Journal of Pediatric Nursing 87 (2026) 479–490

Contents lists available at ScienceDirect

Journal of Pediatric Nursing

journal homepage: www.pediatricnursing.org

Development of the observational kangaroo care assessment scale (OKCAS): A validity and reliability study☆

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ARTICLE INFO

Article history:
Received 24 November 2025
Revised 30 January 2026
Accepted 30 January 2026

Keywords:
Kangaroo mother care
Newborn
Nursing
Psychometrics

ABSTRACT

Purpose: This study aimed to develop the Observational Kangaroo Care Assessment Scale (OKCAS) and evaluate its psychometric properties.
Design and methods: This methodological study was conducted with 562 newborns and their families who received care and treatment in the obstetrics and gynecology department of a university hospital. Data were collected using the "Family and Newborn Identification Information Form" and "OKCAS," "The Kangaroo Care Comfort Scale (KCCS)," and "The Newborn Comfort Behavior Scale (COMFORTneo)." In the psychometric analysis of the scale, content validity, exploratory and confirmatory factor analysis, Cronbach's alpha coefficient, and McDonald's Omega coefficient were evaluated. Additionally, inter-observer reliability was determined using the Intraclass Correlation Coefficient (ICC).
Results: For OKCAS, $KMO = 0.955$ and Bartlett's test $\chi^2 = 1772.423$, $p < 0.001$ were found. As a result of Exploratory Factor Analysis, it was determined that the scale showed a single-factor structure; the eigenvalue was 6.259 and the total variance explained was 62.594%. In the confirmatory analysis, the model fit indices were calculated as $\chi^2 = 83.359$, $df = 35$, $\chi^2/df = 2.382$, $RMSEA = 0.070$, $NFI = 0.949$, $CFI = 0.970$, $IFI = 0.970$, $TLI = 0.961$, and $GFI = 0.944$. The scale has high internal consistency (Cronbach $\alpha = 0.928$; McDonald $\omega = 0.929$). Spearman-Brown = 0.928, Guttman = 0.925, and the two-half correlation is $r = 0.966$. The ICC value for agreement between two observers is 0.962.
Conclusions: Findings indicated that the developed scale is a valid and reliable tool. The scale will enable the objective assessment of the position in which kangaroo care is implemented effectively.
Implications for practice: During OKCAS kangaroo care, it determines the appropriate position for the comfort and health of the kangaroo caregiver and newborns.
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Introduction

Kangaroo care (KC) is a care method in which the baby is placed skin-to-skin on the chest of the mother or caregiver, wearing only a diaper. KC is widely recognized in the literature and in clinical practice as an important practice that supports the health and development of newborns (Cunningham et al., 2022; Suitor, 2023). Although KC was initially introduced as an intervention for preterm and low birth weight newborns, it is now recognized as a "safe, effective, and cost-effective" intervention for both preterm and term infants. Authors present some claims that need to be supported by appropriate references, for example: Although KC was initially introduced for preterm and low birth weight infants, accumulating evidence demonstrates that it is a safe and effective intervention for both preterm and term infants, with cost-effectiveness established in preterm and low birth weight populations (Akbari et al., 2018; Anchieta et al., 2025; Chan, Valsangkar, Kajeepeta, Boundy, and Wall, 2016). Recommended by the World Health Organization (WHO), KC supports infant physiological stabilization, reduces pain, hypothermia, and hospital length of stay, and promotes optimal development and parent–infant bonding (Küçükoğlu, Kurt, Özdemir, and Ozcan, 2021; Wang, Zhang, Ni, and Lv, 2022; WHO, 2003). In addition, KC enhances parental well-being and supports adaptation to the parenting role by strengthening caregiver–infant interaction (Cunningham et al., 2022; Garnica-Torres, Dias, and da Silva, 2024; Pathak, Sinha, Sharma, Mazumder, and Bhandari, 2023).

In KC practice, nurses' adequate knowledge and skills are essential for the effective and consistent implementation of the intervention (Almutairi, Gavine, and McFadden, 2024; Deng, Zhang, Li, Wang, and

☆ This study presented as an oral presentation at the 9th National, 5th International Mediterranean, and 4th International Pediatric Nursing Congress.

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https://doi.org/10.1016/j.pedn.2026.01.048
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Xu, 2018; Maniago, Almazan, and Albougami, 2020). However, there are some obstacles to the KC practice, and nurses' workload, time constraints, and lack of knowledge are among these obstacles (Cunningham et al., 2022; Dedecik and Arslan, 2023; Suitor, 2023). Various guidelines have been developed worldwide and, in our country, to establish the steps related to the "preparation, implementation, and termination" of KC and to ensure standardization in practice (Dedecik and Arslan, 2023; Nationwide Chidren's, n.d.; United Nations High Commissioner for Refugees (UNHCR), 2021). Guidelines enhance nurses' knowledge and skills in this area, thereby making clinical competence more effective and efficient (Nationwide Children's, n.d.; Dedecik and Arslan, 2023; UNHCR, 2021). However, the effectiveness of guidelines may remain limited unless clinical competence is supported by observational assessment in the clinic. Therefore, guides and protocols must be integrated with observational assessment scales (Cunningham et al., 2022; Dedecik and Arslan, 2023; Suitor, 2023).

Evaluating the quality of KC implementation is critical for improving the effectiveness and safety of the practice. In addition to safety considerations, accurate and comfortable KC positioning may contribute to infant regulation and dyadic interaction. Appropriate positioning may support the infant's physiological stability and behavioral organization while also enhancing caregiver comfort, which in turn may promote sustained skin-to-skin contact and more responsive caregiver–infant interaction. These relational and comfort-based dimensions are considered important components of high-quality KC and highlight the relevance of systematically assessing positioning quality (Dedecik and Arslan, 2023; Ogbeye, Ohaeri, Esan, and Ramos, 2025; Wang et al., 2022; Zengin and Çınar, 2019). However, in clinical settings, the assessment of whether KC is practiced in accordance with established standards is often based on individual observation, knowledge, and experience rather than on a standardized measurement tool. This subjective approach is particularly limiting given that specific, observable factors -such as the caregiver's ergonomic posture, physical comfort, and the infant's positioning during KC- directly influence the effectiveness of the practice (Nationwide Children's Hospital, n.d.; Dedecik and Arslan, 2023; UNHCR, 2021).

There are studies in the literature on the development of scales that evaluate the comfort, satisfaction, and physiological effects of KC practice (Cunningham et al., 2022; Dedecik and Arslan, 2023; Küçükoğlu et al., 2021; Zengin and Çınar, 2019). The Kangaroo Care Comfort Scale (KCCS) was developed to measure the comfort level experienced by caregivers during KC based on self-reporting (Zengin and Çınar, 2019); however, no studies have been found in the current literature that observationally evaluate the positional accuracy of KC practice (Cunningham et al., 2022; Suitor, 2023). To promote the widespread adoption and enhance the effectiveness of KC, it is necessary to develop a valid and reliable measurement tool that allows for the observational assessment of the practice. Positioning guides and observational assessment tools must be applied flexibly in accordance with family-centered and trauma-informed care principles, taking into account the cues given by the infant and the caregiver's physical comfort. Based on this, this study aims to examine the psychometric properties of OKCAS and determine its scientific validity and reliability. Thus, standardized implementation of KC across different clinical settings and caregivers may support continuity of practice quality, with OKCAS positioned as a supportive observational tool that complements clinical judgment rather than replacing it.

Method

Design

This research was conducted using a methodological design. The scale development process followed established methodological guidelines, including the stages of item generation, expert review for content validity, pilot testing, and statistical evaluation of construct validity and reliability. The methodological framework was primarily informed by DeVellis and Thorpe's (2021) scale development model and by Polit and Beck's (2020) recommendations for instrument development in nursing research. Furthermore, the evaluation and reporting of measurement properties were guided by the COSMIN guidelines, which were used as a methodological and reporting framework to ensure transparent and standardized assessment of validity and reliability (Mokkink et al., 2010).

Setting and sample

This study was conducted using a convenience sampling method with families of newborns who were diagnosed and treated in the obstetrics and gynecology department of a hospital in the Central Anatolia region of Türkiye between March and October 2025 and who met the inclusion criteria. Participants were families and newborns who (a) were between 35 and 42 weeks' gestational age, (b) had stable health and vital signs, (c) were eligible for KC, and (d) volunteered to participate. In scale development studies, a sample size of 5 to 10 participants was recommended for each item of the scale (DeVellis and Thorpe, 2021). A minimum of 50 participants were required to determine the psychometric properties of the 10-question OKCAS. According to the International Test Commission (2018), a minimum of 200 participants is required for factor analysis in scale validity and reliability studies. In accordance with these guidelines, this study was conducted with 562 kangaroo caregivers and newborns, excluding the 10 participants who participated in the pre-test. Fokkema and Greiff (2017) stated that if the sample size is large enough, both Exploratory Factor Analysis (EFA) and Confirmatory Factor Analysis (CFA) should be conducted on separate databases. Accordingly, to determine the construct validity of OKCAS, the sample was divided into two subsamples of 281 people using random number generation in SPSS. The first subsample was assigned to EFA, and the second subsample was assigned to CFA (Fokkema and Greiff, 2017).

Data collection tools

Data were collected between March and October 2025 using the "Family and Newborn Identification Form, Observational Kangaroo Care Assessment Scale (OKCAS), The Kangaroo Care Comfort Scale (KCCS) and The Newborn Comfort Behavior Scale (COMFORTneo)".

Family and newborn identification form

The form, prepared by the researchers in line with the literature, includes 11 questions regarding the kangaroo caregiver, mother's age, father's age, kangaroo caregiver's previous KC practice status, number of children in the family, baby's gender, mode of delivery, gestational week, postnatal age, birth weight, and nutritional status (Garnica-Torres et al., 2024; Küçükoğlu et al., 2021; Pathak et al., 2023).

OKCAS and development process

Framework and item development. Prior to initiating the scale development, a theoretical framework was constructed that brought together family-centered and child-centered care principles. This framework was aligned with the core elements of KC, emphasizing skin-to-skin contact, bonding, and the overall comfort of the newborn–caregiver dyad.

Item generation. In this context, a comprehensive literature review was conducted using major databases such as Web of Science, PubMed, Scopus, and Science Direct. Keywords such as "kangaroo care," "newborn," "caregiver," "comfort," "observational scale," "psychometric properties," and "validity and reliability" were used in the search process. Theoretical models and measurable components that could guide the development of the scale were taken into consideration (Conde-

Agudelo & Díaz-Rossello, 2016; WHO, 2003). Additionally, field interviews with neonatal nurses played a crucial role in developing the scale items. During these interviews, in-depth information was gathered about nurses' experiences, perceptions, and practices related to KC, which strengthened the theoretical framework of the scale. Data obtained from the field interviews were combined with relevant literature to create a pool of 10 items. Additionally, the scale includes a visual created by artificial intelligence (chatgpt and canva) showing the appropriate position for the kangaroo caregiver and baby. This visual was designed to function as both an instructional guide for kangaroo caregivers and a conceptual reference anchor for observers during OKCAS scoring, supporting consistent interpretation of positioning criteria across clinical settings. Minor positional adaptations may occur in practice based on infant cues and caregiver comfort, provided that safety criteria are maintained (Fig. 1). OKCAS was developed in line with an inductive approach, and the scale development steps are detailed in Fig. 2 (DeVellis and Thorpe, 2021).

Content validity. The draft form of the scale for the "scale items and visuals" created by reviewing existing scales, conceptual models, and practice guidelines on KC was evaluated by a total of 10 experts specializing in the field of Turkish language ($n = 1$). The scale items were evaluated using the Davis technique. As a result of the evaluation, the "*I-CVI*" value was 0.87. Turkish language ($n = 1$). The Davis technique was used to evaluate the scale items. The evaluation revealed that the "*I-CVI*" value was between 0.90 and 1.00, while the "*S-CVI*" value was 0.97. These results indicate a high level of consensus among the experts (Davis, 1992; DeVellis and Thorpe, 2021).

Face validity. To ensure the face validity of the scale, five neonatal nurses were asked to evaluate the extent to which each item reflected the behavior to be measured and the clarity of the wording. Based on expert opinions, the wording of some items was simplified, and items representing similar behaviors were combined. This step aimed to ensure that the scale was apparently fit for purpose and understandable to users.

Preliminary test. A preliminary study was conducted with 10 newborns and their families who met the sampling criteria but were not included in the main sample. As a result of this study, the scale items and visuals were determined to be understandable, and the scale was finalized. Subsequently, the scale was administered face-to-face to the families and newborns in the main sample during their time at the clinic during KC.

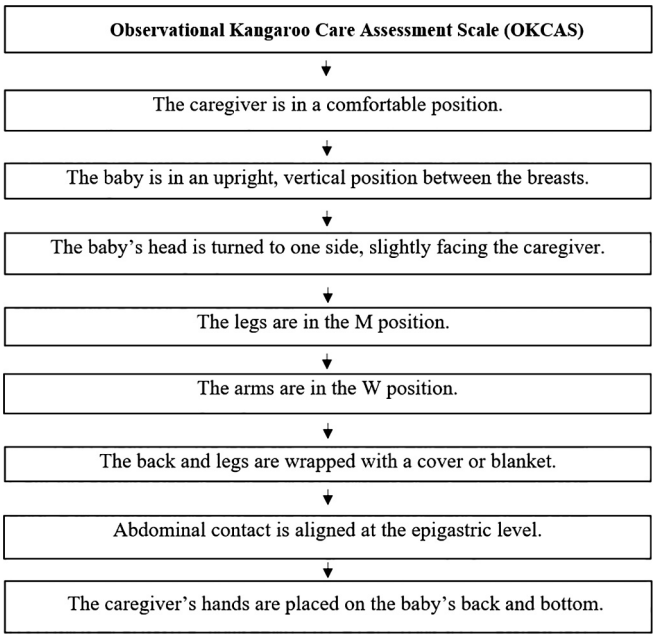

Fig. 1. Essential items for the correct kangaroo care position. M The legs of the infant are flexed toward the abdomen in a frog-like position; W The infant's arms are flexed on both sides of the head with the hands and elbows bent and positioned close to the body.

Reliability and validity analyses

As part of the validity and reliability studies of the scale, the 10-item scale was completed by two observers. Inter-observer reliability was assessed using the *Intraclass Correlation Coefficient (ICC); Single Measures ICC* = 0.56 (moderate reliability) was found for the measurements of a single observer, and *Average Measures ICC* = 0.962 (high reliability) was found for the average scores of two observers (Saeki, Tango, and Wang, 2016). Therefore, in factor analysis practice, the average scores of two observers were used for each item. The single-factor structure of the scale was explained by EFA and confirmed by CFA, and reliability analyses were performed. The relationship between the developed OKCAS and KCCS and COMFORTneo was examined to determine "criterion validity" (DeVellis and Thorpe, 2021).

Final scale description

The final version of the scale includes a visual illustrating the appropriate newborn position with the kangaroo caregiver, followed by 10 items assessing positioning accuracy. The items assess key positioning elements, including caregiver posture, the infant's vertical and midline alignment, head position, leg positioning, thermal coverage, caregiver hand support, and the infant's comfort during KC. The OKCAS, which has no reverse items, is scored on a 5-point Likert scale ranging from 1: Totally Inappropriate to 5: Totally appropriate. The lowest possible score on the scale is 10 and the highest is 50. An increase in score indicates that KC is being performed in the appropriate position and effectively. Although OKCAS was developed and tested in an obstetrics clinic, the fundamental positioning principles evaluated by the scale can be applied in different care settings. The scale can be used in neonatal intensive care units and postpartum wards, as well as for preterm and term infants, provided that observations are interpreted within the context of the infant's clinical condition and tolerance. Similarly, OKCAS is designed for use with different types of KC providers, including mothers, fathers, and other primary caregivers, without any changes to the scale structure. In this context, OKCAS maintains the standardized observation framework, supports reproducibility without compromising the integrity of the instrument, and can be flexibly applied in different settings. The Observational Kangaroo Care Assessment Scale (OKCAS) is provided as a supplementary file (Supplementary File 1).

The kangaroo care comfort scale (KCCS)

The KCCS, developed by Zengin and Çınar (2019), assesses the comfort levels of individuals providing KC. The scale includes 17 items scored on a 5-point Likert format. It comprises two dimensions: Increased Comfort (items 1–13, positively worded) and Discomfort (items 14–17, negatively worded). Total scores range from 17 to 85, with higher scores reflecting greater perceived comfort. In the original validation study, the Cronbach's alpha value was reported as 0.872; in the present study, internal consistency was calculated as 0.925.

The newborn comfort behavior scale (COMFORTneo)

The comfort scale originally created by Ambuel, Hamlett, Marx, and Blumer (1992) was later adapted by Van Dijk et al. (2009) into the COMFORTneo scale, followed by its psychometric evaluation. The Turkish adaptation by Kahraman, Başbakkal, and Yalaz (2014) confirmed the scale's validity and reliability. The instrument consists of seven observational parameters: muscle tone, alertness, facial tension, calmness/agitation, body movements, respiratory response, and crying. This Likert-type tool is used to assess comfort, pain, and distress

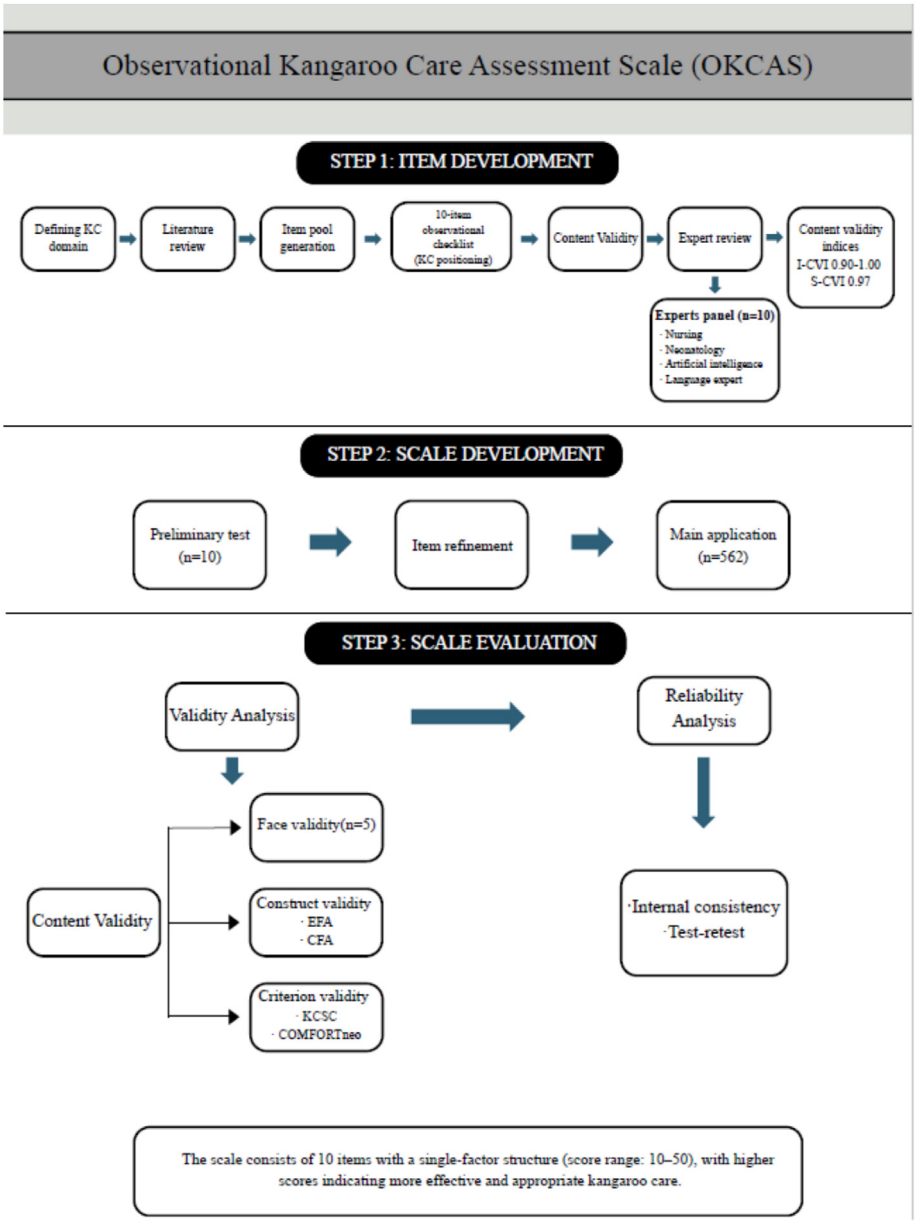

Fig. 2. Research process.

levels in infants receiving care in the NICU. Scores range from 6 to 30, with higher scores reflecting decreased comfort. Kahraman et al. (2014) reported Cronbach's alpha values between 0.82 and 0.85, whereas the current study yielded a Cronbach's alpha coefficient of 0.588.

Data collection

Data collection was conducted in the obstetrics department of the hospital where the study was to be carried out between March and October 2025, following the approval of the ethics committee and the institution. First, participants who met the inclusion criteria were informed about the study by the researcher, and their verbal and written consent was obtained through the "Informed Consent Form." The researcher interviewed the family and the primary nurse of the newborn in the clinic and recorded the identifying information of the family and the newborn on the information form. After this stage, the visual display of the scale developed for KC was shown in the patient room, and skin-to-skin contact was established between the newborn and the caregiver. KC guidelines support KC being performed for as long as possible, without time restrictions. A review of the literature emphasizes that KC should be performed for at least 60 min (Conde-Agudelo & Díaz-Rossello, 2016; WHO, 2003). Therefore, in this study, the KC practice lasted 60 min, and measurements were taken in the middle of the KC practice, i.e., at the 30th minute. Since OKCAS is an observation-based measurement tool, there is a risk of observer bias. To prevent this risk, the data must be evaluated by two independent observers, and then the inter-observer agreement must be determined (Saeki et al., 2016). Therefore, OKCAS data were collected independently by the researcher and clinical nurse, and consistency between the two observers was evaluated. This was done to minimize the risk of bias and ensure the scientific validity and reliability of the study. Prior to data collection, both observers participated in a brief calibration process to enhance scoring consistency. During this process, observers examined both the OKCAS guidelines and a visual representation demonstrating the correct KC position. The observers

practiced scoring during the pilot phase, during which observations were conducted together and discussed to ensure a shared understanding of the assessment criteria. No changes were made to the scoring rules during the data collection phase, and all observations were completed independently to allow for an objective assessment of inter-observer agreement. Additionally, to ensure consistent scoring in borderline or transitional position situations, predefined decision rules were followed by observers during the OKCAS assessment. If the infant returned to an appropriate position within a short observation period, minor, transient infant movements or brief caregiver adjustments were not scored as position errors. Scoring was based on the predominant position observed throughout the assessment interval rather than momentary deviations. In cases where the position remained unclear, observers made decisions based on standardized visual and item definitions. These decision rules were reviewed during the calibration phase to support consistent application of the scale across observations.

The visual representation of the appropriate KC position found in OKCAS was standardized prior to data collection. The visual was introduced during the observer orientation and calibration phase to support a common understanding of the item definitions and optimal position. During data collection, the visual was not constantly referred to during scoring; instead, it served as a conceptual reference rather than a direct scoring template. Furthermore, to support correct positioning and ensure caregivers understood the recommended posture during KC, the same visual was shown to kangaroo caregivers prior to observation. Accordingly, the visual was intended to serve as both an educational tool for caregivers and a conceptual scoring basis for observers, supporting consistent interpretation of positioning criteria and enabling observers to apply their clinical judgment during real-time assessment. To evaluate the test-retest reliability of OKCAS, the scale was repracticed to a subgroup of 35 participants 24 h after the first practice. A 24-h interval was chosen due to the short hospital stay of caregivers and newborns. This period was considered a time frame during which clinical conditions and individuals' situations could remain unchanged (Kennedy, 2022).

Kangaroo care practice

The KC practice was carried out in three stages: preparation, implementation, and recording. During the preparation stage, the kangaroo caregiver was informed about the purpose, duration, and benefits of KC, and hygiene and clothing requirements were ensured. The newborn's vital signs, such as body temperature, heart rate, and respiratory rate, were assessed, and necessary materials, such as hats and blankets, were prepared. The room temperature was set to 24–26 °C, and noise and light were reduced to create a suitable environment for KC. In the implementation phase, the baby's general condition was first checked, and their clothing and position were adjusted. Then, paying attention to the positions specified in the developed scale, the transfer to the kangaroo caregiver was carried out. After the baby was placed, his back was covered with a blanket, and the kangaroo caregiver was asked to support the baby's back with one hand and bottom with the other. The baby's vital signs were checked every 30 min. The baby was allowed to receive KC in this position for 60 min, and at the 30-min mark, the position and comfort of the baby and the kangaroo caregiver were assessed. This timing was chosen to capture positioning quality after the initial adaptation period, when both the infant and caregiver had settled into the KC position. In addition, the 30-min time point was considered clinically feasible within routine care workflows, allowing standardized observation without disrupting ongoing clinical practice (Boundy et al., 2016). When 60 min were completed, KC was terminated if the caregiver wished, and the baby was gently removed from the kangaroo caregiver's chest and placed in the cot. After the baby was placed, its vital signs and general condition were assessed (Conde-Agudelo & Díaz-Rossello, 2016; Küçükoğlu et al., 2021; WHO, 2003).

Data analysis

Data analysis was carried out using IBM SPSS 26.0 and AMOS 23.0. Descriptive analyses included the calculation of means, standard deviations, frequencies, and percentages. Group comparisons were performed using the Student's *t*-test for two-group comparisons and one-way analysis of variance (ANOVA) for comparisons involving more than two groups. Post hoc Tukey tests were conducted following significant ANOVA results, and Bonferroni correction was applied to adjust for multiple comparisons. For the evaluation of the scale's factor structure, the dataset of 562 participants was randomly split into two subsamples of 281 participants through SPSS. EFA was conducted on the first subsample, while the factor structure was verified through *CFA* on the second. Prior to factor analyses, the correlation matrix, Kaiser–Meyer–Olkin (*KMO*) measure, and Bartlett's Test of Sphericity were examined to assess the suitability of the data. In the *CFA*, model fit was evaluated using several fit indices, including Chi-square/degrees of freedom (χ^2/df), Root Mean Square Error of Approximation (*RMSEA*), Standardized Root Mean Square Residual (*SRMR*), Incremental Fit Index (*IFI*), Goodness of Fit Index (*GFI*), Comparative Fit Index (*CFI*), Relative Fit Index (RFI), Tucker–Lewis Index (*TLI*), and Normed Fit Index (*NFI*). Criterion validity was assessed by examining the relationship between OKCAS and both KCCS and COMFORTneo using Pearson correlation coefficients. Reliability analyses included Cronbach's alpha, Guttman split-half and Spearman–Brown coefficients, item–total correlations, ICC, and a test–retest procedure. No missing data were identified in the dataset. A 95% confidence interval was used, and statistical significance was set at $p < 0.05$.

Ethical considerations

Prior to the study, ethical approval was obtained from the Scientific Research Ethics Committee of Health Sciences at a university on March 11, 2025, under number 2025–05/64, and institutional approval was obtained from the Training and Research Hospital where the study was conducted. After verbally and in writing informing the families of newborns who met the inclusion criteria about the study and its purpose, the protection of their privacy and confidentiality, and their right to withdraw from the study at any time, informed consent was obtained from the families using an “Informed Consent Form.”

Results

Participant characteristics

Among the kangaroo caregivers, 67.3% were mothers, 79% had not previously practiced KC, and 41.3% of the families had one child. Among newborns receiving KC, 52.5% were female, 52% were delivered vaginally, 44.3% were 3 days old, and 82.1% were breastfed. The average maternal age of newborns was 27.85 ± 5.29 years, the average paternal age was 30.87 ± 5.69 years, the average gestational age is 38.46 ± 1.40 weeks, the average postnatal age is 2.10 ± 0.87 days, and the average birth weight is 2.10 ± 0.87 g. It was found that the total average scores for OKCAS and KCCS among kangaroo caregivers who had previously practiced KC were higher than those who had not practiced it ($p < 0.001$). It was determined that the kangaroo caregiver's previous KC practice status, the number of children in the family, the baby's postnatal age (days), and the baby's feeding status had an effect on the OKCAS, KCCS, and COMFORTneo total score averages of newborns ($p < 0.05$). Post hoc Tukey analyses revealed that the mean total scores of mothers on the OKCAS and KCCS were significantly higher than those of the other groups ($p < 0.05$). It was determined that the mean total OKCAS and KCCS scores of families with one or two children were significantly higher than those with three or more children; that the mean total OKCAS and KCCS scores of infants who were 3 days old were significantly

higher than those in the other age groups; and that infants who were exclusively breastfed had significantly higher mean total OKCAS and KCCS scores than those who were mixed-fed ($p < 0.05$). It was found that the COMFORTneo total score average of newborns in the group that had previously used KC was lower than that of newborns in the group that had not used KC ($p < 0.001$). The COMFORTneo total score average was found to be significantly lower in newborns in the groups of "kangaroo caregiver mothers, families with two children, 2- and 3-day-old infants, and breastfed infants" compared to other groups ($p < 0.05$) (Table 1).

Validity analysis

Construct validity

Exploratory factor analysis. To examine construct validity, data obtained from participants were randomly divided into two subsamples of 281 individuals using SPSS, and *EFA* was practiced to the first subsample. OKCAS had a *KMO* coefficient of 0.955 and a *Bartlett test* value of 1772.423 with $p < 0.001$. These findings indicate that the sample is perfectly suitable for factor analysis. According to the *EFA* results, the scale was determined to have a single-factor structure. The eigenvalue of the single factor is 6.259, explaining 62.594% of the total variance. The factor loadings of the scale items were found to be acceptable, ranging from 0.657 to 0.848, and the communalities ranged from 0.431 to 0.719. These findings indicate that the scale has a unidimensional and robust factor structure (Table 2).

Confirmatory factor analysis. To validate the single-factor structure obtained with EFA, CFA was practiced to the second subsample. CFA results confirm the single-dimensional structure of the scale. When examining the model's fit indices, $\chi^2 = 83.359$, $df = 35$, and $\chi^2/df = 2.382$ were found. This value indicates an acceptable level of fit. The other fit indices are as follows: *RMSEA* = 0.070, *SRMR* = 0.033, *NFI* = 0.949, *CFI* = 0.970, *IFI* = 0.970, *TLI* = 0.961, *GFI* = 0.944, and *RFI* = 0.935. These values indicate that the CFA model generally fits well (Table 3). The standardized factor loadings of the items range from 0.34 to 0.70, and the factor loadings were found to be significant according to the *t*-test ($p < 0.001$) (Fig. 3).

Criterion validity

The relationship between OKCAS and KCCS and COMFORTneo, developed within the scope of criterion validity, was examined. According to pairwise comparisons, a positive and strong relationship was found between OKCAS and KCCS total scores ($r = 0.754$, $p < 0.001$). In contrast, a negative and strong relationship was also found between the COMFORTneo total score and OKCAS ($r = -0.668$, $p < 0.001$) and KCCS ($r = -0.803$, $p < 0.001$). This finding is consistent with low scores on the COMFORTneo Scale reflecting increased comfort levels, while high scores on the other scales reflect increased comfort (Table 4).

Reliability analysis

Internal consistency reliability

The Cronbach's alpha coefficient ($\alpha = 0.928$) and McDonald's Omega ($\omega = 0.929$) values, which indicate the internal consistency of

Table 1
Comparison of the mean total scores of the OKCAS, KCSC, and COMFORTneo Scale according to the participants' descriptive characteristics ($n = 562$).

Characteristics	*n* (%)		*Mean ± SD*	
Gender		Mother's age	27.85 ± 5.29	
Female	295 (52.5)	Father's age	30.87 ± 5.69	
Male	267 (47.5)	Gestational age	38.46 ± 1.40	
Mode of delivery		Postnatal age	2.10 ± 0.87	
Cesarean	270 (48.0)	Baby's birth weight	2.10 ± 0.87	
Vaginal	292 (52.0)			
		Total OKCAS	Total KCSC	Total COMFORTneo
		Mean ± SD	*Mean ± SD*	*Mean ± SD*
		46.44 ± 3.94	78.64 ± 6.60	7.77 ± 1.70
Kangaroo caregiver				
Mother	378 (67.3)	47.81 ± 3.01[d]	80.77 ± 4.77[c]	7.21 ± 1.39[a]
Father	80 (14.2)	43.21 ± 4.09[c]	75.08 ± 4.51[b]	8.87 ± 1.30[b]
Grandmother	69 (12.3)	45.12 ± 4.15[b]	75.24 ± 10.31[b]	8.50 ± 1.97[b]
Aunt	35(6.2)	41.60 ± 3.07[a]	70.51 ± 5.95[a]	9.91 ± 1.65[c]
Test value, *p*-value		F: 73.849; $p < 0.001$	F: 58.316; $p < 0.001$	F:63.016; $p < 0.001$
Kangaroo caregiver's previous KC practice status				
Yes	118 (21.0)	49.13 ± 2.43	83.91 ± 3.15	7.21 ± 1.39
No	444 (79.0)	45.72 ± 3.96	77.25 ± 6.57	8.87 ± 1.30
Test value, *p*-value		t: 11.654; $p < 0.001$	t: 15.641; $p < 0.001$	t: −9.820; $p < 0.001$
Number of children in the family				
1	232 (41.3)	46.58 ± 4.07[b]	78.84 ± 7.12[b]	7.82 ± 1.76[ab]
2	199 (35.4)	46.95 ± 3.56[b]	79.44 ± 5.42[b]	7.50 ± 1.51[a]
3 or above	131 (23.3)	45.40 ± 4.08[a]	77.09 ± 7.05[a]	8.09 ± 1.82[b]
Test value, *p*-value		F: 6.490; *p*: 0.002	F: 5.275; *p*: 0.005	F: 4.869; *p*:0.008
The baby's postnatal age (days)				
1	191 (34.0)	45.38 ± 4.16[a]	76.77 ± 7.84[a]	8.17 ± 1.91[b]
2	122 (21.7)	45.66 ± 4.21[a]	78.60 ± 6.86[b]	7.73 ± 1.68[a]
3	249 (44.3)	47.63 ± 3.26[b]	80.10 ± 4.87[b]	7.48 ± 1.47[a]
Test value, *p*-value		F: 22.118; $p < 0.001$	F: 14.427; $p < 0.001$	F: 9.176; $p < 0.001$
The baby's nutritional status				
Breast milk	461 (82.1)	46.70 ± 3.71[b]	79.11 ± 5.47[a]	7.68 ± 1.60[b]
Formula milk	16 (2.8)	45.56 ± 4.33[ab]	77.75 ± 7.37[ab]	8.25 ± 2.11[ab]
Mixed feeding	85 (15.1)	45.15 ± 4.78[a]	76.31 ± 10.52[b]	8.15 ± 2.07[a]
Test value, *p*-value		F: 6.051; *p*: 0.003	F: 6.702; $p < 0.001$	F: 3.302; *p*: 0.038

SD: Standard Deviation; *t*: Student t-test; *F*: One-Way Analysis of Variance (ANOVA); $p < 0.05a < b < c < d$.
OKCAS: Observational Kangaroo Care Assessment Scale, KCSC: The Kangaroo Care ComfortScale, COMFORTneo: The Newborn Comfort Behavior Scale, Values are presented as raw mean ± standard deviation.

Table 2
factor loadings from exploratory factor analysis ($n = 281$).

Items	Factor	Communalities
Item 1. The person providing kangaroo care sits in a comfortable position at a 30 or 45 degree angle.	0.848	0.719
Item 2. The baby is placed vertically between the caregiver's breasts so that there is skin-to-skin contact.	0.835	0.697
Item 3. The baby's head is turned to the right or left so that the caregiver can see the baby slightly.	0.822	0.676
Item 4. Avoid flexion of the baby's head forward and hyperextension backward.	0.774	0.599
Item 5. The baby's legs are flexed toward the abdomen in a frog position (M position).	0.785	0.615
Item 6. The baby's arms are flexed on either side of the head in a W position (hands and elbows bent, close to the body).	0.748	0.560
Item 7. The baby's back and legs are wrapped in a blanket or cover to prevent them from getting cold.	0.657	0.431
Item 8. The baby's abdomen is at the level of the kangaroo caregiver's epigastric region (to allow for comfortable abdominal breathing).	0.818	0.669
Item 9. The kangaroo caregiver gently supports the baby through the blanket, with one hand on the baby's back and the other on the baby's hips.	0.797	0.636
Item 10. The baby appears calm, peaceful, and comfortable during kangaroo care.	0.810	0.657
Eigenvalues	6.259	
Explained total variance (%)	62.594	
KMO coefficient	0.955	
Barlett test	1772.423 ($p < 0.001$)	

Table 3
Goodness of fit indices for confirmatory factor analysis ($n = 281$).

Models/Data-model fit indices	One-factor model	Acceptable fit values
χ^2	83.359	
df	35	
χ^2/df	2.382	<5
RMSEA	0.070	Root Mean Square Error of Approximation, indicates good fit (≤ 0.08)
sRMR	0.0336	<0.1
NFI	0.949	Normed Fit Index, indicates excellent fit (≥ 0.90)
CFI	0.970	Comparative Fit Index, indicates excellent fit (≥ 0.90)
IFI	0.970	Incremental Fit Index, indicates excellent fit (≥ 0.90)
TLI	0.961	Tucker-Lewis Index, indicates good fit (≥ 0.90)
GFI	0.944	Goodness of Fit Index, indicates good fit (≥ 0.90)
RFI	0.935	Relative Fit Index, indicates good fit (≥ 0.90)

Reliability analyses of the scale						
		Split into two halves				
Scale total	*Cronbach's α*	*First half of Cronbach's α*	*Second half of Cronbach's α*	*Spearman–Brown*	*Guttman split-half*	*Correlation between two halves*
	0.928	0.888	0.841	0.928	0.925	0.966

Notes: χ^2 = Chi-square; df = Degrees of Freedom; RMSEA = Root Mean Square Error of Approximation; SRMR = Standardized Root Mean Square Residual; NFI = Normed Fit Index; CFI = Comparative Fit Index; IFI = Incremental Fit Index; TLI = Tucker-Lewis Index (also known as NNFI, Non-Normed Fit Index); GFI = Goodness of Fit Index; RFI = Relative Fit Index.

the scale, demonstrate a high level of reliability. McDonald's Omega provides additional data on the scale's reliability, as it considers factor loadings without assuming equal contribution from each item (Hayes and Coutts, 2020; Kalkbrenner, 2024). The Cronbach alpha values of 0.728 and 0.858 for the first and second halves of the scale, respectively, in the split-half reliability results demonstrate the scale's reliability. The *Spearman-Brown* coefficient of 0.928 and the *Guttman split-half coefficient* of 0.925 support the consistent results obtained from the two halves of the scale. The correlation between the two halves is 0.966, indicating a high level of positive relationship. These results confirm that OKCAS has a high level of internal consistency (Table 3).

The mean and standard deviation of each item, the adjusted item-total correlations, and Cronbach's alpha coefficients when the relevant item was removed are examined in Table 5. The adjusted item-total correlations of the items ranged from 0.576 to 0.793, and all values were at an acceptable level. Cronbach's α values when the item is removed range from 0.917 to 0.929, indicating that removing any item does not significantly increase the reliability of the scale. ICC coefficient indicated excellent reliability for the overall scale. The ICC for average measures was 0.93 (95% CI [0.92, 0.94], $p < 0.001$), demonstrating a high level of agreement across items.

Test-retest reliability

OKCAS was re-administered to a subgroup of 35 participants 24 h after the initial practice to assess test-retest reliability and the scale's stability over time. No significant difference was found between the mean total scores of the first administration (46.51 ± 3.57) and the second administration (47.05 ± 2.33) ($t = -1.705$, $p > 0.05$). Furthermore, the correlation between the two measurements was found to be positive and strong ($r = 0.879$, $p < 0.001$). When examined at the item level, the test-retest correlation coefficients ranged from 0.519 to 0.863 (Table 5). These results indicate that OKCAS has strong test-retest reliability and remains stable and consistent over time.

Discussion

Evaluating the practice position in which KC is effectively performed using reliable and valid measurement tools is critical for strengthening evidence-based practices in newborn care (Cunningham et al., 2022; Dedecik and Arslan, 2023; Küçükoğlu et al., 2021; Suitor, 2023). While existing guidelines and structured approaches, including those proposed by the World Health Organization and recent studies, address the assessment of KC positioning, there remains a need for standardized, observational, scale-based measurement tools (Cunningham et al., 2022; Ogbeye et al., 2025). The Observational Kangaroo Care Assessment Scale (OKCAS), developed within the scope of this study, is a valid and reliable instrument designed to observationally assess KC practice and determine whether the caregiver and newborn are positioned appropriately within the Turkish context.

The two criteria used in the evaluation of measurement tools are validity and reliability. Validity refers to the degree to which a scale accurately measures the characteristic it is intended to measure, while

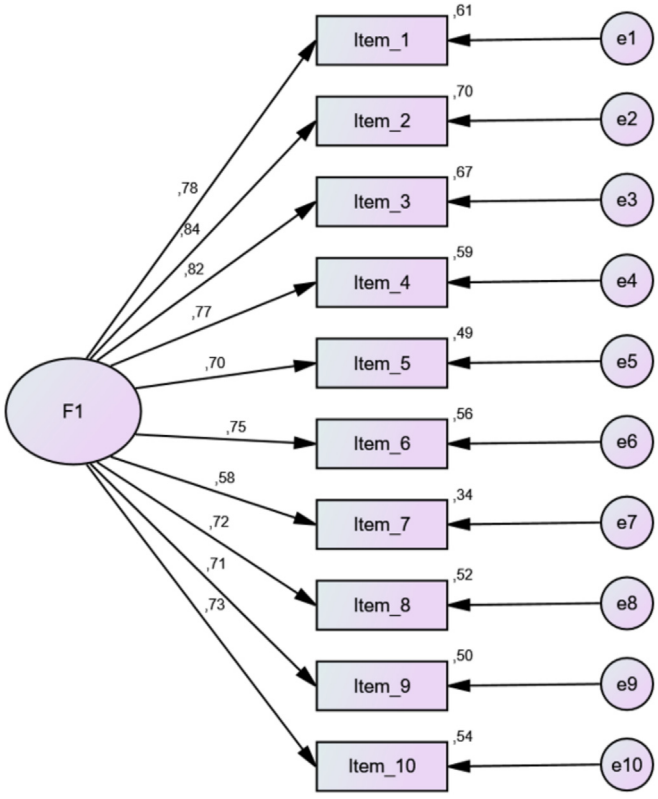

Fig. 3. Confirmatory factor analysis.

Table 4
Criterion validity: Correlation between GKBDÖ, KCSC and COMFORTneo scores.

	KCSC		COMFORTneo	
	r	*p*	*r*	*p*
OKCAS	0.754	< 0.001	−0.668	<0.001
KCSC			−0.803	<0.001

r: Pearson's Correlation Coefficient, OKCAS: Observational Kangaroo Care Assessment Scale, KCSC: The Kangaroo Care ComfortScale, COMFORTneo: The Newborn Comfort Behavior Scale.

reliability refers to the ability to consistently measure the characteristic under different conditions (DeVellis and Thorpe, 2021). The content validity of OKCAS has been established through expert reviews. Researchers aimed to determine whether the draft scale items accurately represented the concept to be measured. After conducting a detailed literature review on KC, OKCAS was evaluated by 10 experts in the field for content validity. The content validity of the scale was assessed using the Davis Technique, where each item was rated on a scale of 1 to 4. The high content validity indices indicates strong expert agreement regarding the relevance and clarity of the items, supporting the content validity of OKCAS. Since no item had an "*I-CVI*" value below 0.80, no items were excluded (Davis, 1992; DeVellis and Thorpe, 2021; Polit and Beck, 2020). The scale has been finalized in accordance with the recommendations of experts, and it has been determined that the visual and scale items are suitable for assessing the position of the kangaroo caregiver and the newborn. The psychometric evaluation of OKCAS was supported by an adequate sample size, strong content validity established through expert review and pre-testing, split-sample EFA and CFA, and high reliability demonstrated across multiple internal consistency and inter-rater reliability indices. These results underscore the methodological strength of the scale.

Validity analysis

Construct validity is one of the most fundamental indicators of the extent to which a measurement tool accurately and consistently reflects its intended characteristic (Çarkçı, 2020). The two most commonly used methods for this purpose are EFA and CFA (Balcı, 2025; DeVellis and Thorpe, 2021). When performing factor analysis, the "*KMO* coefficient and *Bartlett test*" are evaluated first. A *KMO* value above 0.60 and a significant *Bartlett test* result indicate that the sample size is sufficient for factor analysis (Esin, 2021). In this study, the *KMO* value was 0.955 and the *Bartlett test* result was significant which supports that the data is perfectly suitable for factor analysis.

The *EFA* results showed that the factor loadings ranged from 0.657 to 0.848, supporting the single-factor structure of the scale, and explained 62.594% of the total variance. In the literature, factor loadings of 0.50 and above are considered "practically meaningful" or "good," while values of 0.60 and above are considered "very good" (Field, 2018; Hair, Black, Babin, and Anderson, 2019; Özdamar, 2016; Tabachnick and Fidell, 2019). In the current study, the fact that the lowest factor loading is above 0.60 indicates that each item on the scale strongly represents the measured single-factor structure. Furthermore, the total variance ratio, which indicates the explanatory power of the scale, is also considered a noteworthy finding. It is known that the total variance ratio explained for single-factor structures is acceptable between 40% and 60% (Field, 2018; Hair et al., 2019; Özdamar, 2016; Tabachnick and Fidell, 2019). The total variance ratio of in the current study exceeds the acceptable level specified in the literature. This proves that OKCAS can explain the variability in the observations related to the KC practice it measures at a high level on its own.

CFA results also confirm the single-factor structure. According to CFA results, OKCAS shows strong model fit across multiple indices. The χ^2/df ratio of 2.382 is well below the 5 threshold recommended in the literature, indicating robust model fit (DeVellis and Thorpe, 2021). The literature defines *RMSEA* as a measure that accounts for approximation error

Table 5
Item-level correlations and test-retest reliability ($n = 562$).

Items	Mean ± SD	Corrected item total score correlation (r)*	Cronbach's alpha if item deleted	Test-retest correlation of items (r)* ($n = 35$)
Item 1	4.63 ± 0.51	0.770	0.918	0.778
Item 2	4.64 ± 0.51	0.793	0.917	0.639
Item 3	4.60 ± 0.52	0.777	0.918	0.863
Item 4	4.58 ± 0.52	0.724	0.921	0.591
Item 5	4.60 ± 0.50	0.697	0.922	0.611
Item 6	4.64 ± 0.48	0.705	0.922	0.603
Item 7	4.66 ± 0.52	0.576	0.929	0.796
Item 8	4.62 ± 0.51	0.733	0.920	0.791
Item 9	4.69 ± 0.48	0.711	0.921	0.519
Item 10	4.72 ± 0.46	0.730	0.921	0.625
Total	46.44 ± 3.94			0.879

SD: standard deviation. *$p < 0.01$.

in the population and evaluates the lack of fit according to the degree of freedom. Values between 0.05 and 0.08 are considered acceptable for model fit to data, while values close to zero indicate excellent fit (Browne and Cudeck, 1993; Ho, 2013; Kenny, Kaniskan, and McCoach, 2015). In the current study, *SRMR* is below the threshold value of 0.10 recommended in the literature, indicating acceptable model fit. Furthermore, all of *NFI, CFI, IFI, TLI, GFI*, and *RFI* exceed the 0.94 criterion and indicate excellent model fit (Ho, 2013; Marsh, Guo, Dicke, Parker, and Craven, 2020; Sathyanarayana and Mohanasundaram, 2024). In this regard, it is clear that OKCAS has a robust factor structure and high construct validity for assessing the position of KC providers and newborns in the Turkish population.

The kangaroo caregiver and the appropriate position of the newborn are important determinants of comfort. Factors such as the caregiver's "ergonomic posture, physical comfort, and the newborn's position" during KC directly affect comfort (Fernández-Medina et al., 2024; Montealegre-Pomar, Bohorquez, and Charpak, 2020). In the study, within the scope of criterion validity, OKCAS was found to have a high and significant correlation with KCCS and COMFORTneo. In this context, the fact that the scale shows a significant correlation with other measurements considered to be related to the concept it measures supports that the developed scale provides criterion validity. Following the evaluation of validity evidence, the reliability of OKCAS was examined to determine the consistency and stability of the scale across measurements.

Reliability analysis

Since OKCAS is an observation-based measurement tool, inter-observer consistency is one of the most critical factors in determining the reliability of the measurement. In observation-based measurements, it is necessary to prevent bias that may arise from the subjective judgments of researchers (Ahmad, Alias, Hamat, and Mohamed, 2024; Kalkbrenner, 2024). In the current study, OKCAS was completed by two independent observers. An ICC analysis was conducted to determine the agreement between the two observers' assessments, and it was found that the Average Measures value indicated high reliability. This indicates that using the average of two observers in the current study supports reliability by preventing individual observer bias and maximizing measurement consistency. The internal consistency of the scale was evaluated to examine the reliability of OKCAS. Internal consistency is commonly used to evaluate reliability in Likert-type scales. Cronbach's alpha coefficient, which indicates the internal consistency of scale items, ranges from 0 to 1, and a value close to 1 is considered to indicate high internal consistency (Ahmad et al., 2024). In the present study, Cronbach's alpha coefficient was determined to be 0.928. Considering that the Cronbach's alpha coefficient in this study is between 0.80 and 1.00, it can be concluded that the scale has a high level of internal consistency (Aksoy, Doğan, Bolacali, and İnci, 2025; Karagöz, 2019). The McDonald's omega coefficient further supported the strong internal consistency of the scale. These results indicate that the scale has a high level of internal consistency (Hayes and Coutts, 2020; Kalkbrenner, 2024).

The values obtained from the "Split-Half" analysis (Spearman-Brown; Guttman split-half) show consistent results for both halves of the scale, strengthening the evidence of internal consistency. The high level of correlation between the two halves supports the stable structure of the scale. These findings indicate that the scale is highly reliable and that the items sufficiently cover the relevant topic. There is also consistency between the items (Karagöz, 2019; Kartal & Bardakçı, 2018). Consistent with the literature indicating that item–total correlation coefficients of 0.30 and above reflect adequate item–scale consistency (Karagöz, 2019), the high item–total correlations observed in this study further support the internal coherence of OKCAS. This supports that each item in the scale contributes homogeneously to the structure to be measured and that each item is consistent with the scale as a whole. The test-retest method is evaluated using Pearson Correlation analysis in reliability analyses addressing the continuity of the scale over time. The proximity of the correlation coefficient obtained in the test result to 1 indicates high reliability (Kennedy, 2022). In the current study, OKCAS was practiced to a group of 35 people at 24-h intervals due to the short hospital stay of caregivers and newborns. It was determined that there was no statistically significant difference between these two measurements and that they showed a high correlation.

Although the primary focus of this study was the psychometric evaluation of OKCAS, caregiver-related differences observed in the Results warrant brief contextual consideration. In the present study, OKCAS scores were higher among mothers compared to other caregiver groups. This finding should be interpreted cautiously, as it may reflect differences in prior caregiving experience, frequency of participation in KC, access to institutional support, or exposure to education within clinical settings, rather than inherent differences in caregiving ability. Cultural norms and caregiving roles may also influence familiarity with KC practices. Interpreted within a family-centered and trauma-informed care framework, these findings highlight the importance of providing equitable support and education to all caregivers involved in KC. After establishing the reliability of the scale, it is important to consider the strengths and limitations of the study to contextualize these findings.

Strengths and limitations

The strengths of this study include a large and adequate sample size and the use of multiple methods in the validity and reliability analyses of the scale. The strengths of this study include a large and adequate sample size and the use of multiple methods in the validity and reliability analyses of the scale. In particular, the scale was developed and tested using split samples, with exploratory and confirmatory factor analyses conducted to strengthen construct validity. In addition, multiple reliability indicators were examined, including internal consistency, inter-observer reliability, and test–retest reliability. Together, these methodological features enhance the rigor of the psychometric evaluation and support the stability and reliability of OKCAS across assessments. The development of the OKCAS item pool based on a comprehensive literature review, input from neonatal intensive care nurses working in the field, and the development of a previously undeveloped scale in this area are among the strengths of the study. The inclusion of both visual and item-based components in OKCAS represents an important strength, as it enables clinical staff and researchers to observationally assess whether KC is being performed appropriately, thereby addressing a notable gap in the literature. In addition, the short length of the scale, its observational format, and the use of a clear visual aid enhance the clinical feasibility and usability of OKCAS, facilitating rapid and practical application in real-world settings, including busy neonatal intensive care units and postpartum wards. Beyond assessment purposes, these features also support the use of OKCAS as a training and coaching tool for clinicians and caregivers. One of the key strengths of this study is its explicit observational focus. OKCAS addresses an important gap in the literature by providing a structured observational tool specifically designed to assess the quality of KC positioning. Unlike existing instruments that primarily rely on physiological indicators or caregiver self-report, OKCAS enables direct observation of positioning practices during KC. This approach offers a novel and clinically meaningful perspective for evaluating the quality of kangaroo. In addition, the inclusion of mothers, fathers, and other caregivers represents an important strength of the study, as it supports the applicability of OKCAS beyond maternal-only care and aligns with family-centered care principles. Furthermore, OKCAS supports the standardization of KC positioning assessment while also promoting quality improvement by translating existing guidelines into a structured, observable framework that can be readily applied at the bedside. In this way, the scale helps bridge the gap between recommended practices and routine clinical care.

However, the study also has some limitations. The use of a random sampling method in including kangaroo caregivers and newborns in

the study limits the generalizability of the findings to all KC providers. This study was conducted in a single hospital maternity ward and included term and late preterm infants. Therefore, the psychometric properties of OKCAS have not yet been established in NICU settings or among more medically complex or extremely preterm infants. Further studies are needed to examine the applicability of OKCAS in different clinical settings and infant populations. OKCAS focuses on standardized KC positioning criteria; alternative or adaptive approaches (e.g., lateral positioning) were not evaluated and warrant future research. In this observational scale study, while inter-observer reliability is strong, it should be noted that the presence of observers during KC may have influenced caregiver behavior (Hawthorne effect). Furthermore, the short length of stay for mothers and newborns in the postpartum period, resulting in a 24-h waiting period for retesting, is another limitation of this study and limits conclusions regarding the longer-term stability of the scale. In the current study, another limitation is that the internal consistency coefficient obtained for COMFORTneo (Cronbach $\alpha = 0.588$) is lower than the values reported in previous validation studies. This may be due to the relatively homogeneous comfort levels of infants during KC sessions, an environment where COMFORTneo score variability may be limited. Importantly, COMFORTneo was used only for criterion-related comparison, and primary validity and reliability analyses focused on OKCAS. In this study, the fact that mothers constitute the majority of kangaroo caregivers limits the ability to make robust subgroup comparisons between different types of caregivers. Future studies with a more homogeneous caregiver distribution could eliminate potential differences. OKCAS was developed and validated within the Turkish healthcare context, where cultural norms, caregiving practices, and institutional policies may influence the implementation and interpretation of KC. Therefore, cross-cultural validation studies are needed before the scale can be broadly applied in other countries or healthcare systems. Additionally, it is recommended that OKCAS results be evaluated in interventional studies. Within the context of these strengths and limitations, the practical implications of OKCAS for clinical practice can be more clearly interpreted.

Implications for practice

OKCAS facilitates the assessment of appropriate positioning of kangaroo caregivers and newborns in terms of comfort and health, thereby supporting the delivery of safe and effective KC. As a standardized observational tool, the scale can contribute to systematic care documentation in neonatal intensive care units and maternity wards, promoting consistency in the evaluation of KC practices (Ogbeye et al., 2025).

In routine clinical practice, OKCAS can be operationalized as a brief bedside observational checklist integrated into standard KC workflows. Nurses may complete the scale at the initiation of each KC session or following repositioning, allowing immediate verification of key positioning elements. Documenting total scores and flagged items within routine records can facilitate structured documentation, support continuity of care across shifts, and enable longitudinal monitoring of caregiver technique over time.

In addition, OKCAS may support clinical decision-making by enabling healthcare professionals to identify positioning-related problems during KC and to provide timely, evidence-based guidance to caregivers. Low total scores or repeated deficits in specific items (e.g., head–neck alignment, airway visibility, or chest-to-chest contact) may prompt targeted interventions such as immediate repositioning, focused caregiver education, or consultation with senior clinical staff. The availability of a scientifically validated assessment scale may help strengthen adherence to evidence-based practices and support quality improvement initiatives in neonatal care settings (Polit and Beck, 2020).

Furthermore, the use of OKCAS may assist healthcare institutions in enhancing newborn care standards by offering an objective and reliable method for evaluating KC practices. The scale's brief structure, limited number of items, and inclusion of clear visual elements facilitate ease of use in routine clinical practice for both healthcare providers and evaluators. Similar to the routine clinical use of standardized neonatal pain assessment tools such as COMFORTneo or The Neonatal Behavioral Assessment Scale (NBAS) observational instruments like OKCAS can be integrated into daily care to support timely assessment, guide clinical actions, and promote consistent, evidence-based practice (Barlow, Herath, Torrance, Bennett, and Wei, 2018; Kahraman et al., 2014; Van Dijk et al., 2009). By increasing awareness of effective KC positioning, OKCAS may also encourage families to engage more consciously and confidently in KC, thereby contributing to improved care quality and neonatal outcomes (Dedecik and Arslan, 2023; Suitor, 2023). Taken together, these clinical implications inform the overall conclusions regarding the contribution and potential use of OKCAS.

Conclusions

The results show that OKCAS is a valid and reliable measurement tool that can be used in Turkish society for the observational assessment of KC. The scale measures whether the newborn is in the appropriate position with the kangaroo caregiver. The final version of the scale includes a visual showing the appropriate position for the newborn with the kangaroo caregiver and 10 items. OKCAS is a single-factor scale and does not use reverse scoring. It has a score range from a minimum of 10 to a maximum of 50. An increase in score indicates that KC is being performed effectively and in the appropriate position. This scale will allow for the objective observation and assessment of the practice position in which KC is being performed effectively. In addition, the use of OKCAS has the potential to support education and training by providing a structured and visually supported framework for teaching appropriate KC positioning to healthcare professionals and caregivers. The use of OKCAS is intended to support, rather than replace, clinical judgment by offering a structured observational framework to guide the assessment of KC positioning. In this context, its application should remain flexible and responsive to infant cues and caregiver comfort, consistent with family-centered care principles. Accordingly, OKCAS does not prescribe a single "correct" positioning outcome, but supports the assessment of safe and effective KC that may include minor positional adaptations, provided physiological stability and comfort are maintained. In clinical practice, the scale may facilitate more consistent documentation and monitoring of KC implementation across settings, thereby supporting quality improvement initiatives. Furthermore, OKCAS may serve as a foundation for future research examining the quality, implementation fidelity, and outcomes of KC, contributing to a more comprehensive understanding of how optimal positioning influences neonatal comfort, safety, and caregiver engagement. While the findings support the validity and reliability of OKCAS within the studied population of term and near-term infants and their caregivers, further research is needed to examine its applicability across different infant populations, care settings, and cultural contexts.

CRediT authorship contribution statement

Edanur Tar Bolacali: Writing – review & editing, Writing – original draft, Visualization, Validation, Supervision, Software, Resources, Project administration, Methodology, Investigation, Funding acquisition, Formal analysis, Data curation, Conceptualization. **Sibel Kücükoğlu:** Writing – review & editing, Writing – original draft, Visualization, Validation, Supervision, Software, Resources, Project administration, Methodology, Investigation, Funding acquisition, Formal analysis, Data curation, Conceptualization.

Declaration of generative AI and AI-assisted technologies in the writing process

The visual of the kangaroo care position was created using ChatGPT (OpenAI, 2025) and Gemini (Google DeepMind, 2025) and designed

with Canva (Canva Pty Ltd., 2025). During the preparation of this work, the authors used Grammarly and DeepL for language editing. After using these tools, the authors carefully reviewed, revised, and approved all content, and take full responsibility for the accuracy and integrity of the final manuscript.

Funding

This article was supported by the TÜBİTAK 2224-B – Support Program for Participation in Domestic Scientific Events.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Acknowledgments

We extend our sincere gratitude to all mothers and newborns who participated in the study.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.pedn.2026.01.048.

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