

# Non-Communicating Children's Pain Checklist–Revised: Turkish Validity and Reliability Study

## Abstract

**Background:** Pain is frequently experienced by children in intensive care units. Healthcare professionals often have difficulty assessing pain in children who are unable to communicate.

**Aim:** This study aimed to evaluate the validity and reliability of the Turkish version of the Non-Communicating Children's Pain Checklist–Revised [NCCPC-R].

**Methods:** This methodological study was conducted in a pediatric intensive care unit between May 8, 2023 and April 8, 2024. A total of 50 children aged 3–18 years participated in the study. Data were collected using the Sociodemographic Data Form, the NCCPC-R, and the Face, Legs, Activity, Cry, and Consolability (FLACC) Scale. The NCCPC-R was translated and back-translated to establish linguistic validity, and the content validity index (CVI) was calculated. Criterion validity was evaluated by examining correlations between NCCPC-R and FLACC scores. Reliability was assessed using Cronbach's alpha, the intraclass correlation coefficient (ICC), and test-retest analyses conducted by two independent observers at two-week intervals.

**Results:** The mean age of the participants was  $9.08 \pm 5.31$  years, and 62.0% were male. The primary medical diagnosis was neurological disorders in 64% of the children. The NCCPC-R demonstrated a CVI of 0.958. Significant positive correlations were found between NCCPC-R and FLACC scores ( $p < 0.001$ ). Cronbach's alpha coefficient was 0.970. The ICC values for interrater agreement and consistency were 0.988 and 0.994, respectively ( $p < 0.001$ ). Test-retest reliability showed strong positive correlations for Observer 1 ( $r = 0.811$ ) and Observer 2 ( $r = 0.804$ ) ( $p < 0.001$ ).

**Conclusion:** The Turkish version of the NCCPC-R is a valid and reliable tool for assessing pain in children who are unable to communicate.

**Keywords:** Children, communication, pain assessment, reliability, validity

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## Introduction

Pain is a multifaceted sensory and emotional experience associated with actual or potential tissue damage and is shaped by individual factors such as previous pain experiences and perception.<sup>1,2</sup> In pediatric populations, pain is a prevalent concern, frequently resulting from acute medical conditions, trauma, and invasive procedures, particularly among critically ill children receiving care in Pediatric Intensive Care Units (PICUs). These children often experience severe acute pain due to mechanical ventilation, surgical interventions, and life-saving procedures; however, their ability to communicate pain is frequently compromised. When unrecognized and untreated, pain in PICU patients may lead to serious complications, including prolonged hospitalization, physiological instability, and long-term psychological distress.<sup>1-4</sup>

Effective pain management begins with accurate and individualized pain assessment.<sup>1,5,6</sup> Although self-reported verbal pain assessments are considered the gold standard, they are not feasible for many critically ill children in PICUs, as patients may be sedated, intubated, or neurologically impaired. These children, including those with cognitive impairments, retain the full capacity to experience pain but face significant barriers to expressing it. In such cases, nurses and caregivers must rely on nonverbal indicators such as facial expressions, vocalizations, changes in activity levels, physiological responses, and disruptions in sleep or eating patterns.<sup>7,8</sup> However, the subjective interpretation of these cues may result in inconsistencies in pain assessment. To address this challenge, the use of standardized and validated observational tools is essential to ensure objective and reliable evaluations, particularly in high-risk settings such as PICUs.<sup>1,9,10</sup>

The Non-Communicating Children's Pain Checklist–Revised (NCCPC-R), developed by Breau et al.,<sup>11</sup> is a widely recognized instrument for assessing pain in children aged 3–18 years with cognitive impairments that limit verbal communication. This 30-item checklist evaluates pain based on observable behaviors and is designed for use by both caregivers and healthcare professionals without requiring specialized training, making it highly applicable in both clinical and caregiving settings.<sup>11</sup> Pain communication varies significantly among non-speaking children. Some children can express pain through augmentative and alternative communication devices, communication boards, or gestures, whereas others may be unable to communicate pain even through symbolic or alternative means. For example, children with neurological conditions such as cerebral palsy may be unable to speak but can still participate in pain assessment to some extent.<sup>11,12</sup>

*\*This study was prepared as a master thesis.*

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Therefore, it is essential to clarify that the NCCPC-R is particularly suited for children who cannot verbally communicate pain and are also unable to report pain through alternative communication methods.<sup>11</sup> While some children in PICUs who are intubated or have cognitive impairments may still engage in pain assessment, this tool is especially valuable for those who lack the ability to intentionally communicate using speech, symbols, or other expressive methods.<sup>12</sup>

The NCCPC-R has been successfully validated in several languages, including Italian<sup>13</sup> and German,<sup>14</sup> and is used internationally. However, to date, a validated Turkish version of this tool does not exist, which poses a significant barrier for healthcare providers, particularly those working in intensive care settings, where rapid and accurate pain assessment is critical.

This study aims to address this gap by adapting and validating the NCCPC-R for Turkish-speaking populations. By providing a culturally and linguistically validated instrument, this study seeks to support healthcare professionals and caregivers in PICUs and other acute care settings in achieving accurate and timely pain assessments for children who are unable to communicate verbally. The availability of a Turkish version of the NCCPC-R is expected to enhance the quality of pain management and overall care for non-communicating children in intensive care settings, ultimately contributing to improved patient outcomes.

## Research Questions

1. Is the Turkish version of the NCCPC-R a valid tool for pain assessment in non-communicating pediatric patients in the PICU?
2. Is the Turkish version of the NCCPC-R a reliable tool for pain assessment in non-communicating pediatric patients in the PICU?

## Materials and Methods

### Study Aim and Design

This methodological study aimed to evaluate the validity and reliability of the Turkish version of the Non-Communicating Children's Pain Checklist-Revised in non-communicating pediatric patients hospitalized in a PICU, with the goal of providing a valid instrument for pain assessment in this population.

### Setting and Participants

The study was conducted between May 8, 2023 and April 8, 2024, in the PICU of a university hospital in western Türkiye. Initially, 70 pediatric patients aged 3–18 years were enrolled. Six patients were excluded due to mortality, and 14 were transferred or discharged before study completion. Ultimately, 50 patients who met the inclusion criteria completed the study. For the a priori sample size calculation for correlation analysis, a direct reference was not available in the literature. Therefore, an effect size considered practically significant was adopted, and the study was designed to detect at least a high-level correlation ( $\rho=0.50$ ). For a two-tailed test with  $\alpha=0.05$  and power=0.95, the minimum required sample size was calculated as  $n=46$ . A post hoc power analysis based on the relationship between Face, Legs, Activity, Cry, and Consolability (FLACC) and NCCPC-R scores, assuming a two-tailed test with  $\rho=0.756$ ,  $\alpha=0.05$ , and  $n=50$ , yielded a power [ $1-\beta$ ] of 0.99, indicating that the sample size was more than sufficient to detect the examined correlation. The sample size is consistent with previous NCCPC-R validation studies (range: 24–71 participants) and represents a robust achievement given the selective nature of the PICU population.<sup>11,13,14</sup>

### Inclusion Criteria

- Parental consent obtained for participation,
- Age between 3 and 18 years,
- Presence of a medical condition (e.g., intubation) or diagnosis (e.g., cognitive impairment, intellectual disability, cerebral palsy) resulting in severely limited verbal communication,
- Inability to consciously report pain using gestures, facial expressions, symbols, or augmentative and alternative communication methods,
- Experience of one or more events during routine care or medical procedures (e.g., endotracheal suctioning, repositioning, wound care, invasive procedures) considered clinically painful by the nurse or treatment team,
- Hospitalization in the PICU for a minimum of two weeks prior to assessment.

### Exclusion Criteria

- Ability to communicate pain verbally or nonverbally,
- Being under the effects of sedation at the time of data collection.

### Instruments

**Sociodemographic Data Form:** This form consisted of 12 items addressing the sociodemographic characteristics of the patients (e.g., age, sex, family structure, parental education, and occupation) as well as clinical information (e.g., diagnosis and length of hospitalization).<sup>13,15,16</sup> This form was developed to identify factors that may influence pain perception and pain reporting in pediatric patients.

**Non-Communicating Children's Pain Checklist-Revised:** The NCCPC-R is a 30-item pain checklist developed specifically for children who are unable to verbally communicate and who have cognitive impairments.<sup>11,17,18</sup> The original validation studies of the NCCPC-R included children aged 3–18 years with a range of cognitive impairments, such as moderate to severe intellectual disabilities, cerebral palsy, and other neurological conditions that significantly limited their ability to communicate. The scale was tested in both clinical and home settings, with pain assessments conducted by caregivers and healthcare professionals. The validation process demonstrated that the NCCPC-R effectively detects pain-related behaviors in children with varying levels of cognitive impairment and communication limitations.<sup>11,17,18</sup> The NCCPC-R consists of seven subscales: vocal, social, facial, activity, body and limb movements, physiological status, and eating/sleeping parameters. Each subscale multiple items, for a total of 30 items. Observers using the NCCPC-R respond to the question, "How frequently did the child display these behaviors within the last two hours?" Each item is scored on a scale from 0 to 3 (0=not present at all during the observation period; 1=seen or heard rarely but present; 2=seen or heard several times but not continuously; and 3=seen or heard often, almost continuously). A total score greater than 7 indicates that the child is experiencing pain.<sup>11</sup> The NCCPC-R was selected for this study because it was specifically developed and validated for non-communicating children with cognitive impairments, making it appropriate for pain assessment in this population.

**Face, Legs, Activity, Cry, and Consolability (FLACC) Scale:** The FLACC Scale was developed by Merkel et al.<sup>19</sup> and linguistically validated in Turkish by Şenaylı et al.<sup>20</sup> This observational scale assesses five behavioral categories in children and classifies pain severity (mild, moderate, severe) based on total scores ranging from 0 to 10. The FLACC Scale was selected because it is a widely used observational pain assessment tool that does not rely on verbal communication, making it suitable for children with communication barriers. It was originally validated in both verbal and nonverbal pediatric populations, including children with cognitive impairments and communication difficulties.<sup>19,20</sup>

### Data Collection Procedure

The study followed a structured four-stage process:

1. **Translation (Stage 1):** Using the translation-back translation method, 11 bilingual experts independently translated the NCCPC-R into Turkish. Of these experts, four were pediatric nurses with PhD degrees in nursing, two were pediatric physicians, and five were English-Turkish linguists, ensuring both linguistic and conceptual accuracy. Following a consensus review by the researchers and a linguist, a final Turkish version was produced. The back-translated version, completed by a bilingual expert, was compared with the original scale and confirmed to be linguistically equivalent.
2. **Content Validity (Stage 2):** Eleven experts (seven pediatric nursing faculty members and four pediatric medicine faculty members) evaluated the content validity of the scale in terms of language appropriateness and scientific accuracy using a 4-point rating scale. The Davis technique was employed to calculate the Content Validity Index (CVI) for each item, based on the proportion of experts rating the item as "not relevant," "item needs major revision," "relevant but needs minor revision," or "highly relevant." Reliability coefficients range from 0 to 1, with a coefficient of 1 indicating perfect agreement and a coefficient of 0 indicating no agreement. Test-retest analysis and alternate forms are commonly used to calculate reliability through statistical correlation tests.<sup>21</sup> This method was selected because it provides a standardized and objective evaluation of content validity and ensures that the items are conceptually appropriate for the target population. Detailed CVI results are presented as supplementary material [Appendix 1].

**Table 1.** Sociodemographic characteristics of patients and their parents (n=50)

		Min-max	Mean±SD
Age		3.00–18.00	9.08±5.31
Number of children in the family		1.00–5.00	2.44±0.81
Length of PICU stay at first assessment (days)		1–225	12.90±3.00
		n	%
Sex	Male	31	62.0
	Female	19	38.0
Education level (patient)	Not in school yet	35	70.0
	Preschool	1	2.0
	Primary/middle school	14	28.0
Education level (father)	Middle school or lower	6	12.0
	High school graduate	34	68.0
	University graduate	10	20.0
Education level (mother)	Middle school or lower	18	36.0
	High school graduate	28	56.0
	University graduate	4	8.0
Working status (father)	Working	47	94.0
	Not working	0	0.0
	Other	3	6.0
Working status (mother)	Working	13	26.0
	Not working	37	74.0
	Other	0	0.0
Primary reason for hospital admission/ medical diagnosis	Neurological diseases <sup>1</sup>	32	64.0
	Genetic diseases <sup>2</sup>	6	12.0
	Oncological diseases <sup>3</sup>	3	6.0
	Respiratory diseases <sup>4</sup>	3	6.0
	Gastrointestinal diseases <sup>5</sup>	2	4.0
	Musculoskeletal diseases <sup>6</sup>	2	4.0
	Cardiovascular diseases <sup>7</sup>	2	4.0
Secondary medical diagnosis	Neurological diseases	15	30.0
	Respiratory diseases	14	28.0
	Dehydration	4	8.0
	Trauma	4	8.0
	Loss of consciousness	2	4.0
	Infection	2	4.0
	No secondary diagnosis	8	18.0
Total		50	100

<sup>1</sup>: Cerebral palsy, epilepsy, encephalitis, meningitis, cerebral hemorrhage, leukodystrophy, <sup>2</sup>: West syndrome, phenylketonuria, mucopolysaccharidosis type I, <sup>3</sup>: Wilms tumor, brain tumor, <sup>4</sup>: Pneumonia, <sup>5</sup>: Poisoning, dehydration, <sup>6</sup>: Spinal muscular atrophy, Duchenne muscular dystrophy, <sup>7</sup>: Congenital heart disease. SD: Standard deviation, PICU: Pediatric intensive care units.

**3. Pilot Implementation (Stage 3):** To assess clarity and applicability, the Turkish version of the NCCPC-R was pilot-tested with 10 pediatric patients who met the inclusion criteria but were not included in the main study sample. The pilot implementation was completed over a three-week period. Observations were conducted exclusively in the PICU to evaluate the scale's feasibility in a

**Table 2.** Correlations between NCCPC-R subscales and FLACC scores (Observer 1)

Scales	NCCPC-R	FLACC					FLACC
		Face	Legs	Activity	Cry	Consolability	
Vocal	r	0.641 <sup>a</sup>	0.611 <sup>a</sup>	0.553 <sup>a</sup>	0.695 <sup>a</sup>	0.605 <sup>a</sup>	0.744 <sup>a</sup>
	p	0.000*	0.000*	0.000*	0.000*	0.000**	0.000
Social	r	0.715 <sup>a</sup>	0.643 <sup>a</sup>	0.651 <sup>a</sup>	0.758 <sup>a</sup>	0.695 <sup>a</sup>	0.830 <sup>a</sup>
	p	0.000*	0.000*	0.000*	0.000*	0.000*	0.000*
Facial	r	0.700 <sup>a</sup>	0.625 <sup>a</sup>	0.554 <sup>a</sup>	0.626 <sup>a</sup>	0.446 <sup>a</sup>	0.711 <sup>a</sup>
	p	0.000*	0.000*	0.000*	0.000*	0.001	0.000*
Activity	r	0.674 <sup>a</sup>	0.582 <sup>a</sup>	0.545 <sup>a</sup>	0.535 <sup>a</sup>	0.442 <sup>a</sup>	0.665 <sup>a</sup>
	p	0.000*	0.000*	0.000*	0.000*	0.001	0.000*
Body and limb movements*	r	0.668 <sup>a</sup>	0.681 <sup>a</sup>	0.639 <sup>a</sup>	0.765 <sup>a</sup>	0.593 <sup>a</sup>	0.809 <sup>a</sup>
	p	0.000*	0.000*	0.000*	0.000*	0.000*	0.000*
Physiological status	r	0.700 <sup>a</sup>	0.684 <sup>a</sup>	0.665 <sup>a</sup>	0.701 <sup>a</sup>	0.581 <sup>a</sup>	0.803 <sup>a</sup>
	p	0.0000*	0.000*	0.000*	0.000*	0.000*	0.000*
Eating/sleeping	r	0.596 <sup>a</sup>	0.705 <sup>a</sup>	0.540 <sup>a</sup>	0.655 <sup>a</sup>	0.483 <sup>a</sup>	0.721 <sup>a</sup>
	p	0.000*	0.000*	0.000*	0.000*	0.000*	0.000*
Total	r	0.766 <sup>a</sup>	0.739 <sup>a</sup>	0.683 <sup>a</sup>	0.786 <sup>a</sup>	0.639 <sup>a</sup>	0.870 <sup>a</sup>
	p	0.000*	0.000*	0.000*	0.000*	0.000*	0.000*

<sup>a</sup>: Pearson correlation, \*: p<0.001. NCCPC-R: Non-communicating children's pain checklist-revised, FLACC: Face, legs, activity, cry, and consolability.

**Table 3.** Internal consistency of the NCCPC-R total scale and subscales

NCCPC-R subscales		Cronbach's Alpha Coefficient
Vocal	Observer 1	0.952
	Observer 2	0.957
Social	Observer 1	0.891
	Observer 2	0.897
Facial	Observer 1	0.916
	Observer 2	0.915
Activity	Observer 1	0.614
	Observer 2	0.541
Body and limb movements	Observer 1	0.882
	Observer 2	0.882
Physiological status	Observer 1	0.884
	Observer 2	0.880
Eating/sleeping	Observer 1	0.553
	Observer 2	0.597
Total	Observer 1	0.970
	Observer 2	0.970

NCCPC-R: Non-communicating children's pain checklist-revised.

critical care environment. Each patient was observed for a total of two hours, during which pain-related behaviors were assessed. Two experienced pediatric nurses (a clinical nurse with 10 years of experience and a head nurse with 20 years of experience) independently observed each patient and completed

**Table 4.** Interobserver agreement in NCCPC-R scoring

NCCPC-R	ICC	95% Confidence interval		*F-test	p	
		Lower	Upper			
Vocal	Absolute agreement	0.983	0.969	0.990	1130.616	0.000*
	Internal consistency	0.991	0.984	0.995	1130.616	0.000*
Social	Absolute agreement	0.949	0.912	0.971	380.125	0.000*
	Internal consistency	0.974	0.954	0.985	380.125	0.000*
Facial	Absolute agreement	0.957	0.926	0.976	450.860	0.000*
	Internal consistency	0.978	0.962	0.988	450.860	0.000*
Activity	Absolute agreement	0.948	0.911	0.970	370.810	0.000*
	Internal consistency	0.974	0.953	0.985	370.810	0.000*
Body and limb movements	Absolute agreement	0.958	0.927	0.976	460.383	0.000*
	Internal consistency	0.978	0.962	0.988	460.383	0.000*
Physiological status	Absolute agreement	0.967	0.942	0.981	590.247	0.000*
	Internal consistency	0.983	0.970	0.990	590.247	0.000*
Eating/sleeping	Absolute agreement	0.956	0.923	0.975	440.176	0.000*
	Internal consistency	0.977	0.960	0.987	440.176	0.000*
Total	Absolute agreement	0.988	0.979	0.993	1680.027	0.000*
	Internal consistency	0.994	0.990	0.997	1680.027	0.000*

\*: ANOVA, \*: p<0.001. NCCPC-R: Non-communicating children's pain checklist-revised, ICC: Intraclass correlation coefficient.

the NCCPC-R forms separately to prevent bias. After the observations, the two nurses compared their assessments and discussed their evaluations. No major discrepancies were identified, and both confirmed that the scale was comprehensible and applicable in the PICU setting. Based on these findings, the scale was deemed suitable for the main implementation phase without further modification [Appendices 2 and 3].

- Main Implementation (Stage 4):** Two experienced clinical observers (a clinical nurse with 10 years of experience and a head nurse with 20 years of experience) administered the NCCPC-R and FLACC scales to 50 participants. Assessments were conducted in the same clinical setting, while the two observers completed their ratings independently. To evaluate test-retest reliability, pain assessments were repeated two weeks after the initial assessment. This interval was selected to provide a meaningful evaluation of reliability while minimizing the effects of short-term fluctuations in pain-related behaviors.<sup>22</sup> The interval between assessments made by observers may result in a falsely high correlation if the time between assessments is short, or a low correlation if the interval is long. Therefore, the most appropriate time interval for the assessed trait should be selected. A two-to-four-week interval is considered ideal.<sup>23</sup> Both assessments, conducted two weeks apart, took place during interventions that could cause pain, including intravenous catheterization, aspiration, urinary catheter insertion, and tracheostomy care.

### Data Analysis

Data analysis was performed using the Statistical Package for the Social Sciences (SPSS) version 25.0 (IBM Corp., Armonk, NY, USA), with the level of statistical significance set at p<0.05. Descriptive statistics, including frequencies, percentages, means, and standard deviations, were used to summarize participant characteristics and describe the sample distribution.

Linguistic validity was established using the translation-back translation method to ensure semantic and conceptual equivalence between the original and Turkish versions of the scale. Content validity was evaluated using the Content Validity Index, calculated based on expert ratings to quantify agreement regarding item relevance and clarity.<sup>24</sup>

Criterion validity was examined by analyzing correlations between NCCPC-R and FLACC scores. Pearson's correlation coefficients were calculated to assess the strength and direction of these relationships, providing evidence of concurrent validity for the Turkish version of the NCCPC-R.<sup>25</sup>

To assess the reliability of the scale, multiple statistical methods were applied:

**Internal Consistency:** Cronbach's alpha coefficient was calculated to evaluate the internal consistency of the scale, assessing whether the items measured a common underlying construct. A coefficient of  $\geq 0.70$  was considered indicative of acceptable reliability.<sup>26</sup>

**Interrater Reliability:** The intraclass correlation coefficient (ICC) was used to determine the level of agreement between the two independent observers.<sup>27</sup>

**Test-Retest Reliability:** Temporal stability of the scale was assessed by calculating the correlation between scores obtained from repeated assessments at two time points. A high correlation coefficient indicates that the scale yields consistent results over time.<sup>23</sup>

### Ethical Considerations

The study was conducted in accordance with the principles of the Declaration of Helsinki. Ethical approval was obtained from Zonguldak Bülent Ecevit University Non-interventional Clinical Research Ethics Committee (Approval Number: 2023/11, Date: 31.05.2023). Written permission was obtained from the institution where the study was conducted, and written informed consent was obtained from the parents of all participating patients. In addition, permission to use the NCCPC-R for validity and reliability analyses was obtained via e-mail from the developers of the original scale.

## Results

### Characteristics of the Participants

The mean age of the participants was 9.08±5.31 years, and 62.0% were male. It was determined that 70.0% of the patients had not yet started school. Fathers of 68.0% of the patients and mothers of 56.0% were high school graduates. The mean length of PICU stay at the time of the first assessment was 12.90±3.00 days. The primary medical diagnosis was neurological disorders in 64% of the participants, followed by genetic disorders in 12%. Secondary medical diagnoses included neurological disorders in 30% and respiratory disorders in 28% of the participants [Table 1].

### Validity

**Content Validity:** The CVI value of the scale, calculated based on the evaluations of 11 experts, was 0.958 [Appendix 1].

**Table 5.** Test-retest analysis of NCCPC-R scores

NCCPC-R		Mean	SD	t-test statistic	p	r	p		
Observer 1	Vocal	Pretest	5.24	4.08	-0.714 <sup>a</sup>	0.478	0.883 <sup>b</sup>	0.000*	
		Retest	5.44	4.10					
	Social	Pretest	7.60	3.06	-0.425 <sup>a</sup>	0.673	0.764 <sup>b</sup>	0.000*	
		Retest	7.72	2.65					
	Facial	Pretest	9.16	3.66	0.154 <sup>a</sup>	0.878	0.728 <sup>b</sup>	0.000*	
		Retest	9.10	3.79					
	Activity	Pretest	2.84	1.42	-1.905 <sup>a</sup>	0.063	0.764 <sup>b</sup>	0.000*	
		Retest	3.10	1.39					
	Body and limb movements	Pretest	10.52	4.11	0.326 <sup>a</sup>	0.746	0.668 <sup>b</sup>	0.000*	
		Retest	10.36	4.38					
	Physiological status	Pretest	9.50	4.30	1.438 <sup>a</sup>	0.157	0.689 <sup>b</sup>	0.000*	
		Retest	8.78	4.64					
	Eating/sleeping	Pretest	4.28	2.14	-0.521 <sup>a</sup>	0.604	0.867 <sup>b</sup>	0.000*	
		Retest	4.36	2.07					
	Total	Pretest	49.14	20.05	0.157 <sup>a</sup>	0.876	0.811 <sup>b</sup>	0.000*	
		Retest	48.86	20.96					
	Observer 2	Vocal	Pretest	5.30	4.13	-0.519 <sup>a</sup>	0.606	0.860 <sup>b</sup>	0.000*
			Retest	5.46	4.10				
Social		Pretest	7.56	3.00	-0.442 <sup>a</sup>	0.661	0.696 <sup>b</sup>	0.000*	
		Retest	7.70	2.70					
Facial		Pretest	9.22	3.71	0.312 <sup>a</sup>	0.757	0.737 <sup>b</sup>	0.000*	
		Retest	9.10	3.79					
Activity		Pretest	2.76	1.35	-1.347 <sup>a</sup>	0.184	0.695 <sup>b</sup>	0.000*	
		Retest	2.96	1.34					
Body and limb movements		Pretest	10.34	4.08	-0.413 <sup>a</sup>	0.681	0.720 <sup>b</sup>	0.000*	
		Retest	10.52	4.16					
Physiological status		Pretest	9.36	4.29	1.130 <sup>a</sup>	0.264	0.730 <sup>b</sup>	0.000*	
		Retest	8.84	4.54					
Eating/sleeping		Pretest	4.08	2.16	-1.661 <sup>a</sup>	0.103	0.884 <sup>b</sup>	0.000*	
		Retest	4.32	2.06					
Total		Pretest	48.62	20.06	-0.156 <sup>a</sup>	0.877	0.804 <sup>b</sup>	0.000*	
		Retest	48.90	20.57					

<sup>a</sup>: Paired-samples t-test, <sup>b</sup>: Pearson correlation, \*: p<0.001. NCCPC-R: Non-communicating children's pain checklist-revised.

**Criterion Validity:** In the assessments conducted by Observers 1 and 2, NCCPC-R total and subscale scores demonstrated strong, positive, and statistically significant correlations with FLACC scores ( $r=0.870$ ;  $p<0.001$ ). Accordingly, results based on the assessments of Observer 1 are presented in Table 2, while results based on Observer 2 are provided in Appendix 4.

### Reliability

**Internal Consistency:** The overall Cronbach's alpha coefficient of the NCCPC-R was 0.970 for both Observer 1 and Observer 2. Cronbach's alpha coefficients for the NCCPC-R subscales ranged from 0.553 to 0.952 for Observer 1 and from 0.593 to 0.957 for Observer 2 (Table 3).

**Inter-Observer Agreement:** Based on the total scores of the scale, the ICC for absolute agreement between the observers was 0.988, while the ICC for consistency was 0.994 ( $p<0.001$ ). The ICC values for interrater agreement across the NCCPC-R subscales ranged from 0.949 to 0.991 ( $p<0.001$ ) (Table 4).

**Test-Retest Reliability:** In the assessments conducted by Observer 1, the mean NCCPC-R total score was  $49.14\pm 20.05$  at pretest and  $48.86\pm 20.96$  at retest. For Observer 2, the mean total scores were  $48.62\pm 20.06$  at pretest and  $48.90\pm 20.57$  at retest. The NCCPC-R total and subscale scores did not show a statistically significant change over time ( $p>0.001$ ). According to the results of the paired-samples t-test

examining the relationship between the two measurements, the overall correlation coefficient for the scale was  $r=0.811$  for Observer 1 and  $r=0.804$  for Observer 2, indicating a statistically significant relationship between the first and second administrations of the scale (Table 5).

When pain was assessed using the FLACC scale by Observer 1, the mean pretest score was  $6.28\pm 2.56$ , and the mean retest score was  $6.52\pm 2.54$ . Similarly, Observer 2 reported a mean pretest score of  $6.12\pm 2.45$  and a mean retest score of  $6.48\pm 2.54$  (Table 6).

### Discussion

The findings of this study make an important contribution to pediatric pain assessment, particularly in intensive care settings where accurate pain evaluation is critical. The participants had a mean age of approximately nine years, with the majority being male and not yet enrolled in school. These demographic characteristics are consistent with previous studies assessing pain in children with cognitive impairments. For example, a systematic review reported a mean participant age of 9.9 years and a male predominance of 60%.<sup>28</sup> Similarly, Zanchi et al.<sup>29</sup> and Breau et al.<sup>15</sup> reported comparable age distributions. In our study, most participants were hospitalized due to neurological conditions, which aligns with earlier research identifying neurological disorders as the primary diagnosis in similar populations.<sup>11,15,17</sup>

**Table 6.** Test-retest analysis results of FLACC scores

FLACC		Mean	SD	t-test statistic	p	r	p	
Observer 1	Face	Pretest	1.42	0.50	0.629 <sup>a</sup>	0.533	0.619 <sup>b</sup>	0.000*
		Retest	1.38	0.53				
	Legs	Pretest	1.18	0.63	0.000 <sup>a</sup>	1.000	0.601 <sup>b</sup>	0.000*
		Retest	1.18	0.56				
	Activity	Pretest	1.20	0.73	-0.651 <sup>a</sup>	0.518	0.581 <sup>b</sup>	0.000*
		Retest	1.26	0.69				
	Cry	Pretest	1.14	0.73	-0.256 <sup>a</sup>	0.799	0.716 <sup>b</sup>	0.000*
		Retest	1.16	0.74				
	Consolability	Pretest	1.34	0.48	0.000 <sup>a</sup>	1.000	0.553 <sup>b</sup>	0.000*
		Retest	1.36	0.56				
Total	Pretest	6.28	2.56	-0.156 <sup>a</sup>	0.877	0.743 <sup>b</sup>	0.000*	
	Retest	6.52	2.55					
Observer 2	Face	Pretest	1.40	0.49	0.330 <sup>a</sup>	0.743	0.653 <sup>b</sup>	0.000*
		Retest	1.38	0.53				
	Legs	Pretest	1.18	0.60	0.000 <sup>a</sup>	1.000	0.574 <sup>b</sup>	0.000*
		Retest	1.18	0.56				
	Activity	Pretest	1.16	0.71	-1.043 <sup>a</sup>	0.302	0.535 <sup>b</sup>	0.000*
		Retest	1.26	0.69				
	Cry	Pretest	1.10	0.71	-0.771 <sup>a</sup>	0.444	0.711 <sup>b</sup>	0.000*
		Retest	1.16	0.74				
	Consolability	Pretest	1.28	0.45	-0.903 <sup>a</sup>	0.371	0.585 <sup>b</sup>	0.000*
		Retest	1.34	0.56				
Total	Pretest	6.12	2.45	-0.738 <sup>a</sup>	0.464	0.703 <sup>b</sup>	0.000*	
	Retest	6.48	2.54					

<sup>a</sup>: Paired-samples t-test, <sup>b</sup>: Pearson correlation, \*: p<0.001.

In pediatric intensive care units, pain often results from underlying medical conditions or invasive procedures such as catheter insertion, tracheal aspiration, and wound care.<sup>30</sup> In the NCCPC-R assessments conducted by Observer 1, total scores remained stable between pretest and retest measurements, indicating consistent pain-related behavioral responses over time. Similarly, pain assessments using the FLACC scale by both observers yielded comparable scores, reflecting moderate to high levels of pain severity. The relatively elevated pain levels observed in this study may be attributed to the intensive care environment, where patients are frequently exposed to painful procedures and pain management challenges are more pronounced. Previous research has shown that nurses primarily rely on behavioral indicators such as crying, discomfort, and facial expressions to assess pain in children.<sup>31</sup> These findings underscore the importance of standardized tools such as the NCCPC-R, which offer a systematic approach to identifying pain-related behaviors in non-communicating pediatric patients.

The Turkish version of the NCCPC-R demonstrated strong validity, with a CVI of 0.958, indicating a high level of expert agreement. Criterion validity was supported by significant positive correlations between NCCPC-R and FLACC scores. Similar findings have been reported in studies using alternative reference scales, such as the Numeric Rating Scale (NRS), Visual Analog Scale (VAS), and other standardized instruments.<sup>15,17,32</sup> These consistent results support the validity of the Turkish NCCPC-R as an effective tool for pain assessment in children with communication barriers.

Reliability analyses revealed high internal consistency for the Turkish NCCPC-R, with Cronbach's alpha coefficients exceeding established thresholds. These findings are consistent with previous studies reporting Cronbach's alpha values ranging from 0.741 to 0.97 for the original and adapted versions of the NCCPC-R.<sup>11,13,16</sup> Interrater reliability was also strong, as evidenced by high ICC values, indicating substantial agreement between observers. Notably, the ICC values obtained in this study exceeded those reported in some earlier investigations, particularly those conducted under calmer assessment conditions.<sup>29,33</sup>

The results of the test-retest reliability analyses further supported the temporal stability of the scale, demonstrating strong correlations between scores obtained at two different time points. These results are consistent with those reported by Murgia et al.,<sup>13</sup> who also observed high ICC values in test-retest analyses. In contrast, some studies have reported lower ICC values, particularly under calm conditions, attributing these differences to environmental or procedural factors.<sup>33</sup> The high test-retest reliability observed in the present study underscores the consistency of the Turkish NCCPC-R and supports its use as a reliable instrument in clinical practice.

### Limitations

This study has certain limitations. First, as the research was conducted at a single center, the findings may not be generalizable to broader populations. Second, the study sample consisted of non-communicating children receiving intensive care; therefore, the results may not be applicable to other pediatric settings.

### Conclusion

The results confirmed that the Turkish version of the NCCPC-R as a valid and reliable instrument for pain assessment in non-communicating children. This study fills an important gap in pediatric intensive care settings, where accurate pain assessment remains a critical challenge for who are unable to communicate.

The availability of this scale will support healthcare professionals in making more objective clinical decisions, potentially improving patient outcomes through timely and appropriate pain interventions. Future multicenter studies are recommended to further generalize these results.

**Appendix files may be accessed via the link:** [https://jag.journalagent.com/jern/abs\\_files/JERN-50469/JERN-50469\\_0\\_appendix.pdf](https://jag.journalagent.com/jern/abs_files/JERN-50469/JERN-50469_0_appendix.pdf)

**Ethics Committee Approval:** The study was approved by the Zonguldak Bülent Ecevit University Non-interventional Clinical Research Ethics Committee (Approval Number: 2023/11, Date: 31.05.2023).

**Informed Consent:** Written informed consent was obtained from the parents of all participating patients.

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