFA, CFA was also performed with the other half of the data (even-numbered data).

To obtain accurate results from EFA, it is necessary to achieve an adequate sample size.[26] Statistical techniques can give an idea of the adequacy of the EFA sample, and are often decided using the KMO value.[25,27,33,35] The KMO reveals a value between 0 and 1.00, and values closer to 1.00 are considered ideal, while values <.50 are considered unacceptable.[34,37] In this study, the fact that the EFA and KMO values of the scale were found to be .93 indicate that the number of samples is perfectly adequate for factor analysis, while the fact that Barlett's test is significant (.000) shows that inter-item correlation matrix is suitable for factor analysis.

The eigenvalue coefficient is used to calculate the ratio of the variance explained by each factor, and to decide on the number of important factors. As the eigenvalue increases, the variance explained by the factor increases, and in general, factors with an eigenvalue >1 are considered "important factors," while factors <1 are considered "insignificant." [25,27,34,33,38] In this study, the eigenvalue of all factors was found to be above 1.

The correlations in the correlation matrix are required to provide factorability; usually ranging between 0.30 and 0.90, and correlations lower than 0.30 are not acceptable.[33] Factor loadings ranging from 0.30 to 0.40 can be taken as cutoff point to create a pattern.[27,37,38] ,Factor loadings of all items in this study are 0.40 and above, and the loading values were found to be at an adequate level.

When an item provides high loading values in more than one factor in a multi-factor structure, it is noted that the difference between the load values of the item should be at least 0.10. An item that provides a high loading value in multiple factors is defined as a cyclical item, and is removed from the scale.[27,35,39] In this study, the factor load of any item was not observed in more than one dimension with a difference of <0.10.

The path coefficients showing the relationship of an item with its subscale are the loads equivalent to the factor loading, and are recommended to be at least 0.30 and greater.[25] In this study, EFA loads of all items were over 0.30 (between 0.41 and 0.74), which were found to have an adequate loading (Figure 1).

The goodness of fit index in EFA should be at the desired level. Commonly used goodness of fits tests are "the Chi-square test, Root Mean Square Error of Approximation (RMSEA), Standardized Root-mean-Square Residual (SRMR), Comparative Fit Index (CFI), Non-Normed Fit Index (NNFI), Goodness of Fit Index, (GFI), and Adjusted Goodness of Fit Index (AGFI).[36,40] In this study, the Chi-square value was found to be significant, and the "Chi-square" value divided by the "degree of freedom" was found 2.23. The fact that this value is 5 or less indicates that the model has an acceptable goodness of fit.[25,36,40]

The RMSEA equal to 0.08 or less, and the value of $P < .05$ is a good fit.[25,36,40] In this study, ($P < .05$) and the value of RMSEA 0.070 (<0.080) indicated that the model fit is good. SRMR value lower than 0.10 and[36] CFI and NNFI equal to 0.90 or above indicate consistency. The values of CFI and NNFI equal to 0.90 and above indicate an acceptable fit, while values equal to 0.95 and above indicate a good/perfect fit.[25,36,40] According to the SRMR (0.075), CFI (0.94), and NNFI (0.94) values obtained in this study, Nurses' Attitudes Towards Work Environment Risks Scale has a consistent factor structure. AGFI equal to 0.85 or above[25,40] and the GFI equal to 0.85 or above indicate consistency.[25] The AGFI and GFI values of this scale were found to be close to limit.

Limitations

The research findings are limited to the hospitals where the study was conducted. Another limitation is that only nurses who volunteered to participate were included in the study.

Conclusion

In this study, which was carried out to develop a valid and reliable measurement instrument for determining the attitudes of nurses working in hospitals toward the risks in the work environment, the necessary statistical analyses were completed by following the steps proposed in the scale development studies in the literature. "Nurses' Attitudes Toward Work Environment Risks Scale" was found to be a valid and reliable scale that can be used to determine the attitudes of nurses working in hospitals. Using this scale, hospital and nursing services managers will be able to contribute to the development of strategies for predicting and eliminating problems before they occur by identifying nurses' tendencies to risks in the work environment.

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