The Validity and Reliability of the Turkish Version of the Neonatal Skin Risk Assessment Scale

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ABSTRACT

PURPOSE: The study created a Turkish translation of the Neonatal Skin Risk Assessment Scale (NSRAS) that was developed by Huffines and Longsdon in 1997. Study authors used a cross-sectional survey design in order to determine the validity and reliability of the Turkish translation.

SUBJECTS AND SETTING: The study was conducted at the neonatal intensive care unit of a university hospital in Ankara between March 15 and June 30, 2014. The research sample included 130 neonatal assessments from 17 patients.

METHODS: Data were collected by questionnaire regarding the characteristics of the participating neonates, 7 nurse observers, and the NSRAS and its subarticles. After translation and back-translation were performed to assess language validity of the scale, necessary corrections were made in line with expert suggestions, and content validity was ensured. Internal consistency of the scale was assessed by its homogeneity, Cronbach's α, and subarticle–general scale grade correlation.

RESULTS: Cronbach's α for the scale overall was .88, and Cronbach's α values for the subarticles were between .83 and .90. Results showed a positive relationship among all the subarticles and the overall NSRAS scale grade ($P < .01$) with correlation values between 0.333 and 0.721. Explanatory and predicative factor analysis was applied for structural validity. Kaiser-Meyer-Olkin analysis was applied for sample sufficiency, and Bartlett test analysis was applied in order to assess the factor analysis of the sample. The Kaiser-Meyer-Olkin coefficient was 0.73, and the χ^2 value found according to the Bartlett test was statistically significant at an advanced level ($P < .05$). In the 6 subarticles of the scale and in the general scale total grade, a high, positive, and significant relationship among the grades given by the researcher and the nurse observers was found ($P < .05$).

CONCLUSION: The Turkish NSRAS is reliable and valid.

KEYWORDS: Neonatal Skin Risk Assessment Scale, pressure injuries, reliability, translation, validity

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INTRODUCTION

A pressure injury is an important health problem that prolongs hospitalization, increases mortality and morbidity risk, can require intensive care for complications such as infection, and creates high healthcare expenditures.[1–3] In recent years, pressure injuries have begun to be considered a safety problem in healthcare.[4,5] Despite recent technical advances in healthcare, pressure injuries occur at unacceptable rates in healthcare facilities, and many of these injuries are preventable.[6] Pressure injuries are generally preventable with early identification, risk management, and effective interventions. Prevention is facilitated by a multidisciplinary healthcare team when they focus on holistic care.[7] This is a professional responsibility of all healthcare providers.[8]

A pressure injury can occur at any age, including during childhood.[9] Studies indicate that they are prevalent in children, with between 3% and 35% of pediatric patients experiencing them.[10–13] The prevalence rate may rise to as high as 50% in some pediatric care settings, such as neonatal intensive care units (NICUs).[14] In a study conducted by Fujii et al[15] researching the prevalence of pressure injury in a NICU in Japan, the incidence was 16%. Other studies report prevalence rates of 23%[16] and 31.2%[17] in neonatal care units.

Neonatal skin characteristics predispose the neonate to skin breakdown, skin infections, and pressure injuries.[18] Infant epidermis and dermis are thinner, and sweat glands are immature, as are many organ systems (circulation system, etc).[19–22] This affects skin integrity, leading to a greater risk of developing a pressure injury in the neonatal period.[23] Sweat and the evaporation of sweat create an acidic blanket on adult skin, protecting against bacterial and fungal infections. Conversely, young patients with immature sweat glands are susceptible to infection.

Pressure injury risk assessment is one of the nursing interventions to prevent neonatal pressure injuries. For this reason, nurses need a valid, reliable, and convenient scale to assess risk. The most common scale used for studies regarding neonates in many countries is the Neonatal Skin Risk Assessment Scale (NSRAS),

which has been validated and had its reliability established in many countries.[24] Although there are other scales for pressure injury risk assessment in children,[25,26] in Turkey, there is no such alternative scale for the neonatal period. Therefore, this study sought to establish validity and reliability of the NSRAS in Turkey.

METHODS

The study used a cross-sectional design. It was conducted in the NICU of a university hospital in Ankara, Turkey. The study included 17 neonates with no laceration, fracture, or genetic dermatologic disease causing skin breakdown, whose parents had given written permission for participation in the study.

The study included 7 nurses who had been working in the neonatal unit for at least 6 months, who participated in a 1-hour training session on the use of the NSRAS and who volunteered to take part in the study as observers. The observers were the nurses who undertook neonatal care on that specific day. A week before the study, the researcher, one of the authors of the study, gave the nurses a 1-hour training session on the scale, and a bedside model practice was performed. The application of the NSRAS was conducted to cover 3 shifts during convenient working hours in agreement with the nurses. The risk assessments using the NSRAS scale were conducted by the researcher and the observer on the same neonate at the same time but independently from each other. Other nurses were not present during the assessment process. Each assessment lasted 20 minutes. Reassessment of the same neonate by the same nurse and the same researcher was conducted at least 24 hours later.

It was recommended in the literature to gather 5 to 7 times more of the scale components to reach the sample size.[27] The instrument components in this research had 24-item. Therefore, between 120 and 168 pressure injury risk assessments were planned and 130 assessments were carried out on the determined dates. Researchers conducted an average of 7.6 assessments per participant (minimum 5 and maximum 14) depending on the patient's length of stay in the NICU.

Written permission was obtained from Barbara Huffines via e-mail to use the NSRAS in order to determine its validity and reliability. Study procedures were reviewed and approved by the Gazi University Scientific Research and Publication Ethics Committee (no. 191-14.04.2014), Turkey.

INSTRUMENTS

The NSRAS was developed by Huffines and Logsdon[28] in 1997 and is a modified version of the Braden Scale[28] arranged according to the patients' age of gestation. The original scale's

sensitivity was 83%, and specificity was 81%. Interinterviewer reliability was established as 97%.[28,29]

The NSRAS has 6 parameters: general physical condition, mental state, mobility, activity, nutrition, and moisture. Each parameter has 4 subdegrees. Therefore, the total number of components in this scale is 24. Each subscale is scored from 1 to 4 points for a total score ranging from 6 to 24. A score higher than 13 represents an increased risk of skin breakdown; a lower score indicates a lower risk.

A descriptive characteristics form for neonates was prepared by the researchers according to the literature[20,28] in order to identify patient characteristics that might influence the development of a pressure injury. The form was filled in by the first researcher immediately after the NSRAS was conducted.

Researchers also used a descriptive characteristics form for the nurse observers with questions identifying their professional and sociodemographic details. The form was was prepared by the researchers and administered in the nurses' station prior to neonate assessment.

PSYCHOMETRIC PROPERTIES
Validity
Translation and back-translation were used to assess the linguistic validity of the scale. In the first phase, the scale was translated into Turkish by 2 separate native Turkish-speaking translators who had excellent command of English. The differences between these 2 translated texts were eliminated by an instructor with a good command of English. In the second phase, 2 different translators retranslated the Turkish scale into English. A researcher compared the retranslated scale with the original English scale and found no difference.

The Davis technique was used for content validity of the NSRAS. The instrument was sent to 10 healthcare professionals with expertise in neonatology nursing and pressure injury, including 8 nursing faculty members and 2 practicing nurses who had at least 5 years' experience with pressure injuries on neonates. The opinions of 4 associate professors, 3 assistant professors, and 1 lecturer, totaling 8 instructors from the pediatrics departments of various universities, were also collected.

The original and Turkish translations of the scale together with a cover letter about the study were sent to these 18 experts. They were asked to examine every item in the NSRAS and rank items as "very appropriate" (1 point), "item needs to be put into an appropriate form" (2 points), "appropriate but needs minor changes" (3 points), or "not appropriate" (4 points). The experts were also asked to provide narrative comments if desired. The content validity index was calculated by dividing the total score of each item by the total number of experts in this technique.

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The minimum index needed for each item to be declared valid was greater than 0.80.[30]

The experts did not advise excluding any items. Small changes (2 words in 2 items) were made in line with expert opinion regarding linguistic validity, and the scale was finalized. In this way, the Turkish version of the NSRAS was created.

Interrater Reliability

Interrater consistency was tested to measure reliability of the assessments made by the researcher and nurse observers.[31] Because any changes may be observed in the condition of the neonates at any moment, time stability was not controlled.

DATA ANALYSIS

Data analysis included descriptive statistics (percentage, frequency), hypothesis testing, and reliability analysis. The confidence interval was 0.95.[32] The dependent variables of the study are the scores of the NSRAS, and the independent variables are the neonatal characteristics that affect the development of pressure injury. The Davis technique was used to evaluate expert opinion on the conformity of the scale in terms of language/expression and content.[30] Explanatory and confirmatory factor analyses were conducted to identify the construct validity of the scale. Sample adequacy was tested with Kaiser-Meyer-Olkin (KMO) analysis, and sample size was tested with the Bartlett test of sphericity; Cronbach's α was used to determine homogeneity, namely, the internal consistency[33]; the item-total score correlation coefficients were used to indicate the influence of each item on the score; and the Tukey test of additivity was used to establish whether the scale is of an additive nature. Spearman's rank correlation coefficient was used to assess interrater reliability of the assessments made by the researcher and observers.[30] A receiver operating characteristic curve was used to check the scale to

Table 1.

STATISTICAL ANALYSES USED IN THE STUDY

Validity Analysis		Technique
Content validity		Davis technique
Construct validity	Sampling adequacy	Kaiser-Mayer-Olkin test
	The sample size of test	Bartlett Test of Sphericity

Reliability Analysis	
Normal distribution	Kolmogorov-Smirnov test
Internal consistency	Cronbach's α
Item-total score analysis	Spearman's rank correlation
Interobserver reliability	Spearman's rank correlation analysis
Additivity of the scale items	Tukey additivity test
Sensitivity-specificity	Receiver operating characteristic curve analysis

Table 2.

NEONATE DEMOGRAPHICS

Descriptive Characteristics	Mean (SD)	Min-Max	Range
Gestational age, wk	35.89 (3.36)	30–39.4	9.40
Age, d	23.67 (21.49)	1–80	79
Length of stay in hospital, d	23.22 (21.75)	1–80	79
Weight, kg	3.22 (1.39)	1.24–6.28	5.02
Height, cm	48.11 (6.40)	38–58	20
		n	%[a]
Gender	Male	69	53.1
	Female	61	46.9
Breastfeeding status	Yes	88	67.7
	No	42	32.3
Feeding type	Orogastric tube	78	60.0
	Oral	48	36.9
	Total parenteral nutrition	4	3.1

[a]Percentages are taken over n = 130 newborn observations.

determine whether it distinguishes or eliminates pressure injuries.[31] The statistical methods are summarized in Table 1.

RESULTS

Most (53.1%) of the neonates were male; the average gestation age was 35.89 ± 3.36 weeks. When the authors looked at the feeding method for the neonates, it was determined that orogastric tube use was at a high level (60%) and that 67.7% of neonates received breast milk (Table 2). All nurse observers were female, with an average age of 30.14 ± 5.87. Nearly 43% of the nurses held a bachelor's degree, and none had prior training in pressure injuries. Nearly 43% of the nurses were general nurses who were not specialized and 57% of the nurses were neonatal nurses. The nurses had work experience between 1 and 5 years.

Cronbach's α (reliability coefficient) of the scale was .88, and the Cronbach's α of the subitems was between .83 and .90. The scale's .88 Cronbach's α coefficient indicates a high level of reliability of the scale (Table 3).

When the relationship between the scale's total score and the subitem scores was examined, the correlation values ranged between 0.33 and 0.72, indicating a statistically significant positive relationship between all subitems and the scale's total score ($P < .01$). According to these results, the subitems also have a high degree of reliability and are useful for measuring the same variable (Table 4).

There was no significant difference between the assessments of the researcher and nurse observers in the scale's total score and 6 sections that constitute the NSRAS ($P < .05$) (Table 5). Having researchers and nurses giving similar scores to the patients indicates interrater reliability.

To study the construct validity of the NSRAS, factor analysis was implemented; KMO analysis was used for sample adequacy.

Table 3.

INTERNAL CONSISTENCY AND ITEM ANALYSIS (N = 130)

Sub-item	Possible Score Range	Arithmetic mean	SD	Scale mean if item deleted	Scale variance if item deleted	Total item correlation	Scale coefficient of reliability if item deleted
1. General physical condition	1–3	1.8	0.8	12.0	28.5	0.63	0.88
2. Mental state	1–4	2.4	1.3	11.5	23.9	0.67	0.87
3. Mobility	1–4	2.5	1.2	11.4	23.3	0.79	0.85
4. Activity	1–4	2.8	1.3	11.1	21.7	0.90	0.83
5. Nutrition	1–4	2.2	1.1	11.6	24.5	0.75	0.85
6. Moisture	1–2	2.0	1.3	11.9	26.4	0.50	0.90

Total scale score	Arithmetic mean	SD	Variance	Number of items	Cronbach's α
	13.9	5.9	34.9	6	0.88

The KMO test result was 0.73, indicating a sufficient sample adequacy because the KMO test result was greater than 0.50.[31] Therefore, it can be said that those data were acceptable for factor analyses ($P < .05$). Bartlett test analysis was conducted to determine whether the χ^2 data values are compatible for factor analyses.[34]

The discriminatory power of the NSRAS was determined by a receiver operating characteristic (ROC) curve analysis. The ROC curve was constructed for each subitem of the NSRAS. All subitems had an ROC greater than 0.7; the only subitem that has a lower discrimination power compared with the other 5 items was the item on moisture, although the value of the area remaining under the curve was high (the area under the ROC curve = 0.79). It is determined that the increase in sensitivity in the scores cause an increase in specificity.

DISCUSSION

Reliability studies focus on 3 dimensions of reliability: time stability, interrater agreement, and internal consistency. Because immediate changes may be observed in the condition of neonates, time stability was not included in this study. The relationships between the subscales were significant.

Cronbach's α reliability is the internal consistency criterion that represents in summary the relationship between at least 4 questions in the same scale. Cronbach's α coefficient is an index that presents the similarity or proximity between the answers to questions in each subitem. This coefficient takes values between 0 and 1. When the coefficient gets closer to 1, its reliability becomes higher.[35] Again, the scale's total Cronbach's α was .88, and the Cronbach's α of the subitems ranged between .83 and .90. When these results were examined to identify the reliability of the scale, there was a statistically significant positive relationship between all subitems and the general scale scores ($P < .01$).

Correlation shows the relationship between 2 or more variables. The relationship between the variables is expressed with a correlation coefficient, which can take values between -1 and +1. A correlation coefficient between 0.70 and 0.99 indicates a high correlation, between 0.69 and 0.30 indicates a moderate correlation, and between 0.29 and 0.01 indicates a weak relationship.[36] Because none of the NSRAS items were under 0.30, no item was excluded from the scale and item-total scores were within convenient reliability levels.

Interrater agreement is a reliability index in which the researcher looks for equity among independent measurements. An interrater reliability search can be conducted in cases where different observers measure the same fact at the same instance by using the same instrument or by applying 2 parallel instruments to the subjects at the same time.[33] In such measurement types, the closeness of the observation results indicates a high degree of reliability. In this study, the correlation coefficient was between 0.85 and 0.98, and the correlation coefficient of the general scale score was 0.95. Therefore, this study establishes that the interrater agreement and the correlation coefficient of observation of nurses and researchers were high, and the relationship between them was highly significant.

Kaiser-Meyer-Olkin sample adequacy measurement was conducted to test the construct validity of the scale. This value, which can range between 0 and 1, is considered to be normal between 0.5 and 0.7, good between 0.7 and 0.8, very good between 0.8 and 0.9, and perfect if greater than 0.9. The highly significant result of the Bartlett test of sphericity indicated that the sample size is convenient for factor analysis, and also the correlation matrix is appropriate.[37] The 0.73 KMO coefficient indicates that sample adequacy was good, and the χ^2 value

Table 4.

ITEM-TOTAL SCALE SCORE CORRELATION (N = 130)

Subitems	P	r
General physical condition	.000	0.72
Mental state	.000	0.33
Mobility	.000	0.39
Activity	.000	0.63
Nutrition	.000	0.66
Moisture	.000	0.62

Table 5.

INTER-RESEARCHER AND OBSERVER RELIABILITY

Sub-items	Researcher $\overline{\chi} \pm$ SD	MinMax.	Observers $\overline{\chi} \pm$ SD	MinMax.	r[a]	P
General physical condition	1.89 ± 0.83	1–3	1.76 ± 0.92	1–4	0.85	.000
Mental state	2.41 ± 1.37	1–4	2.38 ± 1.38	1–4	0.97	.000
Mobility	2.54 ± 1.28	1–4	2.47 ± 1.27	1–4	0.94	.000
Activity	2.80 ± 1.34	1–4	2.74 ± 1.33	1–4	0.90	.000
Nutrition	2.29 ± 1.19	1–4	2.28 ± 1.20	1–4	0.98	.000
Moisture	2.02 ± 1.31	1–4	1.82 ± 1.15	1–4	0.84	.000
Total scales core	13.92 ± 5.85	6–23	13.42 ± 5.66	6–23	0.95	.000

[a]Spearman's correlation coefficient.

was statistically significant ($P < .05$). It was established that the sample size was valid and adequate for factor analysis.

CONCLUSION

Based on the results of the study, the NSRAS is a valid and reliable measurement instrument for use in Turkish NICUs. Facilities should train nurses on how to use the NSRAS.●

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