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Psychometric properties of the Turkish version of the developmental care scale for neonates with congenital heart disease

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Original Article

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Abstract

Objective: Developmental care for newborns with congenital heart disease (CHD) improves cardiac and respiratory patterns. According to the American Heart Association, developmental care in newborns with CHD is important for improving neurodevelopmental outcomes. This study aimed to evaluate the validity and reliability of the Turkish version of the Developmental Care Scale for Neonates with Congenital Heart Disease. *Methods:* This was a methodological, descriptive study conducted with 169 nurses from a tertiary-level NICU. The Demographical Information Form and the Developmental Care Scale for Neonates with Congenital Heart Disease were used to collect the data. The scales' language and content validity, construct validity, and internal consistency were also assessed. *Results:* The scale consists of 31 items and four subscales. Factor loadings ranged from 0.44 to 0.82 and explained 65% of the total variance. Fit indices indicate that the model is acceptable. Cronbach's α was 0.95 for the entire instrument, 0.91 for developing the external environment subscale, 0.94 for assessing family well-being, 0.86 for the caregiver activities toward the neonate, and 0.82 for the basic need subscale. Item–total correlations ranged between 0.34 and 0.75, according to the item analysis results. *Conclusions:* The Turkish version of the Developmental Care Scale for Neonates with Congenital Heart Disease is valid and reliable. The use of this scale could improve the performance of neonatal intensive care nurses in providing developmental care to newborns with CHD as well as the quality of care.

Introduction

Heidelise Als created the developmental care programme in the 1980s, based on the uniqueness of the newborn.[1] Developmental supportive care interventions reduce stress in high-risk neonates.[2] Developmental care interventions have been shown to improve neurological outcomes and infant growth and development.[3,4] The frequency of developmental and neurological problems in infants is an important finding in assessing the effectiveness of nursing care in the neonatal ICU.[3,5] Some infants monitored in the neonatal ICU have congenital heart disease (CHD), and it has been reported that approximately half of the newborns with CHD have neurodevelopmental delays.[6–8] In this situation, newborns with CHD require neuroprotective support, quality, and adequate developmental care approaches.[7] Most studies that examined developmental care in newborn ICUs excluded infants born with complex CHD.[9] Developmental care for newborns with CHD improves cardiac and respiratory patterns.[10,11] According to the American Heart Association, developmental care in newborns with CHD is an important practice for improving neurodevelopmental outcomes, and there is a need for research evaluating developmental care interventions.[9]

One of the most important roles and responsibilities of neonatal intensive care nurses in the nursing process is to evaluate the developmental care needs of newborns with CHD in the neonatal ICU and to provide quality developmental care.[5,6,12] According to reports, nurses prioritise basic life functions in the care of newborns with CHD, and more effort is required to systematically apply developmental care to these vulnerable newborns.[6] The Developmental Care Scale for Neonates with Congenital Heart Disease was created to assess the quality of developmental care provided to newborns with CHD by neonatal ICU.[6] This could not be assessed because there is no scale in Turkey that can assess the status and quality of developmental care provided by neonatal intensive care nurses to newborns with CHD. This has been a deficiency in practice and literature. This study examined the validity and reliability of the Turkish version of the Developmental Care Scale for Neonates with Congenital Heart Disease.

Methods

Setting and sample

Between April and June 2021, data were collected from eight hospitals in two cities in Western Turkey. Sample selection method was not used in the study because it is recommended to take samples with a size of at least five and maximum 10 times the number of scale items in scale validity and reliability studies.[13,14] The study's inclusion criteria were working as a nurse in the NICU for at least 6 months, caring for newborns with CHD, and volunteering to participate in the study. One hundred sixty-nine nurses from a tertiary-level neonatal ICU participated.

Ethics statement

Ethical approval was obtained for the study from the Medical Research Ethics Committee of the Faculty of Medicine (decision number: 21-3.1/21, approval date: 18 March 2021). Before the study, nurses were informed, and their written consent was obtained. All procedures performed in studies involving human participants were by the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards.

Data collection forms

Demographical Information Form: This form included questions about the nurses' sociodemographic characteristics.

The Developmental Care Scale for Neonates with Congenital Heart Disease: Arter et al. (2019) created the scale. It is a 5-point Likert-type scale with 31 items and four subscales that can be scored between 1 and 5 (1 = *strongly disagree*, 2 = *disagree*, 3 = *neutral*, 4 = *agree*, and 5 = *strongly agree*). The lowest possible score on this scale is 31, and the highest score is 155. There were no cut-off points on the scale. Higher scores indicated improved developmental care performance and quality of care. The subscales were as follows: creating an external environment (1–11 items), assessing family well-being (12–17 items), caregiver activities towards the neonate (18–26 items), and basic needs (27–31 items). Cronbach's α coefficient for the scale was 0.89, and that of the subscales ranged between 0.74 and 0.87.[6]

Translation and adaptation of the scale

The authors of the original scale granted permission to adapt the scale to Turkish via email, which was then adapted to the Turkish society. Three expert translators translated the scale from English into Turkish. An expert translator performed the back translation. The researchers developed the scale items after back translation. Eight experts were presented with Turkish and the original forms to determine language and content validity. The experts had a Ph.D. in paediatric nursing. For expert opinion, it is necessary to get the opinion of at least six experts.[15] The Davis method and content validity index were used to assess expert opinions.[16] Following expert consultation, pilot implementation was conducted with 10 nurses who met the inclusion criteria. No modifications were made because each item was found understandable in the pilot study.

Data collection

Data were collected online because of limited access to neonatal ICUs owing to the COVID-19 pandemic. The questionnaires were created using Google Docs and administered using the web-based software, LimeSurvey. The link to the online questionnaire was distributed to nurses of eight hospitals via WhatsApp groups. Nurses who clicked on the link to the online survey were first informed about the study, and their permission was obtained. Permission was obtained for the care and delivery of newborns with CHD. Nurses who completed the consent form were able to answer the survey questions. During the nurse work shift, data collection forms were filled out through self-reporting. This process required approximately 5–10 min.

Data analysis

IBM SPSS 23 and LİSREL v. 8.72 statistical packages were used for the analysis. Descriptive characteristics were evaluated using numbers, percentages, means, and standard deviations. The validity of the scale was judged on the basis of its content and structure. Content validity index was calculated (using the Davis method) for content validity. Confirmatory factor analysis (e.g., Kaiser–Meyer–Olkin) and explanatory factor analysis were used to assess the scale's structural validity. Cronbach's α and item–total score correlations were used to determine internal consistency.

Results

The average age of the nurses who took part was 34.05 ± 6.14, and 97.0% were female. Fifty-five percent of the participants worked in the neonatal ICU between the ages of 6 months and 5 years. Seventy-one percent of the nurses had a bachelor's degree, and 82.2% had developmental care training. Of the nurses, 98.2% provided developmental care to newborns, and 97.0% provided developmental care to newborns with CHD.

The content validity index values of the scale items calculated for content validity ranged from 0.90 to 1.00. The Kaiser–Meyer–Olkin score for explanatory factor analysis was 0.906, and Bartlett's test was significant. Figure 1 depicts the model's factor loadings. The values on the left in the figure represent error variance, whereas those in the middle represent factor loadings. These items account for 65% of the total variance. The factor loadings for the items were 0.44 and 0.82.

Based on the confirmatory factor analysis results, the suggested modifications were carried out because the root-mean-square error of approximation value was 0.12. The final data analysis revealed that the chi-square value was 914.36, the degrees of freedom were 409, and the p value was 0.000. The chi-square to degrees of freedom ratio was calculated to be 2.25. The root-mean-square error of approximation was 0.086 after modification. The goodness of fit index was 0.74, adjusted goodness of fit index was 0.68, comparative fit index was 0.96, normed fit index was 0.94, and non-normed fit index was 0.96 (Table 1).

Cronbach's α was 0.95 for the entire instrument, 0.91 for developing the external environment subscale, 0.94 for assessing family well-being, 0.86 for the caregiver activities towards the neonate, and 0.82 for the basic need subscale (Table 2). Table 2 displays the item–total score correlations of the scale. The item–subscale total score correlations varied from 0.34 to 0.75.

Discussion

First, language and content validity studies were conducted to adapt the Turkish version of the scale. It was determined that there was an agreement between the experts.[13,17]

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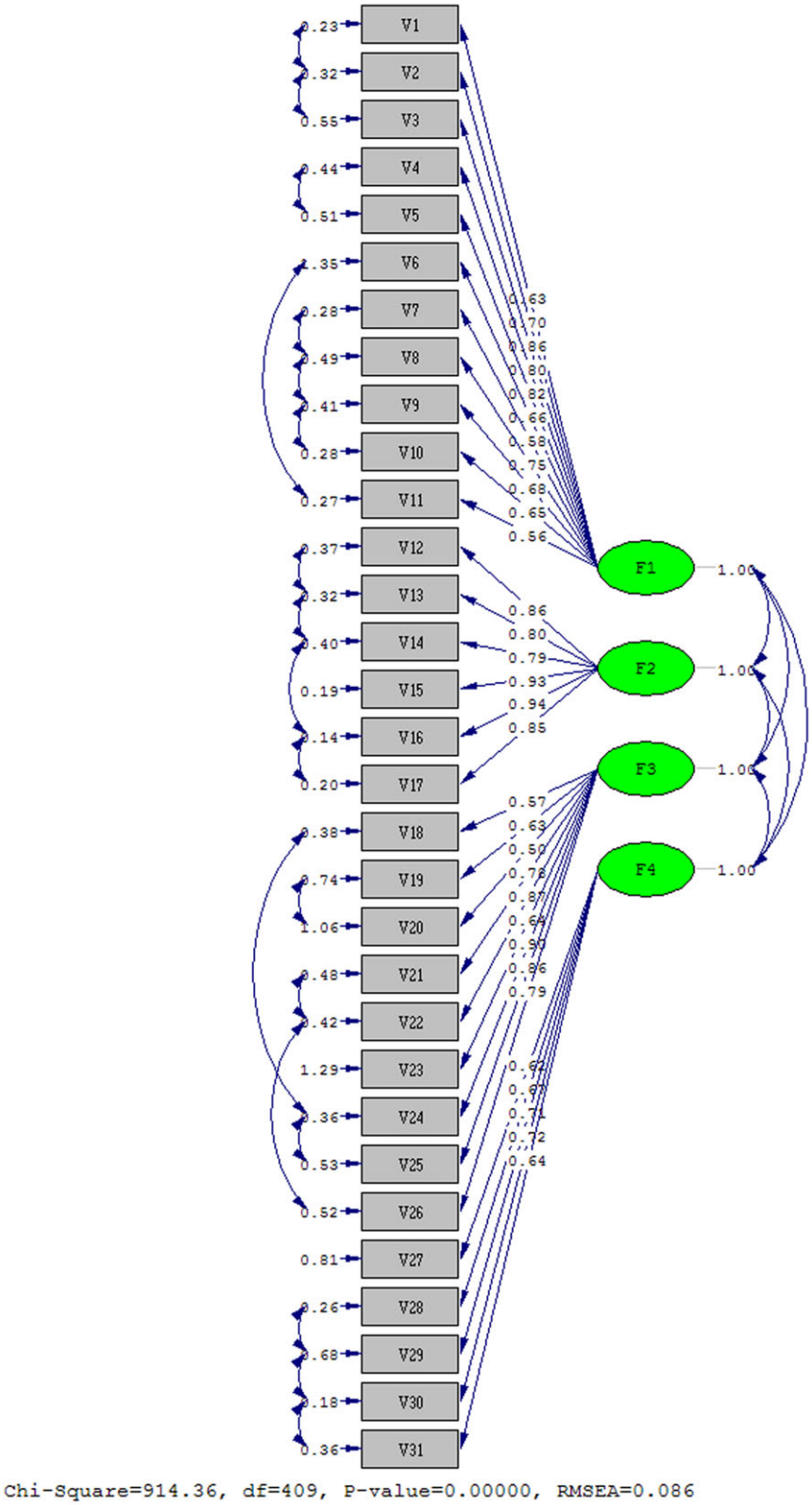

Figure 1. Confirmatory factor analysis path diagram of the scale.

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Table 1. Confirmatory factor fit index results of the developmental support competency scale

Measure of harmony	Value
X^2/SD	2.25
RMSEA[a]	0.086
GFI[b]	0.74
AGFI[c]	0.68
CFI[d]	0.96
NFI[e]	0.94
NNFI[f]	0.96
Factor load (min–max)	0.44–0.82

[a]RMSEA = root-mean-square error of approximation; [b]GFI = goodness of fit index; [c]AGFI = adjusted goodness of fit index; [d]CFI = comparative fit index; [e]NFI = normed fit index; [f]NNFI = non-normed fit index.

The fit of the sample included in the factor analysis was evaluated using the Kaiser–Meyer–Olkin and Bartlett X^2 tests, and the Kaiser–Meyer–Olkin value was greater than 0.60, indicating that the data were appropriate for factor analysis and that the sample size was adequate.[18] According to theexplanatory factor analysis, the scale's four-factor structure explained 65% (64.707%) of the overall variance. Factor loads ranged from 0.44 to 0.82. The factor loads in the original scale were in the range of 0.418–0.823, with a variance of 52%.[6] Previous research suggests that the factor load of each item should be≥0.30.[17,19,20] These values indicate that the factor loadings were satisfactory.

According to cultural adaptation studies, confirmatory factor analysis should be conducted after explanatory factor analysis. Confirmatory factor analysis was used to assess the suitability of the scale's factor structure. The fit indices are extremely diverse.[21] The chi-squared–to–degrees of freedom ratio was calculated to be 2.25. This value was less than five, indicating that the fit was satisfactory.[14,22]

Table 2. Factor analysis, Cronbach's α coefficient, and corrected item–total correlation of the Turkish version of the Developmental Care Scale for Neonates with Congenital Heart Disease

Subscales	Items	Mean ± *SD*	Factor loading	Corrected item–total correlation	Cronbach's α if item deleted	Cronbach's α of subscales
Creating the external environment	1. Efforts were made to protect the neonate from light while sleeping.	4.42 ± 0.79	0.73	0.70	0.95	0.91
	2. Muted, indirect light was provided when the neonate was awake.	4.17 ± 0.90	0.76	0.67	0.95	
	3. Room lighting was individualised based on the neonate's sleep/awake state.	3.93 ± 1.13	0.76	0.62	0.95	
	4. Quiet voices were used while in the neonate's room.	3.92 ± 1.04	0.75	0.64	0.95	
	5. Sounds from other unit-related activities were reduced.	3.85 ± 1.08	0.73	0.63	0.95	
	6. Calming sounds (e.g. music, voices, and womb noises) were played at the bedside based on cues from the neonate.	3.26 ± 1.33	0.48	0.41	0.95	
	7. Air temperature was stable, consistent, and appropriate for maintaining the neonate's well-being.	4.46 ± 0.78	0.60	0.62	0.95	
	8. Sleep–wake state was assessed prior to every interaction with the neonate.	4.08 ± 1.02	0.58	0.65	0.95	
	9. Individualised activities that promote sleep were implemented.	4.18 ± 0.94	0.57	0.64	0.95	
	10. Care was clustered to minimise interruptions in sleep.	4.35 ± 0.84	0.61	0.66	0.95	
	11. The skin surface was protected during use of adhesive products.	4.49 ± 0.76	0.55	0.67	0.95	
Assessment of family well-being interaction	12. Mother's physical health and well-being were assessed.	3.68 ± 1.05	0.69	0.74	0.95	0.94
	13. Mother's emotional health and well-being were assessed.	3.72 ± 0.98	0.71	0.75	0.95	
	14. Referrals were made as needed based on the assessment of mother's health and well-being.	3.62 ± 1.01	0.79	0.62	0.95	
	15. Family satisfaction with the neonate's care was assessed.	3.65 ± 1.02	0.77	0.74	0.95	

(*Continued*)

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Table 2. (*Continued*)

Subscales	Items	Mean ± *SD*	Factor loading	Corrected item–total correlation	Cronbach's α if item deleted	Cronbach's α of subscales
	16. Family resource needs were assessed.	3.73 ± 1.01	0.79	0.73	0.95	
	17. Referrals were made as needed based on the basis of the family resource.	3.76 ± 0.95	0.074	0.74	0.95	
Caregiver activities towards the neonate	18. Opportunities were created for the neonate to be held based on cues from the neonate.	4.15 ± 0.84	0.59	0.67	0.95	0.86
	19. The neonate was swaddled without completely immobilising the extremities.	4.07 ± 1.06	0.54	0.58	0.95	
	20. Non-nutritive sucking was guided by the cues of interest.	3.86 ± 1.14	0.48	0.34	0.95	
	21. Opportunities were created for the neonate to be held skin-to-skin.	4.01 ± 1.04	0.70	0.63	0.95	
	22. Families were involved in creating the pain management plan of care.	3.65 ± 1.09	0.72	0.65	0.95	
	23. Visual stimuli were provided (e.g. mirror, black/white images, and faces) based on the neonate's cues of interest.	3.06 ± 1.30	0.44	0.47	0.95	
	24. Caregiving was provided in collaboration with family as appropriate.	3.71 ± 1.08	0.73	0.62	0.95	
	25. The mother's feeding preference was included in the plan of care.	3.62 ± 1.12	0.68	0.62	0.95	
	26. Family education on safe sleep (A.B.C. Alone, on their Back, in a Crib) has been provided.	3.99 ± 1.06	0.66	0.65	0.95	
Basic needs	27. The daily plan of care was communicated to the family.	3.62 ± 1.08	0.53	0.57	0.95	0.82
	28. The neonate was positioned with the extremities midline and semi-flexed.	4.21 ± 0.84	0.82	0.61	0.95	
	29. The neonate was positioned with the neck and shoulders in alignment with the rest of the body.	4.02 ± 1.08	0.72	0.43	0.95	
	30. Gentle, smooth, and supportive touch was used during care.	4.40 ± 0.83	0.72	0.69	0.95	
	31. Non-pharmacologic measures were used to minimise distress.	4.26 ± 0.87	0.75	0.53	0.95	
Scale average		121 ± 95 ± 20.33				

This scale has not yet been adapted to other languages. Therefore, the results of the confirmatory factor analysis are discussed along with the general literature. A value of <0.08 indicates a good fit for root-mean-square error of approximation.[22] A value of >0.95 indicates a perfect fit, and a value of >0.90 indicates an acceptable fit for other fit indices.[21] The root-mean-square error of approximation value was close to the acceptable value. The goodness of fit index and adjusted goodness of fit index values were below the threshold. The sample size influenced the values of the root-mean-square error of approximation, goodness of fit index, and goodness of fit index.[23,24] Because the sample size was less than 200 people, it may be more appropriate to evaluate the comparative fit index, normed fit index, and non-normed fit index, which are unaffected by the sample size. Values greater than 0.90 for these indices indicate that the model is acceptable.[21]

Item–total correlation is a method for determining a scale's reliability. Jonhson and Christensen (2014) recommended that the item–total correlation coefficient be higher than 0.20.[17] The item–subscale correlations in the original scale ranged from 0.31 to 0.77.[6] The scale's item–total score correlations were acceptable, and no items were removed because their correlations were not less than 0.20.

Cronbach's α reliability coefficient is another value commonly used to determine scale reliability. Cronbach's α coefficients between 0.00 and 0.40 indicate unreliability, 0.40–0.60 indicate low reliability, 0.60–0.80 indicate moderate reliability, and 0.80–1.00 indicate high reliability.[17] Cronbach's α was 0.89, and the reliability of the subscales ranged between 0.74 and 0.87 in the original scale.[6] In this study, Cronbach's α coefficient of the scale was extremely reliable.

Study limitations

During the COVID-19 pandemic, data were collected online. Test–retest analysis could not be performed because the same person could not reach the second time after a 15-day interval. The small sample size of this study is one of its limitations. Due to the pandemic, it was difficult to find nurses who voluntarily

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participated in this study. Therefore, these findings cannot be generalised. Further research with a larger sample size is warranted.

Conclusion

A reliable and valid measure is required to adequately intervene and improve the quality of developmental care. As a result of the study, the Turkish form of the scale was found to be valid and reliable. In Turkey, a scale to assess the quality of developmental care for newborns with CHD is now available. The scale can be used to identify developmental care methods in which nurses are ineffective so that necessary interventions can be planned. The use of this scale could improve the performance of neonatal intensive care nurses in providing developmental care to newborns with CHD as well as the quality of care. Neonatal intensive care nurses should be aware that quality developmental care can improve the neurodevelopmental outcomes of newborns with heart disease.

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Competing interests. The authors declare no potential conflicts of interest with respect to the research, authorship, or publication of this article.

Ethical standard. The study was approved by the Ege University Medical Research Ethics Committee of the Faculty of Medicine (decision number: 21-3.1/21, approval date: 18 March 2021). The nurses were informed about the study and provided written informed consent. All procedures performed in studies involving human participants were by the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards.

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