Iran Red Crescent Med J. 2017 December; 19(12):e64439. doi: 10.5812/ircmj.64439.

Published online 2017 December 5. **Methods Article**

Validity and Reliability of a Revised Northampton Neonatal Skin Assessment Tool in Turkish Language

Ayse Karakoc,[1,*] Duygu Sonmez Duzkaya,[2] Ebru Temizsoy,[3] Semra Karaca,[1] Gulzade Uysal,[4] and Sengul Cangur[5]

[1]Assistant Professor PhD., Faculty of Health Sciences, Marmara University, Istanbul, Turkey
[2]PhD., Istanbul Faculty of Medicine, Directorate of Nursing Service, Istanbul University, Istanbul, Turkey
[3]Msc., Ministry of Health, Zeynep Kamil Obstetrics and Pediatric Diseases Training and Research Hospital, Istanbul, Turkey
[4]Assistant Professor PhD., Faculty of Health Sciences, Okan University, Istanbul, Turkey
[5]Associate Professor PhD., Department of Biostatistics and Medical Informatics, Faculty of Medicine, Duzce University, Duzce, Turkey

[*]*Corresponding author*: Ayse Karakoc, Marmara University Faculty of Health Science, Haydarpasa Campus, Tibbiye Street, No: 45, Kadıkoy/Istanbul, Turkey. Tel: +90-5335695138, Fax: +90-2165506380, E-mail: aysekt75@hotmail.com

Received 2016 November 17; **Revised** 2017 January 19; **Accepted** 2017 April 15.

Abstract

Background: It is important to check the skin of neonates on a daily basis so that abnormal conditions and skin problems are identified.
Objectives: This study aimed at testing the validity and reliability of a revised Northampton Neonatal skin assessment tool in Turkish; a review to determine whether it is valid and reliable in the care of neonates.
Methods: The research had a cross-sectional and methodological design. The data for the study was collected between 1st of January 2015, and 20th of June 2015, at the neonatal intensive care unit (NICU) of a major training and research hospital in Istanbul/Turkey; 362 neonatal skin assessments were executed. The revised tool's language, face, content, construct validity, and reliability were evaluated.
Results: The intra-class correlation coefficient, which indicates interrater reliability, was 1.00 in the study, representing 100% agreement. The Cronbach alpha internal consistency coefficient revealed that the tool's general reliability was at an acceptable level ($C\alpha = 0.71$). Although the model was not found to be significant (Chi-square = 46.22, df = 17, and $P < 0.001$), the other model fit indices found RMSEA < 0.07, $\chi^2/df < 3$, and SRMR<0.06, which meant that the data had an acceptable fit for the model. The model exhibited a good fit because the CFI, NFI, GFI, and AGFI indices were close to 1. When the model fit indices were evaluated in combination, the CFA model generally had a good fit. The most significant and most prominent effect on the tool was the impact of NNS9 (level of care) indicator ($b_9 = 0.86$, t value = 17.46 > 1.96).
Conclusions: The Turkish version of the revised northampton neonatal skin assessment tool is an appropriate, valid, and reliable instrument to be used in the assessment of neonatal skin, especially of infants at the NICU. The tool may be recommended for use in the care of neonates.

Keywords: Validity, Reliability, Neonatal, Skin Tool

1. Background

The skin is the body's largest active organ and has many functions. Among these functions are temperature and blood pressure regulation, acting as a barrier against toxins and infections, maintaining the fluid electrolyte balance, fat storage, vitamin synthesis, and transmitting sensual stimuli (1).

The skin is composed of 3 layers, with each layer having its own specific function. The younger the gestational age, the more immature the functions of these layers. In general, factors that raise the risk of compromising skin integrity include insufficient development of the stratum corneum layer and the links between the dermis and epidermis in premature infants with very low birth weight, extensive invasive interventions, and monitorization (2, 3).

Neonates with impaired skin integrity remain at the hospital and in the neonatal intensive care unit for longer periods due to prematurity, surgical interventions or medical complications. This may cause a higher incidence of infection in neonates, increase mortality and morbidity, and even increase stress and pain (1, 3, 4).

It is important to check the skin of neonates on a daily basis so that abnormal conditions and skin problems are identified. The principles of neonatal assessment should encompass daily examinations (or more frequently as per assessment results).

Before beginning a skin assessment, it is important, in terms of preventing the risk of infection, that hand hygiene procedures are performed. The infant and its skin are assessed completely and comprehensively, from head to toe; the head, ears, back of the head, umbilical region, dia-

Copyright © 2017, Iranian Red Crescent Medical Journal. This is an open-access article distributed under the terms of the Creative Commons Attribution-NonCommercial 4.0 International License (http://creativecommons.org/licenses/by-nc/4.0/) which permits copy and redistribute the material just in noncommercial usages, provided the original work is properly cited.

per area, and extremities should be carefully examined. All types of color change, signs of erythema, cyanosis, dryness, wound, scrape, tear, irritation, pressure or infection are noted. Signs of birth trauma or abnormalities should also be added to the records (5-9). In particular, infants, who have had heel blood testing, arterial/venous blood tests, or are being probe monitored, should be more carefully assessed (areas where adhesive tape and probes have been attached or removed are important). Any findings on the skin that are believed to be of significance may be photographed and added to the records (5).

Although a term infant's skin matures in 14 to 21 days, careful observation and care is needed to minimize skin impairment and iatrogenic injury. The use of a standardized skin assessment tool that could be used in both term and preterm infants at the NICU, and at care plan preparations in accordance with assessment results may facilitate nursing interventions.

The younger the gestational age, the more difficult the assessment and care of the skin. For this reason, specially designed assessment tools are needed for such patients. Although neonatal skin care occupies an important place in nursing literature, skin assessment tools have primarily been designed for adults and later adapted to neonates (5).

There has been no published, valid, and reliable Turkish Language Neonatal skin evaluation scale available in Turkey. Although in international studies, pediatric skin assessment scales are available, the study's relationship with neonatal skin assessment scales are very few. Most of these scales are based on the Braden Q scale (2).

The northampton neonatal skin assessment tool (NNSAT) was developed at Northampton general hospital in 2004 to provide a means of enhancing the skills of nurses in their assessment of newborns' skin in their neonatal care practice. The tool is easy to use and its aim is to provide individual assessment of the newborn.

2. Objectives

This study aimed at testing the validity and reliability of the revised Northampton Neonatal skin assessment tool in Turkish; a review to determine whether it was valid and reliable in the care of neonates was done.

3. Methods

3.1. Type of Research and Purpose

The research had a cross-sectional and methodological design. This study was conducted for the purpose of revising the northampton neonatal skin assessment tool and testing its validity and reliability in the Turkish language, and to determine whether the tool is valid and reliable for use in the care of neonatal patients. The use of a standardized measurement instrument in the assessment of newborns' skin at the NICU would make it possible to make an early identification of risk and prevention complications, thus contributing to nursing care.

3.2. Ethics Committee and Permissions

Prior to the study, permission was obtained via e-mail from Valerie McGurk et al. for the translation and use of the Northampton Neonatal skin assessment tool. The approval of the ethics board of Zeynep Kamil hospital was obtained (September 19th, 2014 /ethics board No. 165). No invasive procedures were done for the newborns. The scale includes only observational evaluation. In addition, signed informed consent forms were obtained from the parents of the newborns.

3.3. Study Population and the Selection of the Sample

The study was conducted at the neonatal intensive care unit (NICU) of a training and research hospital between January 1st, 2015 and June 30th, 2015 with newborns, who were under treatment/care at the unit. Postnatal age was 0 to 28 days. The location of the research was a large public hospital in Istanbul. This hospital has the highest patient (as NICU) capacity in Istanbul. This hospital does not accept any neonatal transport. Only babies born at the same hospital are treated. It was decided that the number of subjects needed for structural equation modeling at 5% significance level, 80% power, and effect size of 0.30 was 362 neonates, in accordance with the study protocol and random sampling methods.

3.4. The Data Collection Process

3.4.1. Language Validity

In the first stage of the translation to Turkish, work was performed on language equivalence.

First, the original instrument was translated to Turkish by 3 independent translators. In the advanced stage of the translation, 2 academics, who were proficient in English compiled the 3 translations to a single instrument. The merged advanced translation was then back translated by another bilingual independent translator to the original language, English. The back translation of the tool was compared with the English original and the discussions held on the Turkish version led to a modification of the Turkish instrument.

3.4.2. Face Validity

To assess face validity, 10 mothers were asked about the importance of each item (very important, important, quite important, a little important, and not important). The impact score of each item was calculated by a Lickert's scale. Items were considered appropriate if they had an impact score equal to or greater than 1.5 (10).

3.4.3. Content Validity

Expert Opinion; the final form of the Turkish instrument and the original tool were evaluated by nursing, medical, and academic experts in the field of newborn clinical nursing (a total of 8 experts). The original form of the study and its Turkish version were sent to the experts, who were asked to assess the scale from the viewpoint of its ease of comprehension. Accordingly, each item was scored from 1 to 4 (1: Inappropriate, 2: Slightly appropriate, 3: Very appropriate, 4: Extremely appropriate) and the tool was revised in line with the expert's opinions.

- The assessment criteria of the items in the instrument were clarified.

- "Item 4 - skin integrity" in the original form of the tool and "item 8 - visual examination" appeared to be the same assessment and therefore Item "8 - visual examination" was removed from the instrument.

- In line with recommendations in the literature, additions were made (e.g. edema and phototherapy) to "skin observation findings", which changed the total score of the complete scale (2, 3, 6-9).

- The total score of the scale and the assessment boundaries were changed to overcome the overlap (for example, 0 to 8 low risk and 8 to 15 medium risk were changed to 0 to 8 low risk and 9 to 15 medium risk).

- The final version of the instrument was used for the data collection (supplementary file Appendix 1).

In this study, content validity was determined by the content validity ratio (CVR) and content validity index (CVI) for each item (11) Moreover, floor and ceiling effects were used when evaluating content validity. Floor and ceiling effects show the proportion of individuals, who achieve the highest or lowest possible numeric value of a score and are considered present when more than 15% of the individuals achieve these values (12).

3.4.4. Reliability of the Instrument

At the beginning of the study, interrater reliability was assessed by 2 different researchers, who simultaneously evaluated 17 infants. At the end of this, Cronbach's alpha internal consistency coefficient was calculated.

3.5. Collection of the Data

The research data were collected using a data collection form and the Turkish adaptation of the revised northampton skin assessment tool (RNNSAT) (supplementary file Appendix 1) between 1st of January 2015, and 30th of June 2015 by 2 researchers, once a day, at the NICU where the newborns were receiving care/treatment (the gestational week and weight at the time of the evaluation were taken as base line data). At the end of the study, skin assessments of 362 newborns were done.

3.5.1. Data Collection Sheets

Patient identification form: This contains the basic demographic data for the newborns (e.g. date of birth, weight at birth, gestational week, gender, diagnosis, and type of delivery).

The northampton neonatal skin assessment tool: Developed in the United Kingdom by Valerie McGurk et al. during year 2004 (5). The tool is used to evaluate skin conditions of inpatients treated at neonatal clinics. The instrument assesses newborn's skin using a 9-item scale: gestational week, weight, age, skin integrity, temperature control, movement, nutritional status, visual examination, and level of care. Each sub-scale comprises 27 items based on pre-determined criteria. The lowest possible score on the items is zero and the highest is 25. A score of 0 to 8 on the scale signifies low risk in terms of skin complications and a daily assessment is recommended. A score of 8 to 15 signifies medium risk in terms of skin complications and a re-assessment is recommended every 6 to 8 hours, together with a change of position. A score of 16 to 24 signifies high risk in terms of skin complications and a re-assessment is recommended every 4 to 6 hours, together with a change of position. A score of over 24 indicates the possible development of high-risk skin complications and a re-assessment is recommended every 2 to 4 hours, together with a change of position. The higher the score on the scale, the higher the newborn's risk of skin complications. Research about original tool's validity and reliability could not be found in the literature review. For this reason, the current study does not discuss the results with the original tool.

3.6. Statistical Assessment

The data set was tested before the validity and reliability study, for appropriateness of multivariate normality and multicollinearity hypotheses, first using Mardia's kurtosis multivariate normality test and then the variance inflation factor (VIF) approach. Sampling adequacy was examined using the Kaiser-Meyer-Olkin test and Bartlett's test of sphericity was employed to determine whether the

data entry matrix was a unit matrix. MinRes factor analysis (varimax rotation) was used to support the factor analysis of the NNSA tool's validity and to reach the most appropriate measuring model. Confirmatory factor analysis was performed to test the validity of the determined factor structure using the technique of maximum likelihood estimation. To assess the reliability of the scale, Cronbach's alpha internal consistency coefficient was calculated. In evaluating the fit of the model (χ^2/df), the following fit indexes were used: root mean square error of approximation (RMSEA), comparative fit index (CFI), goodness-of-fit index (GFI), adjusted goodness-of-fit index (AGFI), standardized root mean square residual (SRMR), and normed fit index (NFI). The intra-class correlation coefficient was calculated to measure the interrater reliability. The SPSS version 22 and LISREL 8.54 programs were used for the statistical evaluations; $P < 0.05$ was accepted as statistically significant.

4. Results

Of the neonates included in this study, 45.0% were females and 55.0% were males; the mean gestational age was 32.59 ± 4.13 weeks (range, 24 to 41 weeks). The mean height of the infants was 45.85 ± 4.56 cm (range, 33 to 50 cm) and their mean birth weight was 1975.61 ± 898.13 g (range, 480 to 4750 g). The characteristics of the newborns and additional skin findings are presented in Table 1.

It was found that the RNNSAT scale has face validity and high content validity. The impact scores of all items were calculated to be 1.5 or above and they had acceptable features. Mean CVR was close to 88% and mean CVI was 93% (Ayre scale, 2014). Additionally, no score had more than 10% of the scores at lowest level (floor effect) or at the highest level (ceiling effect). Moreover, the intra-class correlation coefficient, indicating interrater reliability, was 1.00 in the study; it could be said that there was 100% agreement between the raters, who had professional experience of 3 to 20 years at the NICU.

It was observed that the tool's data set supported the hypothesis of multivariate normality ($P > 0.05$) and multicollinearity. The result of the Kaiser-Meyer-Olkin test was 0.70. This value indicates an adequate sample size for analysis. However, Barlett's test of sphericity showed that the data correlation matrix was not a unit matrix (BS-χ^2 = 974.74, $P < 0.001$). The MinRes factor analysis yielded a two-dimensional model; 53.0% of the factor variance was explained. However, a single-dimension model was adopted in this study instead of a two-dimensional one. Overall, 43.2% of the variance was accounted for in this factor model.

Confirmatory factor analysis (CFA) was performed using maximum likelihood estimation to test the validity of the factor structure determined with MinRes factor analysis. The path diagram of the standardized solution is shown in Figure 1. The t values of path coefficients in the hypothesis test are indicated in Figure 2. The model fit indexes for this model are found in Table 2. Although the model was not found to be significant (Chi-square = 46.22, df = 17, and $P < 0.001$), the other model fit indices had RMSEA < 0.07 and χ^2/df < 3, and SRMR < 0.06, which meant that the data had an acceptable fit for the model. The model exhibited a good fit because the CFI, NFI, GFI, and AGFI indices were close to 1. When the model fit indices were evaluated in combination, the CFA model generally

Table 1. Neonataes Demographic Characteristics (N = 362)[a]

	N	%
Gender		
Female	165	45.4
Male	197	54.6
Admission diagnosis		
Preterm + preterm with additional problems	205	56.6
Respiratory problems	56	15.5
Hyperbilirubinemia/ ABO incompatibility	37	10.2
Sepsis/EMR (early membrane rupture)	21	5.6
Congenital anomalies	20	5.5
Other	24	6.6
Delivery mode		
Vaginal birth	129	35.7
Cesarean section	233	64.3
Skin findings		
Site of extravasation	3	0.8
Wound	13	3.6
Electrolyte imbalance	128	35.5
Edema	74	20.5
Central catheter	62	17.2
Cord clamp in situ	93	25.8
Intravenous cannula in situ	210	58.2
Drain	93	25.8
Arterial line in situ	6	1.7
Umbilical catheter	41	11.4
Peritoneum dialysis catheter	1	0.3
Phototherapy	69	19.1
Diaper dermatitis	86	23.8
Apparent birth trauma	3	0.8

[a] Skin findings include more than one evaluation.

had a good fit. The multiple coefficients of determination for each equation in the scale model are shown in Table 3.

Table 2. Model Fit Indices for NNSAT

Model fit indices	Value
χ^2	46.21
p	< 0.001
df	17
χ^2/ **df**	2.71
Root mean square error of approximation (RMSEA)	0.06
Standardized root mean residual (SRMR)	0.05
Comparative fit index (CFI)	0.97
Normed fit index (NFI)	0.96
Goodness-of fit index (GFI)	0.97
Adjusted goodness-of-fit index (AGFI)	0.92

Abbreviation: df, degree of freedom.

Cronbach's alpha internal consistency coefficient revealed that the tool's general reliability was at an acceptable level (Cα = 0.71). However, the items of signs and age reduced the reliability coefficient of the tool. However, when these items were removed from the tool, the model's validity was compromised. For this reason, the tool's validity and reliability were examined before the mentioned items were removed.

In addition to Age (NNS3) ($b_3 = 0$, t value = -1.15 < 1.96), all of the other indicators had a positive and significant effect on the scale. The items in order of their significant effects on the scale may be listed as level of care (NNS9), mobility (NNS6), temperature control (NNS5), nutritional status (NNS7), signs, skin integrity (NNS4), weight (NNS2), and gestation (NNS1). The most significant and most prominent effect on the tool was the impact of NNS9 ($b_9 = 0.86$, t value = 17.46 > 1.96).

5. Discussion

The mean gestational age was found to be 32.59 $\pm$ 4.13 weeks (range, 24 to 41 weeks), and the mean birth weight was 1975.61 $\pm$ 898.13 g (range, 480 to 4750 g). The ability of the tool to work with a sample of newborns with a wide range of gestational ages and birth weights shows that this tool may be used for both term and preterm infants.

In terms of the diagnoses for acceptance in the unit in this study, 56.6% of the infants were classified as preterm/preterm with additional problems, and 15.5% as respiratory problems/transient tachypnea of the newborn (TTN). Infants, who are preterm or preterm with additional comorbidities and respiratory problems are given priority for acceptance in the NICU's, around the world (13). The individualized developmental care and assessment of preterm infants in the NICU is of vital importance (14). Skin assessment occupies an important place in this daily care (5, 8) and in this context, the NNSA tool could contribute to standardizing the process of skin assessment.

One of the challenges of observation-based tools, in the context of determining reliability, is the concordance between independent observations. The agreement between observers is expressed by accordance scores when different implementers simultaneously use the same measuring instrument. An agreement of 70.0% or more between more than 1 rater is considered a good result for reliability. The interrater agreement was found to be 1.00, i.e. 100%, which indicates "excellent agreement in the range of 0.93 to 1.00."

In the validity and reliability testing of Lund and Osborn's (2004) neonatal skin condition scale (NSCS) (3), this rate was 89%; in the Neonatal skin risk assessment scale (15) by Huffines and Logton (1997), it was found to be 97%, and the same rate was 98% in the neonatal braden Q risk assessment scale by Lima et al., 2016 (9). No scales on neonatal total skin assessment have been tested for validity and reliability in the Turkish literature. However, "pressure ulcer risk assessment" scales based on observations for assessing skin symptoms in children and newborns recorded 100% interrater reliability in the study by Sacar et al., 2013 (16), and no significant difference was found between the assessors in a study by Gunes and Toruner, 2014 (17).

In this study, the two-dimensional model determined with MinRes factor analysis displayed a variance explanation rate of 53.8%; this rate was found to be 43.2% for the single-dimension model. The single-dimension model was preferred because the assessment of a newborn's skin requires an integrated approach. Huffines and Logston's (1997) Neonatal Skin Risk Assessment Scale was divided to sub-scales (15). Three of the sub-scales (physical condition, activity, and nutrition) had high predictive value (sensitivity, 83% and specificity, 81%) and the other 3 sub-scales (mental status, mobility, and moisture) exhibited low predictive value. As a result, the 3 low-predictive-value sub-scales were removed from the tool, however, the importance of the items for determining skin injury are emphasized in the literature, consequently the revised scale was used overall (18).

Cronbach's alpha internal consistency coefficient revealed that the tool's general reliability was at an acceptable level (Cα = 0.71). However, the Signs and Age indicators reduced the reliability coefficient of the tool. The existence of these additional skin findings (signs) increase the risk of skin injury and must not be ignored in the assessment. In addition, age is an important factor because the skin of

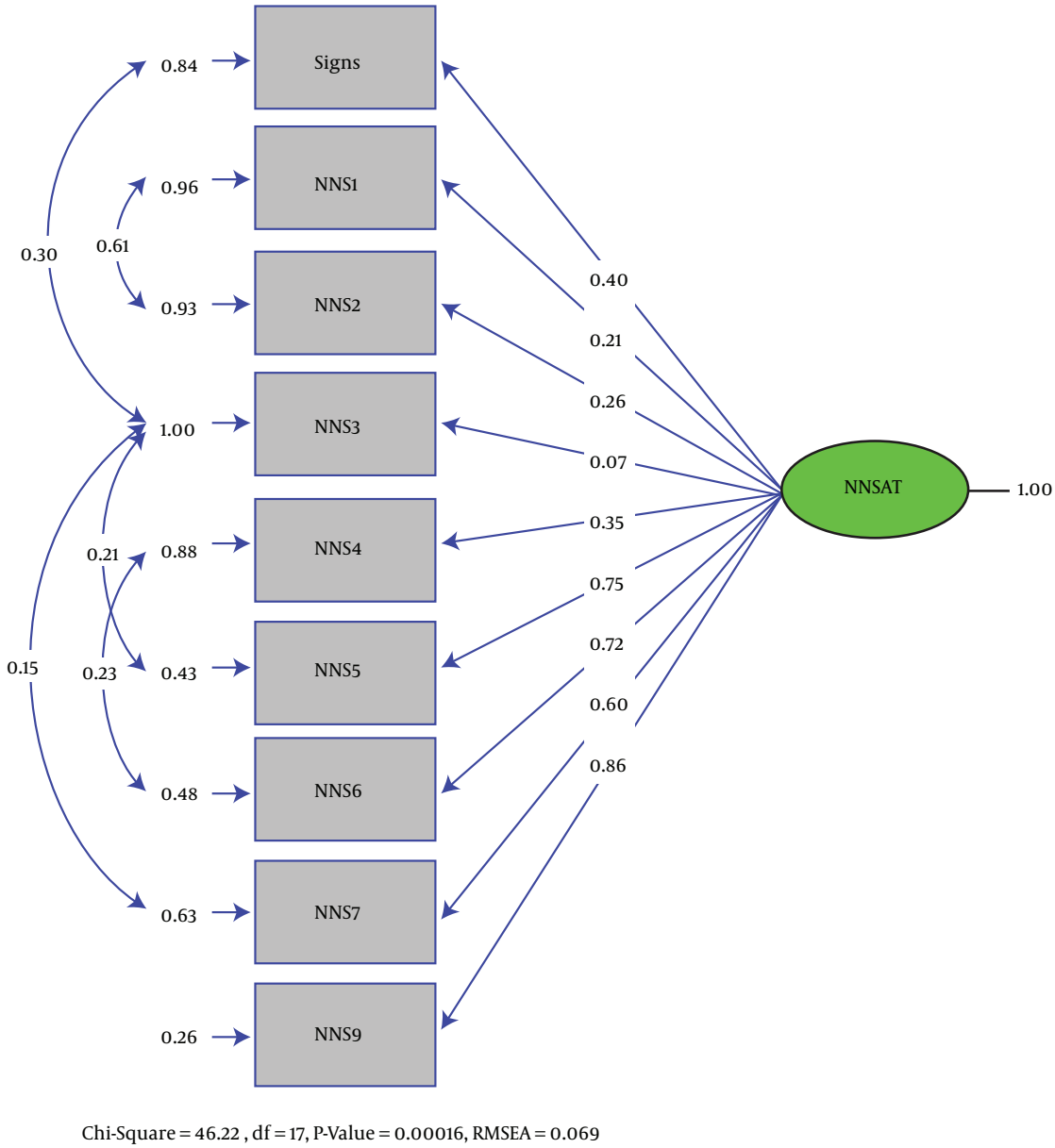

Figure 1. Standardized Solution

a term newborn matures between 14 and 21 days and the younger the postnatal age, the higher will be the risk of skin damage and iatrogenic injury (2, 3, 6-9). For this reason, the tool's validity and reliability were examined before the items were removed.

The indicators in order of their significant effects on the scale were NNS9, NNS6, NNS5, NNS7, signs, NNS4, NNS2, and NSNS1. As the level of care (NNS9) increases, the NNSAT scale score also increases, i.e. the level of risk in terms of skin complications rises. According to national and international NICU standards, in level one, -two, and -three NICUs, as the level of care increase, the infant's total health and care/treatment risks also increases (19).

Items NNS6 and NNS5 are other important items in the scale. When temperature control is variable or poor, the newborn is exposed to the risk of complications. More-

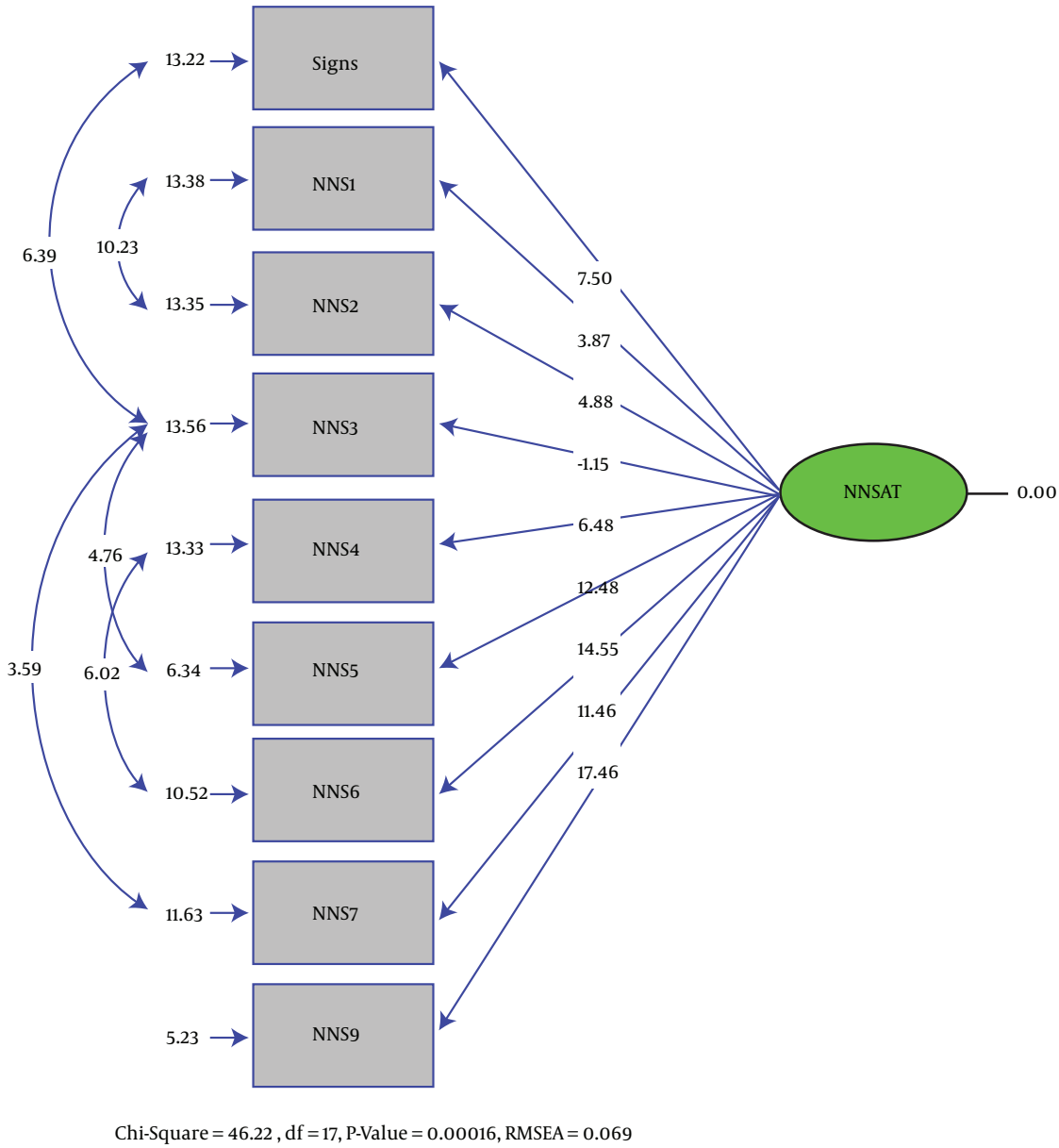

Figure 2. Standardized Solution (T Value)

over, if the infant is assessed as having restricted or no movement, the infant can be at risk of complications. Infants with problems of skin integrity may also be at risk of skin complications. The literature on neonate skin care and physiology reveals that infants should be carefully assessed for thermoregulatory (temperature control system) issues, loss of movement or restricted movement (risk of pressure ulcers), and signs of loss of skin integrity, all of which increase the risk of skin injury (6-9, 16, 17).

The existence of additional or excessive skin findings indicates that the newborn is at increased risk. In the skin assessment of the neonate, it is recommended that a careful evaluation is made of every kind of cannula or probe that may require the application of adhesive tape to the infant's skin, including any existing edema, including pressure sores, which may increase the risk of skin injury, and

Table 3. Squared Multiple Correlation of Each Indicator in Measurement Model and Cronbach Alpha Value of NNSAT

Factor	Item No	Items	R^2	Cronbach alpha
NNSAT	NNS1	Gestation	0.04	0.71
	NNS2	Weight	0.07	
	NNS3	Age	-	
	NNS4	Skin integrity	0.12	
	NNS5	Temperature control	0.57	
	NNS6	Mobility	0.52	
	NNS7	Nutritional status	0.37	
	NNS9	Level of care	0.74	
	Signs	Wound, site of extravasation, peritoneum dialysis catheter, edema, central catheter, phototherapy, drain, electrolyte imbalance, arterial line in situ, umbilical catheter, intravenous cannula in situ, cord clamp in situ, diaper dermatitis, apparent birth trauma	0.16	

every kind of cannula, drain, and phototherapy, which may increase subcutaneous fluid loss and disrupt skin integrity (2, 3, 6-9).

The findings of the study show a high discrimination power in items NNS9, NNS6, NNS5, NNS7, signs, NNS4, NN3, and NSNS1.

NNS1 (gestational week) and NNS2 (weight) are the indicators with the least positive and significant effect on the scale. This result shows that newborns at younger gestational age and lower birth weights are at risk of developing skin complications or have increased risk levels. The lower the gestational week and birth weight, the higher the newborn's risks and as such, a positive correlation is not expected. The lower the gestational age and birth weight, the risk of skin injury rises and necessitates special care (5, 8). These results are consistent with previous literature.

6. Conclusion and Recommendations

The results of this study indicate that the Turkish version of the RNNSAT is a valid and reliable instrument that may be used, particularly in NICUs, for the skin assessment of all newborns and preterm infants and could be recommended for use in future studies on the care of neonates.

Weak points of the study: Not being multi-centered.

Strong points of the study: A Turkish language validity-reliability neonatal skin evaluation scale wasn't reached (published). For this reason, this study is important.

Supplementary Material

Supplementary material(s) is available here [To read supplementary materials, please refer to the journal website and open PDF/HTML].

Footnote

Conflict of Interest: The manuscript has been read and approved by the 6 authors. The authors declare that they had no competing interests.

References

1. Visscher MO. Update on the use of topical agents in neonates. *Newborn Infant Nurs Rev*. 2009;**9**(1):31–47. doi: 10.1053/j.nainr.2008.12.010.
2. Vance DA, Demel S, Kirksey K, Moynihan M, Hollis K. A delphi study for the development of an infant skin breakdown risk assessment tool. *Advances in Neonatal Care*. 2015;**15**(2):150–7. doi: 10.1097/anc.0000000000000104. [PubMed: 25000102].
3. Lund CH, Osborne JW. Validity and reliability of the neonatal skin condition score. *J Obstet Gynecol Neonatal Nurs*. 2004;**33**(3):320–7. doi: 10.1177/0884217504265174. [PubMed: 15180195].
4. Harrison D, Boyce S, Loughnan P, Dargaville P, Storm H, Johnston L. Skin conductance as a measure of pain and stress in hospitalised infants. *Early Hum Dev*. 2006;**82**(9):603–8. doi: 10.1016/j.earlhumdev.2005.12.008. [PubMed: 16507342].
5. McGurk V, Holloway B, Crutchley A, Izzard H. Skin integrity assessment in neonates and children. *Paediatr Nurs*. 2004;**16**(3):15–8. doi: 10.7748/paed2004.04.16.3.15.c903. [PubMed: 15116678].
6. Molina PG, Lopez EB. The risk assessment scales are an efficient tool in the prevention of pressure ulcers in hospitalized neonates. *J Neonatal Biology*. 2014;**3**(4):151. doi: 10.4172/2167-0897.1000151.
7. August DL, Edmonds L, Brown DK, Murphy M, Kandasamy Y. Pressure injuries to the skin in a neonatal unit, Fact or fiction. *J Neonatal Nurs*. 2014;**20**(3):129–37. doi: 10.1016/j.jnn.2013.08.006.

8. Oranges T, Dini V, Romanelli M. Skin Physiology of the Neonate and Infant: Clinical Implications. *Adv Wound Care (New Rochelle)*. 2015;**4**(10):587–95. doi: 10.1089/wound.2015.0642. [PubMed: 26487977].
9. de Lima EL, de Brito MJ, de Souza DM, Salome GM, Ferreira LM. Cross-cultural adaptation and validation of the neonatal/infant Braden Q risk assessment scale. *J Tissue Viability*. 2016;**25**(1):57–65. doi: 10.1016/j.jtv.2015.12.004. [PubMed: 26777790].
10. Lacasse Y, Godbout C, Series F. Health related quality of life in obstructive sleep apnea. *Eur Respir J*. 2002;**19**(3):499–503. [PubMed: 11936529].
11. Ayre C, Scally AJ. Critical values for lawshe's content validity ratio, revisiting the original methods of calculation. *Meas Eval Couns Dev*. 2017;**47**(1):79–86. doi: 10.1177/0748175613513808.
12. Terwee CB, Bot SD, de Boer MR, van der Windt DA, Knol DL, Dekker J, et al. Quality criteria were proposed for measurement properties of health status questionnaires. *J Clin Epidemiol*. 2007;**60**(1):34–42. doi: 10.1016/j.jclinepi.2006.03.012. [PubMed: 17161752].
13. Karakoc A, Cigdem Z. Neonatal transportation and transport risk ındeks physiologic stability score. *Turkiye Klinikleri J Nurs Sci*. 2013;**5**(1):1–10.
14. Lawhon G, Als H. *Theorical perspective for developmentally supportive care in developmental care of newborns and infants*. 2 , editor. Chicago: National Association of Neonatal Nursing; 2010.
15. Huffines B, Logsdon MC. The neonatal skin risk assessment scale for predicting skin breakdown in neonates. *Issues Compr Pediatr Nurs*. 1997;**20**(2):103–14. [PubMed: 9423386].
16. Sacar. C , Ozturk C, Bektas M. The psychometric properties of the Turkish form of the glamorgan pediatric pressureulcer risk assessment scale. *J Crıt Care Nurs Soc*. 2013;**17**(2):45–51.
17. Gunes NB, Toruner EK. Turkish validity and reliability of the braden q scale for predicting pressure ulcer risk in children. *J Anatolia Nurs Health Sci*. 2014;**17**(1):6–14.
18. Dolack M, Huffines B, Stikes R, Hayes P, Logsdon MC. Updated neonatal skin risk assessment scale, (NSRAS). *Ky Nurse*. 2013;**61**(4):6. [PubMed: 24260847].
19. American academy of pediatrics . Levels of neonatal care. *Pediatrics*. 2012;**130**(3):587–97. doi: 10.1542/peds.2012-1999.