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RESEARCH ARTICLE

Development and psychometric analysis of a Pediatric Oncology Nurses' Educational Needs Scale

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Abstract

Background/objectives: It is important to determine the educational needs of pediatric oncology nurses in order to maximize and implement nursing care interventions. Therefore, this study aims to develop a valid and reliable measurement tool to determine pediatric oncology nurses' educational needs and examine its psychometric properties.

Design/methods: This methodological study was conducted with 215 pediatric oncology nurses in Turkey between December 2021 and July 2022. Data were collected with the "Nurse Information Form" and "Pediatric Oncology Nurses' Educational Needs Scale." IBM SPSS 21.0 and IBM AMOS 25.0 software programs were used for data analysis, and descriptive statistics were used to analyze numeric variables. Exploration and confirmatory factor analyses were performed to determine the scale's factorial structure.

Results: The factorial analysis was used to test the structural validity of the scale. A five-factor structure consisting of 42 items was developed. The Cronbach's alpha coefficient for "Illness" was .978, "Chemotherapy and Side Effect" was .978, "Another Therapy and Side Effect" was .974, "Palliative Care" was .967, "Supportive Care" was .985, and the total score was .990. Fit indices resulting from the study were χ^2/SD: 3.961, root mean square error of approximation (RMSEA): 0.072, goodness-of-fit index (GFI): 0.95, comparative-of-fit index (CFI): 0.96, and normed fit index (NFI): 0.95.

Conclusion: The Pediatric Oncology Nurses' Educational Needs Scale is a valid and reliable scale for pediatric oncology nurses to determine their educational needs.

KEYWORDS
educational needs, pediatric oncology nurses, reliability, validity

Abbreviations: CFA, confirmatory factor analysis; CFI, comparative-of-fit index; CVI, content validity index; EFA, exploratory factor analysis; GFI, goodness-of-fit index; KMO, Kaiser–Meyer–Olkin coefficient; LMICs, low- and middle-income countries; NFI, normed fit index; PONENS, Pediatric Oncology Nurses' Educational Needs Scale; RMSEA, root mean square error of approximation; S-CVI, scale-level content validity index; TONA, Turkish Oncology Nursing Association; WHO, World Health Organization.

1 | INTRODUCTION

About 400,000 children and adolescents are diagnosed with cancer each year.[1,2] It is reported that more than 80% of children diagnosed with cancer survive in high-income countries, where comprehensive services are generally available compared to 15%–45% in low- and middle-income countries (LMICs).[3] In this context, the World Health Organization (WHO) (2018) established the Global Initiative for Childhood Cancer to provide countries with leadership and professional support in creating and sustaining high-quality childhood cancer strategies.[4] By 2030, all children with cancer will have a survival rate of at least 60%. WHO project aims to strengthen nations' ability to implement best practices for pediatric cancer treatment and to prioritize pediatric cancer at the global, regional, and national levels.[4]

Many strategies have been suggested to enhance childhood cancer survival rates in LMICs. One of these strategies is the empowerment of pediatric oncology nurses, who are universally accepted as the most important providers of care.[5–7] Pediatric oncology nursing requires advanced knowledge and special clinical skills about pediatric cancers.[5,8] Hospitals in high-income countries increase the knowledge and skills of nurses by providing special and comprehensive training, especially for newly recruited pediatric oncology nurses. In contrast, pediatric oncology nurses in LMICs do not have the opportunity to receive such training.[9] This is a major barrier to the treatment and care of pediatric oncology patients, and causes inequalities in children's survival rates.[5]

In 2014, baseline standards for pediatric oncology nursing in LMICs were established by the International Society of Pediatric Oncology (SIOP) Nursing Working Group on Pediatric Oncology in Developing Countries.[9] It was emphasized that pediatric oncology nurses in LMICs have limited access to specialized education and clinical training. In this context, it is recommended to determine the educational needs of nurses based on self-report and to make plans in this direction while creating the pediatric oncology nursing education curriculum in LMICs.[10,11]

It is important to determine the educational needs of pediatric oncology nurses for creating a curriculum in pediatric oncology.[5,6,9,11] The Pediatric Oncology Working Group of the Turkish Oncology Nursing Association (TONA) has organized various unstandardized training programs for pediatric oncology nurses for the last 10 years. Unfortunately, no nursing curriculum in pediatric oncology has been explicitly created for LMICs.[12] Through a three-part investigation that began in 2012, the International Society of Pediatric Oncology Nursing Working Group aimed to fill this gap in the knowledge base.[12] For the first phase, determine the educational priorities of LMICs nurses who provide cancer care. For the second phase, request training content from experienced pediatric oncology nurses. In the third phase, create a culturally sensitive curriculum framework, focusing on the priorities of LMICs nurses. To do all these stages, first of all, it is important to develop a tool for the educational needs of pediatric oncology nurses to organize nationally structured education programs. There is a gap in the literature on this issue. There needs to be a measurement tool in the national and international literature to determine the training needs of pediatric oncology nurses. In this context, this study aimed to create a measurement tool to determine pediatric oncology nurses' educational needs and examine its psychometric properties.

2 | METHODS

2.1 | Study design

A cross-sectional, methodological, and descriptive study was conducted to develop and assess the psychometric properties of the Pediatric Oncology Nurses' Educational Needs Scale (PONENS) for pediatric oncology nurses.

2.2 | Setting and sample

The study population consisted of pediatric oncology nurses who were members of the TONA between December 2021 and July 2022. There are approximately 62 pediatric oncology wards in Turkey. Most nurses in the wards are members of the TONA. Nurses who are members of the TONA were included in the study, because it was easy to communicate with nurses through the association. The research was carried out through online platforms (email). The link to the survey created with Google was sent to the nurses. Pediatric oncology nurses were informed by email, and who met the sample criteria were asked to fill in the forms if they volunteered.

In scale development studies, it is emphasized that at least five participants should be taken per item to be able to perform factor analysis. It is highlighted that if there is no problem in reaching the sample, the number of participants per item should be 10.[13] To carry out the validity and reliability of the PONENS (42 items), the sample size for the study was calculated as 210 nurses when five nurses were taken per item. A total of 215 nurses were reached in this study.

The inclusion criteria were being a volunteer and working in the pediatric oncology wards. Exclusion criteria were wanting to withdraw from the research and complete the survey data incompletely. In addition, nurses working in an ambulatory setup were not included in the study.

2.3 | Data collection tools

Research data were collected with Nurse Information Form and PONENS.

2.3.1 | Nurse Information Form

The form was created by the researchers, in line with the literature. The form includes 10 questions containing the sociodemographic characteristics of pediatric oncology nurses.

2.3.2 | Pediatric Oncology Nurses' Educational Needs Scale

Determining the information needs of pediatric oncology nurses to fulfill their responsibilities in the best way is an important step in increasing the quality of care. So, the researchers reviewed studies on the educational needs of pediatric oncology nurses.[5,6,9,11] As a result of the literature review, a scale suitable for clinical use was created to evaluate the educational needs of pediatric oncology nurses.[5,6,9,11] The first version of the scale consisted of 29 items, and the first version was sent to 13 experts. After expert opinions, 17 items were added to the scale. The scale's final version, arranged after expert opinions, consisted of 42 items. The scale is scored as a five-point Likert scale (Never = 1 point; Rarely = 2 points; Sometimes = 3 points; Often = 4 points, and Always = 5 points). The scale consists of five subdimensions: illness, chemotherapy and side effect, other therapy and side effect, palliative care, and supportive care. The lowest score is 42 points, and the highest score is 210 points. The increase in the total scale score and the subdimension mean score indicates the nurses' total educational needs and regarding the relevant subdimension increase, respectively.

2.4 | Study procedure

2.4.1 | Generation of item pool

In the first stage of the study, an item pool consisting of 29 items was created, in line with the information obtained from the literature on nurses' educational needs. Care was taken to ensure that the items were understandable and that each item expressed only one training need.[13,14]

2.4.2 | Specialist opinions

It is recommended to consult at least 10 experts to determine the scales' content validity.[14] Opinions were obtained from 13 experts, associate professors, or professors in child health and diseases nursing (nine experts) and pediatric oncology nurses (four experts) for the content scales. The content validity index (CVI) was calculated using Lawshe's CVI.[15] The experts evaluated whether the items in the scale measure the relevant concept and whether they should remain on the scale by scoring between 1 and 4 points (1 = Not applicable, 2 = The item needs to be replaced appropriately, 3 = Suitable but needs minor modification, 4 = Very suitable).[16] The scale-level content validity index (S-CVI) and item content analysis were calculated separately for each item. The items that experts gave 1 and 2 points were revised.[14]

2.4.3 | Pilot test

After receiving expert opinions, it is recommended to conduct a pilot with 20–30 participants with similar characteristics to the sample in which the scale will be conducted, but the people included in the pilot test should not be included in the study sample.[13,14] The pilot test was carried out through online platforms (email). The link to the survey created through the Google survey was sent to the nurses. Pediatric oncology nurses who met the pilot testing inclusion criteria were informed by email and were asked to fill in the forms if they volunteered. The draft scale was created by taking opinions and applied to 30 pediatric oncology nurses. As a result of pilot testing, the comprehensibility of each item was evaluated, and necessary corrections were made. The scale was finalized and made ready for application.

2.5 | Data analysis

IBM SPSS 21.0 and IBM AMOS 25.0 software programs were used for data analysis. The descriptive statistics were calculated using percentages and mean scores. The error margin was set at .05 for analyzing the data. Statistical methods used in the research are shown in Figure 1.

2.5.1 | Ethics approval

The study was approved by the Scientific Research and Publication Ethics Board of a university (approval number E.30151 dated November 24, 2021). Written information was given to the nurses about the purpose and method of the study, and it was stated that voluntary participation was essential. This study was conducted and performed in accordance with the ethical rules stated in the Declaration of Helsinki.[17] After all participants were informed, their written informed consent was obtained.

3 | RESULTS

The characteristics of the participants are presented in Table 1. It was determined that the mean age of the nurses was 32.81 ± 7.46 years. The professional experience period of the nurses was 10.19 ± 8.13 years, and the period of experience in the clinic where they were currently working was 5.2 ± 4.6 years.

3.1 | Results of validity analysis

The first version of the scale consisted of 29 items, and the first version was sent to 13 experts. After expert opinions, 17 items were added to the scale, four items were removed, and seven items were revised according to the expert's recommendation. The final version of the scale was arranged and consisted of 42 items. The agreement among experts ranged from 0.92 to 0.99 for each item (I-CVI) and 0.97 for the whole scale (S-CVI).

Exploratory factor analysis (EFA) results using the Varimax rotation method revealed the scale structure with five subdimensions. The EFA results of the scale are presented in Table 2. Factor anal-

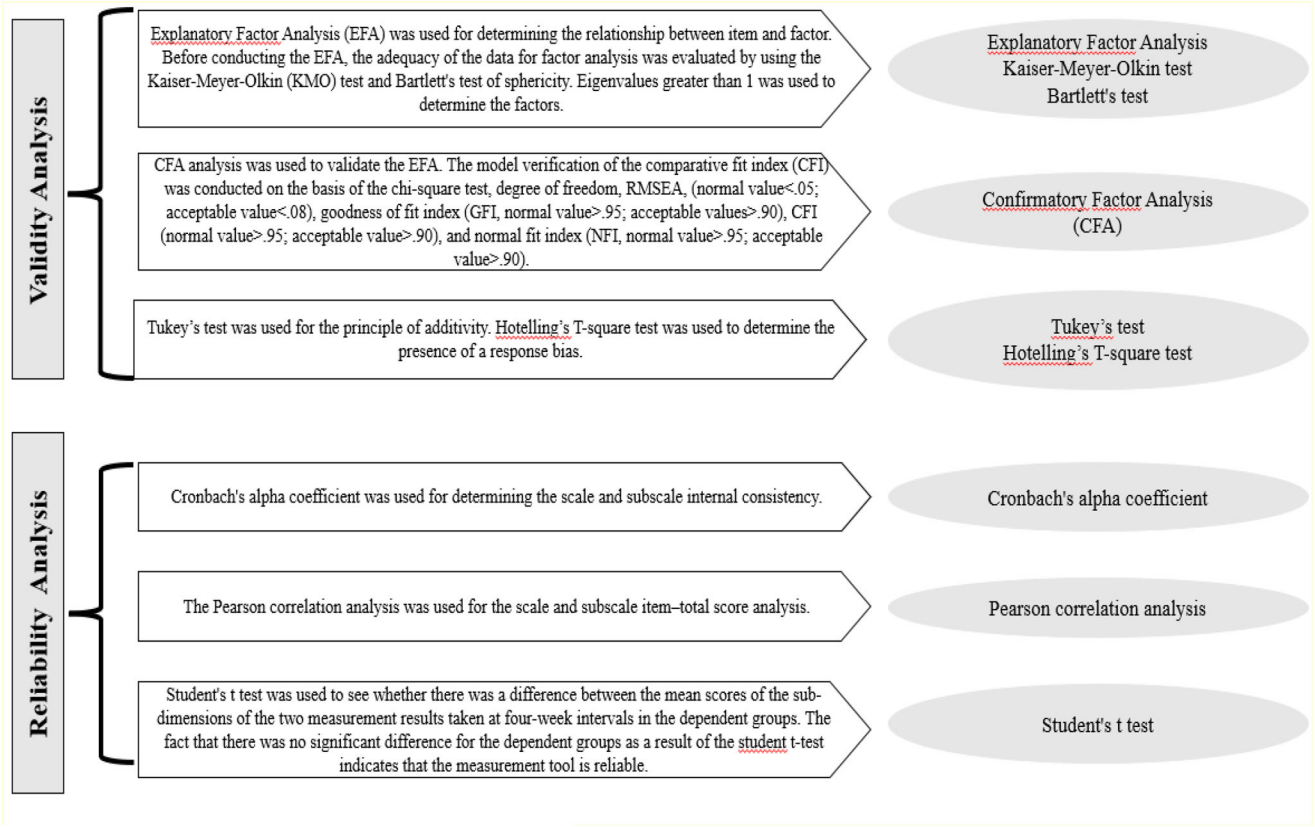

FIGURE 1 Statistical analysis.

TABLE 1 Characteristics of participants

		Mean ± SD	Min–max
Age (years)		32.81 ± 7.46	22–57
Professional experience period (years)		10.19 ± 8.13	0–36
Length of experience in the pediatric oncology clinic (years)		5.2 ± 4.6	0–25
		n	%
Gender	Male	19	8.8
	Female	196	91.2
Education status (graduated school)	Health vocational high school	17	7.9
	Two-year college	12	5.6
	University	181	84.2
	Non-nursing undergraduate/graduate education	5	2.3
Position in the clinic	Clinical nurse	175	81.4
	Clinical head nurse	40	18.6
Work shift	Mostly daytime (8- or 12-hour shifts)	78	16.3
	Mostly 16- and 24-hour shifts	30	14.0
	Often alternating day/evening and night shifts	97	45.1
	Mostly 8- or 16-hour shifts	10	4.7
The state of wanting to receive education about the care of children with cancer	Yes	211	98.1
	No	4	1.9

TABLE 2 Results of exploratory factor analysis

Items		Subdimensions				
		1	2	3	4	5
Education about disease						
1.	Physiopathology of cancer			0.823		
2.	Epidemiology of childhood cancers			0.816		
3.	Etiology of childhood cancers			0.826		
4.	Types of childhood cancers			0.697		
5.	Staging in childhood cancers			0.715		
6.	Diagnostic methods used in childhood cancers			0.715		
7.	Treatment methods used in childhood cancers			0.609		
8.	Monitoring the effect of cancer on the growth and development of the child			0.608		
Education about chemotherapy and side effects						
9.	Management of pain		0.743			
10.	Symptom management		0.766			
11.	Infection control		0.849			
12.	Catheter care and management of side effects		0.874			
13.	Parenteral, blood products and transfusion administration principles and care		0.878			
14.	Characteristics of chemotherapy agents/drugs		0.699			
15.	Principles for the preparation of chemotherapy		0.658			
16.	Principles for the administration of chemotherapy		0.747			
17.	Management of side effects of chemotherapy		0.742			
Education about other treatments and side effects						
18.	Principles for the administration of radiotherapy					0.378
19.	Management of side effects of radiotherapy					0.410
20.	Principles for the administration of immunotherapy drugs					0.463
21.	Management of side effects of immunotherapy					0.487
22.	Targeted agents and management of their side effects					0.461
23.	Management of bone marrow and stem cell transplantation process					0.415
Education about palliative care						
24.	Palliative care, hospice and terminal term concepts				0.746	
25.	Palliative care and nurse's responsibilities in pediatric oncology				0.687	
26.	Preparing the child for the death process				0.728	
27.	Preparing the family for the death process				0.735	
28.	Supporting the family in time of loss and mourning				0.727	
Education about supportive care						
29.	Education of surviving child and family	0.674				
30.	Long-term side effects	0.680				
31.	Discharge education	0.639				
32.	The effect of being diagnosed with cancer and the treatment process on the child	0.751				
33.	The effect of being diagnosed with cancer and the treatment process on family and siblings	0.755				
34.	Coping methods family members can use	0.767				

(Continues)

TABLE 2 (Continued)

Items		Subdimensions				
		1	2	3	4	5
35.	Communicating, taking into account the child's growth and development characteristics	0.776				
36.	Communication with a newly diagnosed child	0.820				
37.	Communication with the hospitalized child	0.795				
38.	Communication with family members of the child with cancer	0.820				
39.	Communication with the child in the terminal period	0.764				
40.	Communication with family members during the terminal period	0.760				
41.	Determining the spiritual needs of the child and family members	0.790				
42.	Spiritual support of the child and family members	0.814				
Explained variance (%)		71.263	6.284	4.261	2.921	2.554
Total explained variance				87.284		
KMO coefficient				.959		
Barlett test				17,496.043 ($p < .001$)		

TABLE 3 Model fit indices of the scale

	X^2	DF	X^2/DF	RMSEA	GFI	CFI	IFI	RFI	NFI	TLI
Five Factor Model	364.468	92	3.961	0.072	0.95	0.96	0.96	0.96	0.95	0.95

Abbreviations: CFI, comparative-of-fit index; DF, degree of free; GFI, goodness-of-fit index; IFI, incremental fit index; NFI, normed fit index; RFI, relative fit index; RMSEA, root mean square error of approximation; TLI, Trucker–Lewıs index.

ysis revealed the Kaiser–Meyer–Olkin coefficient (KMO) coefficient was .959, Bartlett test X^2 value was 17,496.043, and $p < .01$. The first subdimension accounted for 71.26% of the total variance, the second subdimension accounted for 6.28%, the third subdimension accounted for 4.26%, the fourth subdimension accounted for 2.92%, and the fifth subdimension accounted for 2.55%, for a total of 87.28% of the total variance. The factor loading ranged 0.63–0.82 for the first subdimension, 0.69–0.87 for the second subdimension, 0.60–0.82 for the third subdimension, 0.74–0.68 for the fourth subdimension, and 0.37–0.48 for the fifth subdimension (Table 2).

As a result of confirmatory factor analysis (CFA), it was revealed that the scale confirmed its five-dimensional structure. CFA results of the scale are given in Table 3 and Figure 2.

The internal consistency and time invariance analysis results showed that the Hotelling T square value was 658.362 and $F = 39.145$, and there was no response bias in the scale ($p < .01$). In addition, as a result of the summability analysis, $F = 0.672$ and $p = .740$, it was determined that the scale was reliable.

3.2 | Results of reliability analysis

The total and subdimension Cronbach's alpha coefficient results of the scale are given in Table 4. In addition, the correlations of the items with the total score and the item-subscale total score correlations were determined by Pearson correlation analysis and are presented in Table 4.

The test–retest analyzes of the scale were administered to 42 nurses at 4-week intervals, and the results of the test–retest analysis are presented in Table 5. In addition, it was determined that there was no statistically significant difference between the mean scores of the two measurement results, which were applied 4 weeks apart ($p > .05$, Table 5).

4 | DISCUSSION

This study aimed to develop a valid and reliable measurement tool to determine the educational needs of pediatric oncology nurses and the scale's psychometric properties.

Content validity is the result of whether the items of a measurement tool reflect the phenomenon it wants to measure.[18] Expert opinions were taken to interpret the suitability of the item pool of the scale prepared by the researchers and to determine the content validity. The CVI value is recommended to be at least 80% for the overall scale.[14,19,20] In this study, the final version of the scale, which was arranged after expert opinions, consisted of 42 items and five subdimensions. The I-CVI value ranged from 0.92 to 0.99 for each item, and the whole scale (S-CVI) was 0.97. These results demonstrate that the

TABLE 4 Results of the reliability analyses of the scale and correlations of the item total score and subdimension total score

Items	Cronbach α	$X \pm SD$	Item-total score correlation	Item-subscale total score correlation	Test–retest correlations of items ($n = 42$)
1	.978	3.66 ± 1.17	.771	.894	.703
2		3.65 ± 1.22	.843	.947	.748
3		3.62 ± 1.24	.832	.945	.783
4		3.80 ± 1.15	.860	.941	.900
5		3.74 ± 1.20	.847	.928	.786
6		3.80 ± 1.18	.876	.950	.878
7		3.89 ± 1.12	.893	.923	.939
8		3.82 ± 1.14	.900	.915	.957
9	.978	4.16 ± 0.97	.821	.909	.854
10		4.13 ± 1.02	.833	.926	.865
11		4.25 ± 0.91	.777	.920	.834
12		4.24 ± 0.95	.771	.932	.848
13		4.22 ± 0.95	.752	.923	.853
14		4.12 ± 1.04	.875	.925	.951
15		4.02 ± 1.14	.832	.893	.915
16		4.16 ± 1.05	.859	.940	.938
17		4.18 ± 1.02	.862	.940	.939
18	.974	3.79 ± 1.26	.847	.919	.832
19		3.81 ± 1.26	.863	.946	.879
20		4.00 ± 1.19	.877	.961	.884
21		3.98 ± 1.22	.884	.968	.888
22		3.96 ± 1.22	.885	.954	.883
23		3.94 ± 1.23	.814	.896	.748
24	.967	3.82 ± 1.09	.734	.883	.744
25		3.89 ± 1.10	.835	.943	.887
26		3.84 ± 1.14	.824	.954	.897
27		3.84 ± 1.17	.834	.962	.897
28		3.84 ± 1.18	.827	.957	.874
29	.985	3.86 ± 1.13	.765	.826	.873
30		3.93 ± 1.10	.787	.844	.892
31		4.06 ± 1.03	.766	.812	.897
32		3.94 ± 1.08	.876	.923	.852
33		3.91 ± 1.09	.874	.924	.816
34		3.93 ± 1.15	.877	.927	.876
35		3.98 ± 1.11	.909	.953	.929
36		4.09 ± 1.09	.883	.952	.918
37		4.05 ± 1.11	.879	.938	.896
38		4.00 ± 1.12	.877	.947	.886
39		3.94 ± 1.17	.858	.921	.876
40		3.92 ± 1.17	.861	.922	.894
41		3.93 ± 1.14	.883	.947	.894
42		3.93 ± 1.14	.882	.956	.905
Total Cronbach alpha (α) value	.990				

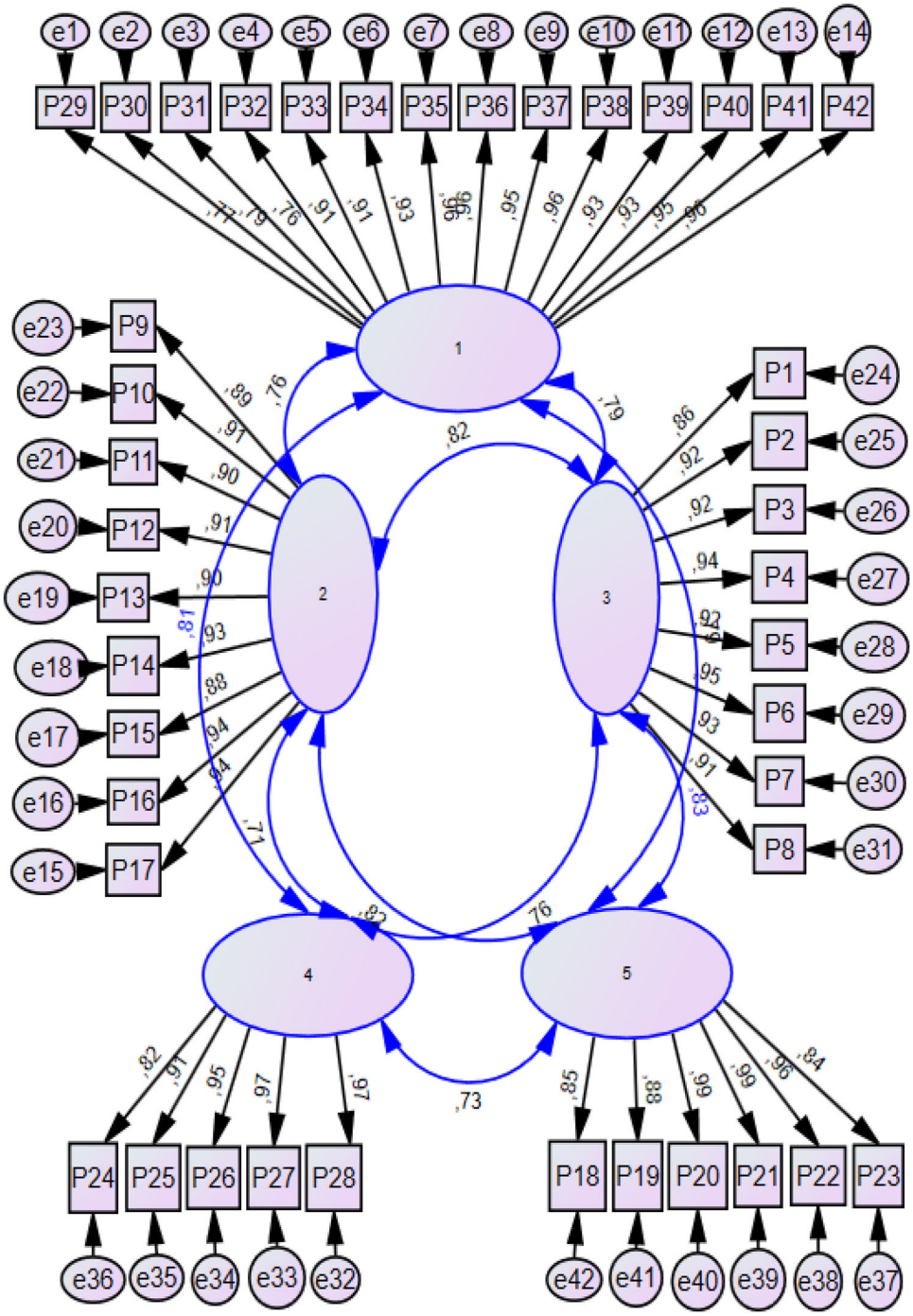

FIGURE 2 Results of confirmatory factor analysis.

TABLE 5 Test–retest score mean obtained from the scale and their comparison ($n = 42$)

Scale score mean			Analysis results			
	First implementation $X \pm SD$	Second implementation $X \pm SD$	*r*	*p*	*t*	*p*
Scale	163.21 ± 38.43	165.83 ± 39.97	.102	<.001	.080	.936

scale was understandable, reflected the items to be assessed, and the scale content is valid.

EFA is a multivariate statistical approach that has become critical in constructing and validating conceptual frameworks and measures.[21] EFA was performed for the construct validity of the scale. Kaiser–Meyer–Olkin (KMO) test and the Bartlet test of sphericity were used to examine the factor structure. KMO determines the adequacy of the sample for data analysis. KMO criterion .90–100 is excellent, .80–.89 is fairly good, .70–.79 is good, .60–.69 is moderate, .50–.59 is poor, and $p < .50$ is considered unacceptable. The closer the KMO measurement is to 1, the more appropriate it is to perform factor analysis on the available data.[22] In our study, the KMO coefficient was .959. This value is very good for KMO, and it is appropriate to analyze the relevant data. The Bartlet test of sphericity determines whether the correlation between variables is sufficient.[23] The Bartlet test of sphericity was used to test the hypothesis of whether the correlation matrix is similar, and this hypothesis was rejected at $p < .001$.[22] This showed the existence of a relationship between the items and the suitability of the data for factor analysis.

CFA is applied to determine the validity of the results obtained in the EFA.[24] Based on the fit indices of the analyzed data, it is determined whether the factors have a valid structure. As a result of CFA, it was determined that the scale items consisted of five factors. These five factors explain 87.28% of the variance of the scale. The Cronbach's alpha value, which shows the consistency of the scale questions, was .99. The fit indices used in CFA were χ^2, χ^2/SD, goodness-of-fit index (GFI), root mean square error of approximation (RMSEA), normed fit index (NFI), and comparative-of-fit index (CFI).[13] Fit indices from the study were χ^2/SD: 3.961, RMSEA: 0.072, GFI: 0.95, CFI: 0.96, NFI: 0.95. The RMSEA value used as a fit index was below 0.08, indicating that the model is acceptable, and the GFI, NFI, and CFI values were 0.90, and above, which indicates that the fit indices are acceptable.[25] Accordingly, these results and the scale data have a good fit and are statistically reliable and valid. As a result of the analysis, all items and five subdimensions were appropriate to determine the educational needs of pediatric oncology nurses. Therefore, all items were retained in the scale.

Reliability is a measure of the consistency and stability of a scale. Similar results should be obtained when a reliable scale is applied under similar conditions and at different times. Reliability reveals the consistency of all scale evaluation items and the evaluated phenomenon's invariability.[13] In this study, the Cronbach's alpha coefficient for "Illness" was .978, "Chemotherapy and Side Effect" was .978, "Other Therapy and Side Effect" was .974, "Palliative Care" was .967, "Supportive Care" was .985, and the total score was .990. It was shown that the scale is reliable and consistent with all evaluation items of the scale.

The homogeneity test is used to examine whether the targeted concept(s) is measured correctly in the validity and reliability studies of the scale.[23] The homogeneity of the nurses' responses included in the sample to the scale items was evaluated with the Hotelling T^2 test. This demonstrated that the PONENS did not alter and that the measure was unbiased.

5 | LIMITATIONS

This scale is valid and reliable for pediatric oncology nurses, but its use on adult oncology nurses may need to be revised. Another limitation of this study is that only clinical nurses and head nurses working in pediatric oncology wards were included in the sample. However, the study did not include nurses working in an ambulatory setup.

6 | CONCLUSION

PONENS is a valid and reliable scale that will determine the educational needs of nurses working in pediatric oncology wards. The fact that the scale is the first valid and reliable tool to be used in determining the educational needs of pediatric oncology nurses in Turkey is the strongest of the study, but it also reveals its importance. It is essential to meet pediatric oncology nurses' educational needs to provide holistic patient care. With this scale, the educational needs of nurses will be determined, and it will shed light on experimental studies that will be planned to meet their educational needs. In future studies, adapting the scale to nurses working in pediatric oncology outpatient units may be recommended.

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CONFLICT OF INTEREST STATEMENT

The authors declare no conflicts of interest.

DATA AVAILABILITY STATEMENT

The data supporting this study's findings are available upon reasonable request from the corresponding author.

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