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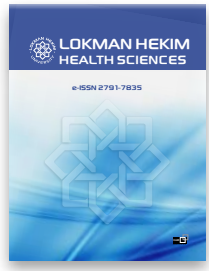

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ORIGINAL ARTICLE

The Development and Psychometric Evaluation of the Individualized Developmentally Supportive Care Scale for Neonatal Nurses

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Abstract

Introduction: Individualized developmentally supportive care (IDSC) is a critical nursing approach essential to providing effective care for pre-term newborns. This study aims to develop the IDSC scale for neonatal nurses and to evaluate its psychometric properties.

Methods: This study was conducted in a methodological, comparative, and correlational design with the neonatal nurses employed in the neonatal intensive care units. The content validity of the scale was evaluated by consulting with 11 specialists in pediatric nursing. Data were analyzed using descriptive statistics (numbers and percentages), t-tests, correlation analysis, criterion-related validity, exploratory and confirmatory factor analyses, and Cronbach's alpha reliability coefficient.

Results: The study included 558 neonatal nurses. The Cronbach's alpha reliability coefficient was 0.96 for the entire scale, 0.91 for the knowledge subdimension, and 0.96 for the attitude subdimension. According to the explanatory factor analysis, the scale explained 72.92% of the total variance, and the factor loads of the items were between 0.58 and 0.91. The confirmatory factor analysis concluded that the scale was acceptable with the root mean square error of approximation=0.078, goodness of fit index (GFI)=0.844, adjusted GFI=0.806, comparative fit index=0.918, and $\chi 2/df=2.754$ values ($p<0.001$).

Discussion and Conclusion: The "Individualized Developmentally Supportive Care Scale" comprising two subdimensions and 24 items, was found to be a valid and reliable measurement tool.

Keywords: Individualized developmentally supportive care; Neonatal nurse; Newborn; Scale

The World Health Organization and the American Academy of Pediatrics define newborns born before 37 weeks of gestation as pre-term.[1] Each year, approximately one million infants die due to complications of pre-maturity.[2] The earlier a baby is born, the higher the risk of morbidity and mortality.[3] Pre-term newborns, unable to adapt to the external environment after birth, require advanced medical intervention and specialized nursing care in neonatal intensive care units (NICUs) to survive. Although scientific and technological advances in treatment and

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nursing have reduced mortality rates in NICUs, morbidity such as neurodevelopmental delays, impaired motor skills, and long-term learning and behavioral disorders has increased.[4] Brain development continues in the NICU, where conditions differ significantly from the protective intrauterine environment, and pre-term infants are exposed to stressors such as pain, light, noise, and frequent handling. These stressors can negatively impact brain structure and function, contributing to neurodevelopmental impairments. Research has shown that exposure to painful procedures, noise, and light adversely affects future development, underscoring the importance of developmentally supportive care.[5,6] In the late 2000s, key concepts of developmentally supportive care for pre-term infants began to emerge. Studies have demonstrated its positive effects on brain structure, motor development, and long-term cognitive and behavioral outcomes in NICU settings.[7–9] Individualized developmentally supportive care (IDSC), based on the Synactive Theory, promotes the development of high-risk, hospitalized newborns. Within this framework, the Newborn Individualized Developmental Care and Assessment Program was developed.[9–11] Developmentally supportive nursing practices are vital for conducting neurobehavioral and observational assessments of pre-term infants before, during, and after care, enabling nurses to interpret their strengths, vulnerabilities, and responses to the NICU environment.[12] Providing such care requires a high level of professional competence, which can be fostered through targeted training and increased awareness of the importance of IDSC implementation in NICUs.[5,13] Recent studies indicate that nurses often lack sufficient knowledge of developmental care, with limited awareness being the primary barrier to effective practice.[2,5,10,14–16] A review of the literature reveals few studies evaluating neonatal nurses' knowledge, attitudes, and behaviors regarding IDSC, most of which rely on researcher-developed questionnaires. Therefore, there is a need for standardized, psychometrically validated tools to assess the implementation of IDSC by neonatal nurses.[11,14,15] In this context, this study aims to develop the IDSC scale (IDSCS) for neonatal nurses and to evaluate its psychometric properties.

Materials and Methods

Study Place and Design

This methodological, comparative, and correlational study aimed to develop the IDSCS for neonatal nurses. The study was conducted with neonatal nurses working in NICUs in Türkiye between January and October 2022.

Population and Sample

The sample size for scale development studies was proposed as a minimum of 300 by Norusis (Norusis 2005).[17] A purposive sampling method was used to define the target population, namely neonatal nurses working in NICUs across Türkiye who met the inclusion criteria. Within this population, convenience sampling was employed to recruit participants who were accessible and willing to take part in the study. Accordingly, the sample of the study consisted of the nurses working in the NICUs who volunteered to participate in the study and met the inclusion criteria. The inclusion criteria of the study were working as a nurse in the NICU for at least 6 months and volunteering to participate in the study.

Data Collection Tools

Sociodemographic Data Form

The form was prepared by the researchers based on the literature and consisted of 11 questions inquiring about the personal and professional characteristics of the nurses.[11,14] It included questions about age, gender, marital status, having children, educational background, institution employed, years of nursing experience, years of working in the NICU, level of the NICU, and having received training on IDSC.

IDSCS

The IDSCS, developed within the scope of this study and determined to be a valid and reliable instrument, has been uploaded to the system as a supplementary file. The scale consisted of 24 items and two subdimensions to evaluate the IDSC levels of nurses working in the NICU. It was a five-point Likert-type scale. Each item was scored as "1=Strongly Disagree," "2=Disagree," "3=Moderately Agree," "4=Agree," and "5=Strongly Agree." The knowledge subdimension of the scale included items 1, 2, 3, 4, 7, 8, and 10, and items 11, 12, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, and 29 belonged to the attitude subdimension. The maximum and minimum scores that could be obtained from the scale were 120 (24×5) and 24 (24×1), respectively. An increase in the total scale score indicated high knowledge and attitude levels in nurses.

Developmental Support Competency Scale for Nurses (DSCS-N)

The DSCS-N was utilized for the convergent validity of the IDSCS. DSCS-N was developed by Kim and Shin in 2016 to evaluate the competence of neonatal intensive care nurses in developmental supportive care practices, and the Turkish

validity and reliability study was conducted by Kahraman and Ceylan in 2020.[7,14] It was a 4-point Likert-type scale, consisting of 19 items and 6 subdimensions scored between 1 and 4 (1=Never, 2=Sometimes, 3=Often, and 4=Almost always). The lowest and highest scores that could be obtained from the scale were 19 and 76, respectively. In the original study by Kim and Shin (2016), the Cronbach's alpha coefficient for the overall scale was reported as 0.83, with subscale reliability coefficients ranging from 0.60 to 0.76. In the Turkish adaptation by Kahraman and Ceylan (2020), the overall Cronbach's alpha was 0.90, and the values for the six subscales ranged from 0.67 to 0.85.[7,14]

Data Collection

The content validity of the scale was assessed by 11 pediatric nursing experts, resulting in revisions based on their feedback. Eight items were removed from the initial 38-item draft, yielding a final version of 30 items. A Turkish language specialist reviewed the scale for grammar and spelling. The 30-item draft was piloted with 31 eligible nurses, who reported no issues regarding readability or clarity. Their data were excluded from the main analysis. Subsequently, the scale was administered to nurses working in the NICU.

The study was conducted with neonatal nurses working in NICUs in Türkiye between January and October 2022, face-to-face (190) and online through Google Forms (368). A questionnaire created online through Google Forms was delivered to the nurses working in the NICU in Türkiye through a questionnaire link on social networks (WhatsApp, Instagram, Facebook, etc.). The nurses were informed about the purpose of the study and shared an information text containing a letter of assurance that their personal information would remain confidential. Nurses who agreed to participate in the survey online were granted access to the questionnaire after approving the informed consent text. In the face-to-face group, the scale was readministered to 182 nurses 15 days following the first administration. This subsample consisted of participants who completed the initial assessment and consented to participate in the retest phase. The correlation between the test and retest scores was calculated to assess test-retest reliability.

Statistical Analysis Process

The data were analyzed using IBM Statistical Package for the Social Sciences (SPSS) Statistics for Windows, Version 23.0 (IBM Corp., Armonk, NY, USA) and IBM SPSS Amos, Version 23.0. Data entry was made by the researchers, and statistical analyses were conducted in collaboration with a biostatistician. Data were expressed using descriptive statistics (number, percentage, mean, and standard deviation). The content validity index (CVI) was calculated to evaluate specialist opinions using the Davis technique.[18]

The dataset was randomly split into two subsamples to perform exploratory factor analysis (EFA, n=267) for examining item–factor relationships and confirmatory factor analysis (CFA, n=291) for testing the factor structure. EFA was conducted using principal component analysis (PCA) with Varimax rotation. In the CFA, model fit was evaluated using multiple goodness-of-fit indices, including the Chi-square to degrees of freedom ratio ($\chi 2/df$), the root mean square error of approximation (RMSEA), the goodness of fit index (GFI), the adjusted GFI (AGFI), the comparative fit index (CFI), the normed fit index, the incremental fit index, and the Tucker–lewis index. Modification indices were examined, and theoretically justified modifications were applied to improve model fit. The Kaiser–Meyer–Olkin (KMO) test was used to assess the adequacy of the sample size for factor analysis, and Bartlett's Test of Sphericity was used to determine whether the correlation matrix significantly differed from the identity matrix. The Cronbach's Alpha, Split Half, Sperman–Brown, and Guttman coefficients and test–retest analysis were used for reliability analysis of the scale. A 27% lower-upper item analysis was performed for item discrimination analysis. An independent samples t-test was used to compare the item scores of the upper and lower 27% groups. Test-retest results were examined by Pearson correlation analysis.

Ethic Approval

Ethics committee approval was obtained from the University of Health Sciences Gülhane Scientific Research Ethics Committee (Meeting No: 2020/421, Decision No: 2020–471) for the study. The necessary institutional permissions were obtained. All of the participants were informed about the purpose and content of the study, and written informed consent was obtained from those who agreed to participate in the study. Volunteering nurses were included in the study, and they were informed that they could abandon the study at any time. In the study, the Helsinki Declaration of Human Rights was complied with from the beginning to the end of the process, paying careful attention to the protection of personal rights.

Results

Demographic Data

The study included 558 neonatal nurses. When the distribution of the nurses included in the study was

examined according to their demographic characteristics, the mean age of the participants was 29.00±5.42. Among the participants, 97.3% were female, 51.8% were married, and 35.5% had children. The rate of participants with a bachelor's degree was 75.7%, and 40.7% worked in the city hospital. In terms of experiences, 45.3% of the participants had been working as nurses for 4–9 years, and 39.2% had between 4 and 9 years of experience in the NICU. It was observed that 69.7% were employed in Level 3 and 22.4% were in Level 4 NICUs. Among the nurses, 40.7% had been trained in IDSC (Table 1).

Table 1. Sociodemographic characteristics of the participants (n=558)

Characteristics	Mean±SD	
Age	29.00±5.42	
	n	%
Gender		
Female	543	97.3
Male	15	2.7
Marital status		
Married	289	51.8
Single	269	48.2
Having children		
Yes	198	35.5
No	360	64.5
Education		
High school	43	7.7
Associate degree	43	7.7
Bachelor's degree	422	75.7
Master's degree	46	8.2
PhD	4	0.7
Institution of employment		
City hospital	227	40.7
Training and research hospital	65	11.6
Private hospital	52	9.3
University hospital	125	22.4
State hospital	89	15.9
Nursing experience		
<1 year	37	6.6
1–3 years	155	27.8
4–9 years	253	45.3
10 years and longer	113	20.3
Working experience in the NICU		
<1 year	72	12.9
1–3 years	204	36.6
4–9 years	219	39.2
10 years and longer	63	11.3
Level of the NICU		
Level 1	18	3.2
Level 2	26	4.7
Level 3	389	69.7
Level 4	125	22.4
Having received training on IDSC		
Yes	227	40.7
No	331	59.3

SD: Standard deviation; IDSC: Individualized developmentally supportive care; NICU: Neonatal intensive care unit.

Validity Analysis

The Content Validity

Eleven persons specialized in Pediatric Health and Diseases Nursing were consulted to evaluate the content validity. After obtaining specialist opinions, the CVI was calculated using the Davis technique, and eight items below 0.80 (2, 4, 5, 8, 10, 13, 16, and 35) were excluded from the scale. The CVI values of the draft form, consisting of 30 items, ranged between 0.81 and 1.00, and it was determined that the content validity was achieved for the scale according to the CVI value calculated. Following the EFA, the scale was reduced to 24 items. The mean CVI of the final 24-item scale was 0.89 (I-CVI range: 0.81–1.00), indicating that the content validity of the final scale was adequate.[18]

Convergent Validity

The convergent validity of the scale was evaluated using the DSCS-N, which had been tested for validity and reliability by Kahraman and Ceylan. Convergent validity analyses were conducted using the CFA subsample (n=291), as the assessment of associations with a related scale is recommended to be performed on a sample in which the factor structure of the newly developed scale has been confirmed.[19] A statistically significant and positive correlation was determined between the IDSCS and the DSCS-N in terms of the total and sub-dimension scores (Table 2).

Construct Validity

Explanatory factor analysis

Before the EFA, the KMO test value was found as 0.95 and Bartlett's Test of Sphericity value as (χ^2[956]=7729.073, p<0.01. After confirming the suitability of the data for factor analysis, EFA was performed using PCA with Varimax rotation to examine the factor structure of the scale. In the EFA (n=267), the overlapping items (5, 6, 9, 13, 14, and 30) were excluded from the analysis, and the EFA was repeated

Table 2. Convergent validity correlations of the individualized developmentally supportive care scale and the developmental support competency scale for nurses (n=291)

	IDSCS	Knowledge	Attitude
DSCS-N			
r	0.629	0.479	0.609
p	0.000**	0.000**	0.000**
Environmental support			
r	0.498	0.358	0.490
p	0.000**	0.000**	0.000**
Parental support			
r	0.363	0.320	0.324
p	0.000**	0.000**	0.000**
Partnership			
r	0.461	0.370	0.431
p	0.000**	0.000**	0.000**
Professional support			
r	0.470	0.420	0.416
p	0.000**	0.000**	0.000**
Interaction			
r	0.455	0.337	0.442
p	0.000**	0.000**	0.000**
Critical thinking			
r	0.520	0.401	0.496
p	0.000**	0.000**	0.000**

**: p<0.01. IDSCS: Individualized developmentally supportive care scale; DSCS-N: Developmental support competency scale for nurses; r: Pearson correlation coefficient.

multiple times. It was determined that the factor loads of the 24 items remaining in the scale ranged from 0.58 to 0.91 and were grouped under two subdimensions. According to the results of the EFA, the scale explained 72.92% of the total variance, the knowledge subdimension explained 23.41%, and the attitude subdimension 49.50% (Table 3).

CFA

The two-factor model obtained from the EFA was tested using CFA on the second subsample (n=291) (Fig. 1). The goodness-of-fit indices of the model indicated an overall acceptable fit (RMSEA=0.078, χ^2/df=2.754, CFI=0.918), whereas some indices demonstrated relatively lower fit values (GFI=0.844; AGFI=0.806) (Table 4) (p<0.001).[20,21] Although the AGFI value was slightly below the recommended threshold of 0.85, the model was considered acceptable based on the collective evaluation of multiple fit indices.

In addition, the reliability and convergent validity of the measurement model were further examined using average variance extracted (AVE) and composite reliability (CR) values. For the knowledge subdimension, the AVE and CR values were 0.50 and 0.94, respectively. For the attitude subdimension, the AVE and CR values were 0.62 and 0.76, respectively, indicating adequate convergent validity and construct reliability.[20,21]

Reliability

Item analysis based on correlations

The item-total test correlation values of the participants' answers to the scale questions were examined, and it was determined that there were no items below 0.30. Item-total test correlation values of all items varied between 0.45 and 0.80. As presented in the item-total test correlation table, all items were found to be related to each other (Table 5).

Internal consistency analysis

The Cronbach's alpha coefficient was calculated as 0.91 and 0.96 for the knowledge and attitude subdimensions of the scale, respectively. The overall Cronbach's alpha coefficient of the scale was calculated as 0.96, and it was found to be very highly reliable. The analysis was conducted using the full dataset (n=558). The items were divided into two halves: Part 1 included items 1, 3, 7, 10, 12, 16, 18, 20, 22, 24, 26, and 28 (Cronbach's alpha=0.92) Part 2 included items 2, 4, 8, 11, 15, 17, 19, 21, 23, 25, 27, and 29 (Cronbach's alpha=0.92). The correlation coefficient between the split halves was calculated as 0.95, the Spearman–Brown coefficient as 0.97, the Guttman coefficient as 0.97, and the tool was found reliable. These results are presented in the text and not tabulated.

Test-retest reliability

The scale was readministered to 182 nurses 15 days after the first administration. The correlation was calculated between the two tests after the first test and the retest. The correlation values of the knowledge and attitude subdimensions were calculated as r=0.96 (p<0.001) and r=0.97 (p<0.001), respectively. The overall correlation value of the IDSCS was calculated as r=0.97 (p<0.001). According to the results, it was determined that consistent results were obtained within the period. In addition to Pearson correlation coefficients, test–retest reliability was evaluated using the intraclass correlation coefficient (ICC). The overall scale demonstrated good test–retest reliability (ICC=0.84, p=0.001). These results are presented in the text and not tabulated.

Discussion

The IDSCS was developed to assess neonatal intensive care nurses' knowledge and attitudes toward IDSC. Content

Table 3. Explanatory factor analysis results (n=267)

Factors and items	Factor load	Explained variance (%)	Eigenvalue
Factor 1 knowledge			
Item 2. I have the knowledge necessary for providing individualized developmentally supportive care.	0.909	23.418	2.420
Item 1. I know the concept of individualized developmentally supportive care.	0.884		
Item 10. I think I am competent in providing individualized developmentally supportive care.	0.837		
Item 3. Individualized developmentally supportive care supports the neuro-motor, sensory, and emotional development of the pre-term newborns	0.713		
Item 4. Individualized developmentally supportive care has positive outcomes for the pre-term newborn (preventing stress, reducing oxygen demand, supporting postural development, etc.).	0.669		
Item 7. I know the recommended lighting standards for the neonatal intensive care unit.	0.612		
Item 8. I know the recommended sound level standards for the neonatal intensive care unit.	0.608		
Factor 2 attitude			
Item 24. I protect the newborn from sound and light by covering the incubator in the neonatal intensive care unit with a sheet.	0.910	49.508	15.082
Item 22. I support the self-soothe of the pre-term newborn (holding the baby's finger, placing its hand in its mouth/face, supporting its foot, placing it to the midline, etc.).	0.893		
Item 21. I provide the pre-term newborn with positive sensory stimuli, such as using a soft tone of voice and making eye contact, according to the gestational week.	0.889		
Item 28. I encourage the newborn to be breastfed by providing breast milk and breastfeeding training to the family from the first moment of its admission to the unit	0.887		
Item 20. I avoid touching the pre-term newborn unnecessarily, frequently, fast, and inappropriately.	0.885		
Item 18. I use non-pharmacological methods (wrapping, positioning, breast milk, etc.) in the pain management of the newborn.	0.862		
Item 27. I use kangaroo care according to the condition of the pre-term newborn.	0.860		
Item 25. I reduce the sound level and lighting at certain hours to ensure the sleep-wake cycle of the newborn.	0.854		
Item 19. I apply the feeding technique according to the cues of the pre-term newborn before, during, and after feeding.	0.849		
Item 15. I use support equipment (pillows, blankets, etc.) for the postural support of the pre-term newborn.	0.815		
Item 29. I support the family to participate in care and make decisions about it from the admission of the newborn to the neonatal intensive care unit.	0.791		
Item 16. I perform total care to stimulate the newborn minimally and prevent stress.	0.790		
Item 12. I work collaboratively with other nurses and healthcare professionals in individualized developmentally supportive care practices.	0.701		
Item 11. I determine my care approaches and priorities according to the developmental needs of the newborn.	0.667		
Item 17. I assess the skin integrity of the newborn daily with the help of a scale.	0.657		
Item 23. I prevent the spread of odors such as perfume, disinfectant, and alcohol in the neonatal intensive care unit.	0.635		
Item 26. I use pacifiers to support the feeding of the pre-term newborn, facilitate its transition to oral feeding, and calm it down.	0.586		

Kaiser-Meyer-Olkin=0.956 $X^2(276)=7729.073$. Bartlett's test of sphericity (p)=0.000. Rate of total explained variance=72.92.

validity refers to the extent to which a scale covers all relevant subtopics and adequately represents the item universe. One common method to establish content validity is through expert consultation. The recommended number of experts ranges from 3 to 20.[22] In this study, content validity was evaluated using the Davis technique

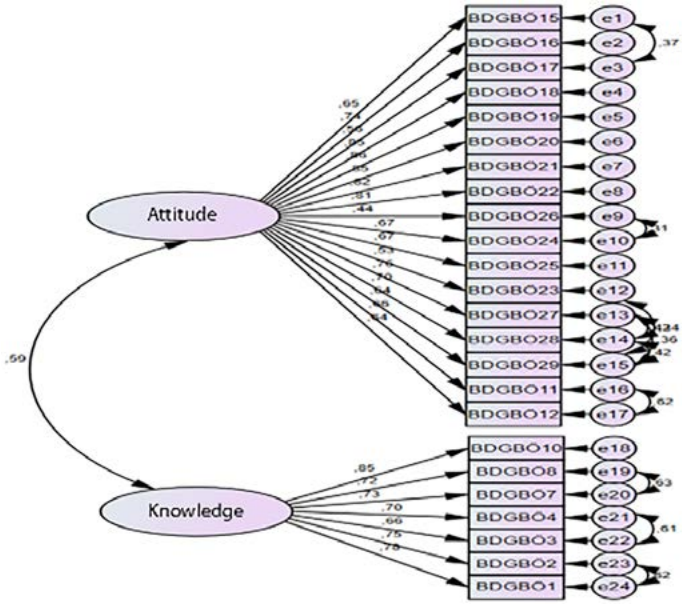

Figure 1. Adjusted CFA model diagram of the Individualized Developmentally Supportive Care Scale (IDSCS).

with 11 experts, and the CVI was calculated. A CVI of 0.80 or above indicates strong content validity.[22–24] Based on expert feedback, eight items with CVI values below 0.80 were removed. The remaining 30 items had CVIs ranging from 0.81 to 1.00, indicating acceptable content validity.

Convergent validity is established when a measurement tool shows similar results to a validated instrument. In this study, the DSCS-N, whose Turkish validity and reliability were confirmed by Kahraman and Ceylan, was used for convergent validity.[7] Since the developed scale included subdimensions, appropriate tests were applied separately for each. A significant positive correlation was found between the IDSCS and DSCS-N scores and their respective subdimensions, confirming convergent validity.

Item-total correlation reflects the relationship between individual item scores and the total scale score, indicating each item's distinctiveness. Items with correlations ≥0.30 effectively discriminate among participants.[25] In this study, all items had item-total correlations between 0.45 and 0.80, with none below 0.30, demonstrating good internal consistency.

Factor analysis is a construct validity technique used to reveal whether there is a specific relationship between the reactions of the participants to the items in the measurement tool being developed. The sample size must be large enough to predict the relationships reliably. Prior to conducting the EFA, the KMO test was conducted to assess sample adequacy, and Bartlett's Test of Sphericity was used to determine whether the correlation matrix significantly differed from the identity matrix.[25–27] In this study, it was determined that the KMO value was 0.95 according to the result of the analysis. The sample size was found to be perfectly sufficient. The results of Bartlett's Test of Sphericity showed a significant Chi-square value ($\chi 2[956]=7729.073$, $p<0.01$), indicating that the correlation matrix significantly differs from the identity matrix and that the data are suitable for factor analysis.

A high factor loading (≥0.30) in EFA indicates structural validity.[26,28] Items must form a coherent whole consistent with factor analysis results.[22,26] In this study, the total explained variance was 72.92%. Overlapping items (5, 6, 9, 13, 14, 30) were removed to ensure homogeneity and dimension clarity. The remaining items had factor loadings between 0.58 and 0.91, indicating good validity. Items 1, 2, 3, 4, 7, 8, and 10 loaded on Factor 1 (Knowledge), whereas items 11, 12,15–29 loaded on Factor 2 (Attitude). Thus, the scale was confirmed to have two theoretically consistent dimensions with an acceptable factor structure.

Table 4. Individualized developmentally supportive care scale first level multi-factor model confirmatory factor analysis fit indices

Index	Perfect fit	Acceptable fit	After modification
χ^2/SD	$0\leq\chi^2/df\leq3$	$3\leq\chi^2/df\leq5$	2.754
RMSEA	0.00 0.05	0.05	0.078
SRMR	0.00 0.05	0.05	0.068
CFI	0.95≤CFI	0.85≤CFI	0.918
GFI	0.90≤GFI	0.85≤GFI	0.844
AGFI	0.90≤AGFI	0.85≤AGFI	0.806
IFI	0.90 1.00	0.80	0.919
TLI	0.90≤TLI	0.80≤TLI	0.906
NI	0.90≤NFI	0.80≤NFI	0.878

Hooper et al.,[20] Lomax and Schumacker[21]. RMSEA: Root mean square error of approximation; SRMR: Standardized root mean square residual; CFI: Comparative fit index; GFI: Goodness of fit index. AGFI: Adjusted Goodness of Fit; IFI: Incremental Fit Index; TLI: Tucker-Lewis Fit Index; NI: Normed Fit Index.

Table 5. Item analysis results of the scale items (n=291)

Item	Item total correlation (r)	Alpha value when the item was deleted	Lower 27%-Upper 27% **(t)	Lower 27%-Upper 27% (p)
Knowledge				
Item 1	0.794	0.888	19.241	0.000*
Item 2	0.783	0.890	22.745	0.000*
Item 3	0.678	0.901	14.051	0.000*
Item 4	0.691	0.901	13.992	0.000*
Item 7	0.703	0.899	16.230	0.000*
Item 8	0.706	0.898	14.468	0.000*
Item 10	0.754	0.893	16.899	0.000*
Attitude				
Item 11	0.683	0.935	12.300	0.000*
Item 12	0.659	0.936	12.338	0.000*
Item 15	0.625	0.937	13.540	0.000*
Item 16	0.689	0.935	13.087	0.000*
Item 17	0.564	0.939	12.862	0.000*
Item 18	0.786	0.934	13.430	0.000*
Item 19	0.809	0.933	17.346	0.000*
Item 20	0.785	0.934	15.727	0.000*
Item 21	0.771	0.934	16.450	0.000*
Item 22	0.770	0.934	14.215	0.000*
Item 23	0.533	0.939	12.090	0.000*
Item 24	0.670	0.936	11.758	0.000*
Item 25	0.666	0.936	13.643	0.000*
Item 26	0.459	0.942	9.883	0.000*
Item 27	0.763	0.934	13.611	0.000*
Item 28	0.711	0.935	14.070	0.000*
Item 29	0.679	0.936	15.716	0.000*

*: p<0.001; **: n1=n2=79. r: Item total score correlation.

The aim of CFA is to validate the factor structure identified by EFA. The two-factor structure derived from EFA was confirmed in a second sample using CFA (n=291). CFA assesses the alignment between factors and associated variables using multiple fit indices.[28] These indices showed acceptable values. A good model fit is indicated by fit indices above 0.80, $X^2/df<5$, and RMSEA <0.08.[20,21,29,30] The CFA results supported the model, confirming the two-factor structure, correlations between subdimensions and the overall scale, and adequate factor loadings.[28] Reliability was further assessed through AVE and CR, with acceptable thresholds being AVE>0.50 and CR>0.70. The obtained values met these criteria.[31]

Whether the items measure a specific conceptual structure consistently using a single measurement tool and measuring at a single time should be investigated, and the tools with high internal consistency are deemed reliable.[22] In this study, the Cronbach's alpha coefficient was used first for evaluating the internal consistency. The coefficient of 0.80 and above indicates very strong reliability.[25,27] The Cronbach's alpha coefficient was calculated as 0.91 and 0.96 for the knowledge and attitude subdimensions of IDSCS, respectively. The Cronbach's alpha coefficient was found to be 0.96 for the overall scale, and the scale was found to be very highly reliable.

Second, the split-half method was utilized to evaluate internal consistency. In this method, the form is split into two equal parts, enabling reliability estimation according to the correlation between the scores of the subjects from the halves after the two halves are administered to the subjects

simultaneously. According to the method, the internal consistency is determined based on the similarity of the scores obtained from both halves of the sample, provided that the measurement tool is reliable. The reliability coefficient of the Split-Half Sperman–Brown and Guttman reliability should be at least 0.70.[24,27] In the present study, Cronbach's alpha value was calculated as 0.92 for Part 1 with 12 items and 0.92 for Part 2 with 12 items. The internal consistency coefficient between the two halves was calculated as 0.95, the Spearman–Brown coefficient as 0.97, and the Guttman Split-Half coefficient as 0.97. Therefore, it was concluded that the scale was sufficiently reliable.

The test–retest method entails administering the same measurement tool to the same group twice under similar conditions, with intervals long enough to prevent recall but short enough to avoid changes in the measured construct. While interval recommendations vary, a 15-day gap is commonly used in paper-based tests.[32] If the measured feature is a continuous variable and the developed scale is an equal range or ratio scale, the Pearson Product-Moment Correlation coefficient (r) is calculated. When the correlation coefficient and p-value results between the two tests were examined in this study, the p-values were found to be below 0.05 for the knowledge and attitude sub-dimensions of IDSCS. In addition, statistically significant, positive, and very high levels of relationships were obtained ($p<0.05$). As a result, the measurements made with IDSCS were accepted as stable and consistent.

Limitations

The fact that the scale was filled in by NICU nurses who volunteered to participate in the study may have caused selection bias. Furthermore, collecting data using two different methods, including face-to-face interviews and online, to reach all neonatal nurses working in NICUs in Türkiye is a limitation of the study.

Nurses should have a high level of knowledge and awareness about IDSC to implement it effectively in the NICUs. There is a limited number of studies evaluating the knowledge, attitudes, and behaviors of nurses regarding IDSC. Accordingly, measurement tools tested for reliability and validity are needed to evaluate the IDSC performed by neonatal nurses. In this sense, it is a pioneering study in the field. According to the results obtained from the validity and reliability analysis of the study, the IDSCS for Neonatal Nurses is a valid and reliable measurement tool. The scale can be easily administered as a measurement tool by conducting validity and reliability studies in different cultures.

Conclusion

According to the validity and reliability analyses, the IDSCS developed for neonatal nurses was accepted as a valid and reliable measurement tool. This scale can be effectively used to evaluate the knowledge and attitudes of nurses working in the NICU toward IDSC.

Ethics Committee Approval: The University of Health Sciences Gülhane Scientific Research Ethics Committee granted approval for this study (date: 30.11.2020, number: 2020–471).

Informed Consent: Nurses who agreed to participate in the survey online were granted access to the questionnaire after approving the informed consent text.

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