



Development and psychometric evaluation of the parent–infant caregiving touch scale: A validity and reliability study in a Turkish population

Elif Simay KOÇ^{a,*}, Türkan KADİROĞLU^b

^a Department of Medical Services and Techniques, Kilis 7 Aralık University, Kilis, Turkey

^b Department of Pediatric Nursing, Ataturk University, Erzurum, Turkey

ARTICLE INFO

Article history:

Received 17 July 2025

Revised 12 October 2025

Accepted 12 October 2025

Available online xxxx

Keywords:

Parent
Infant
Caregiving
Validity
Reliability

ABSTRACT

Aim: This study aimed to evaluate the validity and reliability of the Turkish version of the Parent–Infant Caregiving Touch Scale (PICTS).

Design and methods: This methodological and cross-sectional study was conducted between June and July 2025 with 313 parents (157 mothers and 156 fathers) residing in southeastern Turkey, all of whom had infants aged 0–12 months. Data were collected using a Descriptive Information Form and the PICTS. The psychometric properties of the scale were examined through Content Validity Index (CVI), Confirmatory Factor Analysis (CFA), Cronbach's α , McDonald's Ω , and test-retest reliability analyses.

Results: The CFA confirmed the three-factor, 11-item structure of the scale for both mothers and fathers, with acceptable fit indices. Internal consistency coefficients were $\alpha = 0.810$ for mothers and $\alpha = 0.882$ for fathers, with similarly high McDonald's Ω values. In test-retest analyses, Pearson correlation coefficients ranged from $r = 0.898$ to 0.988 , and Intraclass Correlation Coefficients (ICC) ranged from 0.939 to 0.993 .

Conclusion: Findings indicate that the Turkish version of the PICTS demonstrates strong psychometric properties and can be used to assess parents' tactile caregiving behaviors toward their infants.

Practice implications: The PICTS can assist in identifying parents who exhibit negative tactile interaction patterns in clinical settings and can inform interventions aimed at promoting positive tactile caregiving behaviors through structured assessment.

© 2025 Elsevier Inc. All rights are reserved, including those for text and data mining, AI training, and similar technologies.

Introduction

Touch is a multifaceted and powerful form of communication that conveys emotional support, reassurance, and love (Wigley et al., 2023). The sense of touch is the first sensory modality to develop in human life and serves as a primary means of interaction between infants and their caregivers (Brzozowska et al., 2021; Wigley et al., 2023). Through touch, babies establish bonds with those around them (Figueiredo et al., 2024). Touch not only communicates love and a sense of security between parents and infants, strengthening the parent–infant bond (Madden-Rusnak et al., 2025), but also functions as a fundamental stimulus that supports cognitive, emotional, and physiological development (Wigley et al., 2023; Addabbo et al., 2021; Carozza & Leong, 2021).

Research shows that tactile interactions established in early childhood influence infants' growth and development (Du et al., 2024), attachment patterns (La Rosa et al., 2024), stress regulation (Feldman et al., 2010; Madden-Rusnak et al., 2025), sleep patterns (Du et al., 2024; Fauzia et al., 2022), nervous system development (Eğrikiliç & Dere, 2024; Carozza & Leong, 2021), and immune system functioning (Du et al., 2024).

Parents use various forms of touch for different purposes in their interactions with their infants, including caregiving, soothing, play, and fostering emotional closeness (Wigley et al., 2023). However, mothers and fathers tend to differ in the ways they touch their babies (Cabrera & Roggman, 2017; Cordolcini et al., 2024; Morris et al., 2021). Mothers typically prefer more rhythmic, continuous, and soothing forms of touch, whereas fathers are more likely to engage in brief, stimulating, and play-based tactile interactions, such as bouncing or gentle rocking (Carozza & Leong, 2021). Assessing parents' tactile caregiving behaviors toward their infants is crucial for planning interventions that support child development and for gaining a deeper understanding of the

* Corresponding author at: Kilis 7 Aralık University, Kilis, Turkey.
E-mail address: kocelifsimay@gmail.com (E.S. KOÇ).

parent–infant relationship. However, it is important to note that tools for measuring these behaviors remain limited, and existing scales predominantly focus on mothers (Beebe et al., 2010; Cordes et al., 2017; Hodsoll et al., 2022; Koukounari et al., 2015; Wigley et al., 2023).

There are very few culturally adapted measurement tools that comprehensively assess parents' tactile caregiving behaviors toward their infants and include both mothers and fathers. The lack of valid and reliable scales that objectively assess the role of parents in infant care, particularly within Turkish society, represents a significant gap in the literature. Although the Parent–Infant Caregiving Touch Scale (PICTS) is one of the key measurement tools developed in this field, no Turkish version has yet been adapted or psychometrically tested. Moreover, previous validation studies have been limited to mothers and no prior study has included fathers as a validation group (Addabbo et al., 2021; Hodsoll et al., 2022; Wigley et al., 2023). Existing literature also highlights the scarcity of research on fathers' tactile behaviors and emphasizes the need for further investigation in this area (Cordolcini et al., 2024; Morris et al., 2021). Therefore, the aim of this study is to translate the PICTS into Turkish and to conduct validity and reliability analyses with both mothers and fathers.

Research questions:

1. **Is the Turkish version of the PICTS a valid and reliable measurement tool for mothers?**
2. **Is the Turkish version of the PICTS a valid and reliable measurement tool for fathers?**

Research hypothesis:

H1. The Turkish version of the PICTS has been demonstrated to be a valid and reliable measurement tool for mothers.

H2. The Turkish version of the PICTS is a valid and reliable measurement tool for fathers.

Methods

Study design

This study employed a methodological and cross-sectional design. The validity and reliability of the Turkish version of the PICTS were tested on both mother and father samples.

Setting

This study was conducted at two Family Health Centers in southeast Turkey to evaluate parents' tactile caregiving behaviors toward their infants aged 0–12 months. Family Health Centers are facilities where routine monitoring, vaccinations, and developmental follow-ups are provided for infants. They represent an appropriate setting for reaching the study's target population, namely parents.

Data were collected through face-to-face surveys administered to volunteer parents who visited the Family Health Centers and met the study criteria. The data collection process took approximately 5–10 min per participant. The pilot study was conducted between June 10 and June 12, 2025, while data for the main study were collected between June 13 and July 11, 2025.

Population and sample of the study

The study population consisted of parents and their infants who met the inclusion criteria. For the pilot study, a minimum sample size of 50 participants was required (Seçer, 2015). A total of 51 individuals participated in the pilot phase of this study. In scale validity and reliability studies, sample size recommendations are commonly based on rules such as 5, 10, or 100 times the number of items (Brown, 2015; Finch, 2019). Since the main PICTS form consists of 12 items, a minimum of 60 parents was required for the main study. In total, 313 parents (157

mothers and 156 fathers) participated in the main study, successfully meeting the required sample size.

Inclusion criteria

This study included parents who had infants aged 0–12 months, were literate, volunteered to participate, completed all questions in full, and provided both written and verbal consent to participate in the study.

Exclusion criteria

Parents with children older than 12 months and those who did not provide consent to participate were excluded from this study.

Measurements

The Descriptive Information Form and the PICTS were used to collect the research data.

Descriptive Information Form: This form, developed by the researchers based on the relevant literature, was designed to identify the descriptive characteristics of the participants (Hodsoll et al., 2022; Koukounari et al., 2015; Wigley et al., 2023). The form includes questions regarding both the parents and their infants.

Parent–Infant Caregiving Touch Scale: The PICTS was developed and validated by Koukounari et al. (2015) to quantitatively and qualitatively assess caregivers' perceptions of their tactile behaviors with their infants. The PICTS consists of 12 items and three subscales: stroking, holding, and emotional communication, which evaluate caregivers' self-perceptions of common tactile behaviors in early caregiver–infant interactions. Each subscale consists of 4 items and is rated on a five-point Likert scale: Never (1), Rarely (2), Sometimes (3), Often (4), Very often (5). For both the total score and the subscale scores, the higher the scores, the more frequently the parent engages in the touch-related aspects of caregiving. In the original version of the scale, Cronbach's alpha values were reported as 0.795 and 0.836 for infants at 5 and 9 weeks of age, respectively (Koukounari et al., 2015).

Validity analysis process

The adaptation of the PICTS was carried out in three stages.

Step 1: Language and Content Validity.

In this study, the language validity of the PICTS was first established (Heggestad et al., 2019), followed by an assessment of its content validity. The initial translation was independently conducted by two individuals (Gökdemir & Yılmaz, 2023). During the translation process, the translators took into consideration the cultural, psychological, and grammatical differences between the two languages, as well as language-specific nuances and idiomatic expressions. Both translators were native speakers of the target language. The first translator was informed about the subject, purpose, and objectives of the study, while the second translator performed the translation in a natural and unbiased manner. Subsequently, a back-translation into English was carried out by a third bilingual expert who was blinded to the original version of the scale (Beaton et al., 2000).

Following the translation, the draft version of the scale was sent via email to 10 expert faculty members specializing in pediatrics to obtain their feedback, and necessary revisions were made accordingly. The experts were asked to evaluate the cultural appropriateness of the scale and the extent to which the items accurately reflected the targeted construct. Using the Content Validity Index (CVI), the experts rated each item on a 4-point scale, ranging from 'not appropriate (1)' to 'very appropriate (4)', following the Davis technique. After the evaluation, the CVI was calculated by dividing the number of items rated as 'very appropriate' or 'appropriate with minor revisions' by the total number of experts (Yusoff, 2019).

Step 2: Pilot Implementation.

A pilot study was conducted with 51 parents who met the inclusion criteria to evaluate the comprehensibility and appropriateness of the scale items from the perspective of parents. The participants in the

pilot study were not included in the main study. Based on the feedback provided by the parents, the scale was re-evaluated by the researchers, and the final version of the scale items was determined in accordance with the feedback received.

Step 3: Main Application.

The data for this study were collected by the researchers through face-to-face interviews at Family Health Centers. At the outset, the purpose of the study was explained to the parents, and their voluntary consent to participate was obtained. The data collection forms were then completed with the assistance of the researchers. A total of 313 parents (157 mothers and 156 fathers) participated in the study.

Statistical analysis

The collected forms were carefully reviewed by the researchers to ensure data integrity and accuracy before being transferred to Microsoft Excel. During this process, each participant's responses were meticulously organized and checked for any missing or incorrect data. The finalized dataset was then transferred to SPSS (Statistical Package for the Social Sciences) version 25.0 for statistical analysis. Sociodemographic characteristics were analyzed using percentage and frequency distributions. The normality of data distribution was assessed using skewness and kurtosis coefficients. The suitability of the dataset for further analysis and the adequacy of the sample were determined using the Kaiser-Meyer-Olkin (KMO) measure (> 0.60) and Bartlett's Test of Sphericity ($p < .05$). For the CFA, the following fit indices were used: Chi-square to degrees of freedom ratio (CMIN/df) (< 5), Goodness of Fit Index (GFI) (> 0.90), Comparative Fit Index (CFI) (> 0.90), Root Mean Square Residual (RMR) (< 0.08), Standardized Root Mean Square Residual (SRMR) (< 0.08), Normed Fit Index (NFI) (> 0.90), Tucker-Lewis Index (TLI) (> 0.90), Incremental Fit Index (IFI) (> 0.90), Parsimony Normed Fit Index (PNFI) (> 0.50), Parsimony Goodness of Fit Index (PGFI) (> 0.50) and Root Mean Square Error of Approximation (RMSEA) (< 0.08). The reliability of the scale was assessed using Cronbach's alpha and McDonald's omega coefficients. Reliability coefficients greater than 0.60 were considered indicative of acceptable internal consistency. To assess discriminant validity, comparisons were made between the lower and upper 27 % groups (Alpar, 2022; Bae, 2017; DeVellis & Thorpe, 2021; Erkorkmaz et al., 2013; Seçer, 2015).

Ethical considerations

Permission to adapt the PICTS for use with the Turkish population was obtained via email from the corresponding author who developed the scale. In addition, ethical approval for conducting the study was obtained from the Ethics Committee of a university (Date: 02.05.2025, No: B.30.2.ATA.0.01.00/330), and institutional permission was granted by the Provincial Directorate of Health in southeastern Turkey (Date: 04.06.2025, No: E-34007727-605-277,954,963). At the beginning of the data collection form, participants were provided with a written statement explaining the purpose and scope of the study, along with an assurance that their responses would be used solely for research purposes. This study was conducted in accordance with the principles of the Declaration of Helsinki.

Results

Participants' characteristics

Among the mothers participating in the study, 52.2 % were aged 31 and over, 49.7 % had a bachelor's degree, and 39.5 % were employed as civil servants. Additionally, 50.3 % had male infants, and 76.4 % had given birth between 37 and 42 weeks of gestation. Half of the infants (50.3 %) were 5 months and older. Regarding socioeconomic status, 71.3 % of mothers reported that their income equals

expenditure, 79.6 % resided within the province, and 92.4 % lived in nuclear families. Furthermore, 68.8 % of mothers delivered via cesarean delivery.

Among the fathers, 64.1 % were aged 31 and over, 50 % had a bachelor's degree, and 74.4 % were employed as civil servants. Regarding their infants, 50.6 % were girls, and 62.2 % were born between 37 and 42 weeks of gestation. Half of the infants (50 %) were 5 months and older. Additionally, 68.6 % of fathers reported that their income equals expenditure, 82.1 % resided within the province, 96.8 % lived in nuclear families, and 53.8 % reported cesarean delivery (Table 1).

Findings related to validity

Content validity

Content validity was assessed using the Davis technique and the Item-Level Content Validity Index (I-CVI). The I-CVI values for the 12 items ranged between 0.90 and 1.00. Agreement among experts yielded I-CVI values between 0.99 and 1.00 for each item, and the overall Scale-Level Content Validity Index (S-CVI) was calculated as 0.99. These results indicate high content validity for the scale.

Sampling adequacy and factor structure

For mothers, the KMO value was 0.787, and Bartlett's Test of Sphericity was significant ($\chi^2 = 630.003$, $p = .001$), confirming sample adequacy and data suitability for factor analysis. Item i4 showed a low item-total correlation (0.058) and was excluded. After this exclusion, Cronbach's alpha for the remaining 11 items was 0.810, with item-total correlations ranging from 0.351 to 0.601.

For fathers, the KMO value was 0.826, and Bartlett's Test of Sphericity was significant ($\chi^2 = 911.537$, $p = .001$). Again, item i4 had a low item-total correlation (0.001) and was excluded. Cronbach's alpha for the remaining 11 items was 0.882, with item-total correlations ranging from 0.525 to 0.704 (Table 2).

Table 1

Distribution According to Participants' Sociodemographic Characteristics (N = 313).

Features	Variables	Mother (N = 157)		Father (N = 156)	
		N	%	N	%
Age	19–30	75	47.8	56	35.9
	31 and Over	82	52.2	100	64.1
Education Level	Primary School	1	0.6	0	0
	Middle School	6	3.8	0	0
	High School	28	17.8	32	20.5
	Associate Degree	33	21.0	38	24.4
	Bachelor's Degree	78	49.7	78	50.0
Occupation	Master's Degree	11	7.0	8	5.1
	Civil Servant	62	39.5	116	74.4
	Worker	21	13.4	24	15.4
	Self-Employed	18	11.5	16	10.3
	Housewife	56	35.7	0	0
Baby's Gender	Girl	78	49.7	79	50.6
	Boy	79	50.3	77	49.4
Baby's Gestational Age	Before 37 Weeks	12	7.6	17	10.9
	Weeks 37–42	120	76.4	97	62.2
	After 42 Weeks	25	15.9	42	26.9
Baby's Age (Months)	1–4 Months	78	49.7	78	50.0
	5 Months and Older	79	50.3	78	50.0
Economic Status	Income is Less Than Expenditure	32	20.4	32	20.5
	Income Equals Expenditure	112	71.3	107	68.6
	Income Exceeds Expenditure	13	8.3	17	10.9
Residence	Province	125	79.6	128	82.1
	District	32	20.4	28	17.9
Family Type	Nuclear Family	145	92.4	151	96.8
	Extended Family	12	7.6	3	1.9
	Broken Family	0	0	2	1.3
Mode of Delivery	Vaginal Delivery	49	31.2	72	46.2
	Cesarean Delivery	108	68.8	84	53.8

Table 2

Mean, item-total correlation, exploratory factor analysis and confirmatory factor analysis factor loadings.

		Mean ± SD	Item-Total Correlation Values	Cronbach's Alpha if Item Deleted	Factor Loadings		
					F1	F2	F3
Mother-PICTS (n = 157)	i1	4.64 ± 0.65	0.417	0.740		0.53	
	i2	4.29 ± 0.73	0.512	0.731		0.74	
	i3	4.55 ± 0.82	0.355	0.743			0.66
	i4	2.55 ± 1.69	0.058	0.810			
	i5	3.69 ± 1.14	0.416	0.736		0.59	
	i6	3.38 ± 1.42	0.415	0.739		0.51	
	i7	4.41 ± 1.01	0.484	0.728			0.95
	i8	4.45 ± 0.78	0.553	0.726			0.81
	i9	4.15 ± 0.95	0.595	0.716	0.76		
	i10	4.22 ± 0.82	0.404	0.739	0.67		
	i11	4.19 ± 0.88	0.480	0.730	0.61		
	i12	4.10 ± 0.91	0.522	0.725	0.75		
Father-PICTS (n = 156)		Mean ± SD	Item-Total Correlation Values	Cronbach's Alpha if Item Deleted	F1	F2	F3
	i1	4.42 ± 0.77	0.530	0.816		0.75	
	i2	3.99 ± 0.91	0.576	0.811		0.81	
	i3	4.22 ± 0.83	0.518	0.816			0.52
	i4	2.38 ± 1.81	0.001	0.882			
	i5	3.53 ± 1.16	0.544	0.811		0.57	
	i6	3.10 ± 1.37	0.522	0.814		0.53	
	i7	4.12 ± 0.99	0.590	0.809			0.84
	i8	4.18 ± 1.06	0.652	0.803			0.90
	i9	3.71 ± 1.07	0.620	0.806	0.90		
	i10	3.90 ± 0.90	0.630	0.808	0.85		
	i11	3.72 ± 1.05	0.597	0.808	0.64		
	i12	3.59 ± 1.15	0.637	0.803	0.76		

Note. F1 = Stroking Subscale; F2 = Holding Subscale; F3 = Emotional Communication Subscale.

Confirmatory Factor Analysis.

Mothers' Scale.

Items i9, i10, i11, and i12 loaded onto Factor 1 (Stroking) with factor loadings between 0.61 and 0.76. Items i1, i2, i5, and i6 loaded onto Factor 2 (Holding) with loadings between 0.51 and 0.74. Items i3, i7, and i8 loaded onto Factor 3 (Emotional Communication) with loadings between 0.66 and 0.95. Item i4 was excluded. The mothers' final scale structure consisted of 11 items across 3 factors (Table 2; Fig. 1).

Fathers' Scale.

Items i9, i10, i11, and i12 loaded onto Factor 1 (Stroking) with loadings between 0.64 and 0.90. Items i1, i2, i5, and i6 loaded onto Factor 2 (Holding) with loadings between 0.53 and 0.81. Items i3, i7, and i8 loaded onto Factor 3 (Emotional Communication) with loadings between 0.52 and 0.90. Item i4 was excluded, resulting in a final 11-item, three-factor structure for fathers (Table 2; Fig. 2).

AMOS analysis recommended a modification between items i5 and i6 for fathers, which was implemented. CFA Model Fit Indices:

For mothers: CMIN/df = 1.663, GFI = 0.929, CFI = 0.952, RMR = 0.050, SRMR = 0.0591, NFI = 0.890, IFI = 0.953, PGFI = 0.577, PNFI = 0.664, RMSEA = 0.075.

For fathers: CMIN/df = 2.858, GFI = 0.885, CFI = 0.915, RMR = 0.078, SRMR = 0.0724, NFI = 0.877, IFI = 0.916, PGFI = 0.537, PNFI = 0.638, RMSEA = 0.078 (Table 3).

These fit indices confirmed the validity of the 11-item, three-factor structure for both groups.

Findings related to reliability

Internal consistency

For mothers, Cronbach's alpha values were 0.787 (Stroking), 0.640 (Holding), 0.836 (Emotional Communication), and 0.810 (overall scale). McDonald's omega values were 0.791, 0.659, 0.873, and 0.796, respectively.

For fathers, Cronbach's alpha values were 0.864 (Stroking), 0.759 (Holding), 0.790 (Emotional Communication), and 0.882 (overall scale). McDonald's omega values were 0.866, 0.756, 0.830, and 0.876, respectively (Table 4).

Discriminatory power and test-retest reliability

Upper and lower 27 % group comparisons were statistically significant for all subscales and total scores ($p < .001$), indicating strong discriminatory power (Table 4). Positive correlations between total and subscale scores further supported reliability.

Test-retest reliability was evaluated with 20 mothers and 20 fathers over two weeks. For mothers, Pearson's r values were 0.967 (Stroking), 0.913 (Holding), 0.988 (Emotional Communication), and 0.970 (total) ($p < .001$). For fathers, these were 0.898, 0.942, 0.979, and 0.969 ($p < .001$).

Paired-samples t -tests revealed no significant differences between administrations ($p > .05$). Intraclass Correlation Coefficients (ICC) values exceeded 0.93 for mothers and 0.94 for fathers on all subscales (Table 5).

Discussion

This study was conducted to introduce the PICTS to Turkish society and to evaluate its cultural validity among both mothers and fathers. It was determined that other existing scales measuring parental behaviors or parent-child interactions do not directly overlap with the PICTS in terms of content or structure. Notably, the PICTS represents a unique measurement tool in the field, particularly because it focuses on dimensions specifically related to touch.

A CVI above 0.80 for both individual items and the overall scale indicates acceptable inter-rater agreement (DeVellis & Thorpe, 2021). In this study, the I-CVI values obtained for the PICTS items ranged from 0.90 to 1.00. These findings indicate that the scale items are appropriate for the intended construct and that there is a high level of consensus among experts in the relevant field (DeVellis & Thorpe, 2021; Seçer, 2015; Yusoff, 2019).

KMO and Bartlett's Test of Sphericity were performed to evaluate the suitability of the PICTS for factor analysis and the adequacy of the sample size. A KMO value above 0.60 and a Bartlett's Test of Sphericity p -value less than 0.05 indicate that the data are appropriate for factor analysis and that the sample size is sufficient (DeVellis & Thorpe,

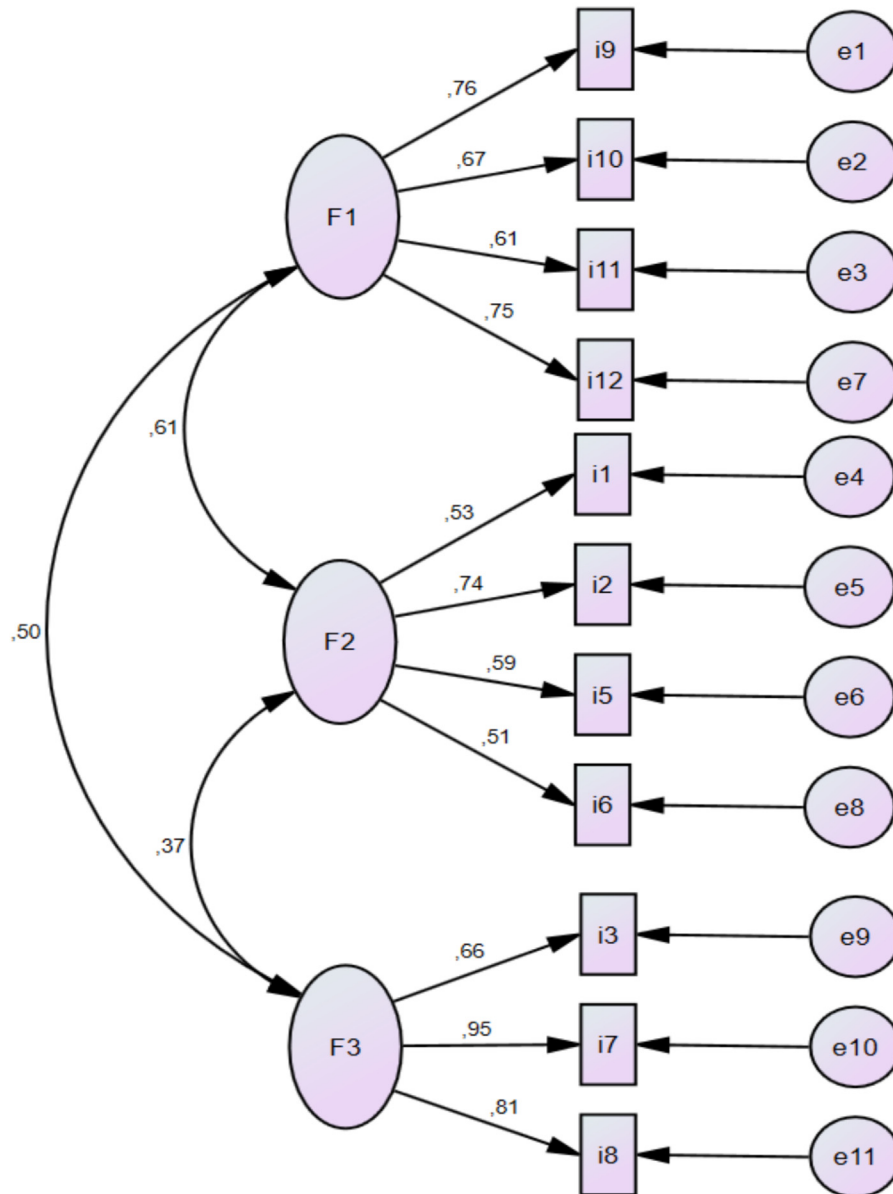


Fig. 1. Confirmatory Factor Analysis Results for Mothers (Three-Factor Structure: Stroking, Holding, Emotional Communication).

2021; Pallant, 2020). In this study, the KMO value for the PICTS administered to mothers was 0.787, with Bartlett's Test of Sphericity yielding $\chi^2 = 630.003$, $p = .001$. For the fathers' data, the KMO value was 0.826, and Bartlett's Test of Sphericity yielded $\chi^2 = 911.537$, $p = .001$. These results indicate that the sample size and data set were sufficient for conducting factor analysis for both the PICTS administered to mothers and the PICTS administered to fathers.

CFA is applied to verify a model that has been either previously established or theoretically proposed (Seçer, 2015). In factor analysis, each item is evaluated individually, and factor loadings above 0.30 are considered indicative of a robust factor structure for the scale (DeVellis & Thorpe, 2021; Seçer, 2015).

In the CFA results of the PICTS, according to the three-factor model, all items administered to both mothers and fathers had factor loadings above 0.30, except for item i4 (DeVellis & Thorpe, 2021). Excluding item i4, the factor loadings for the items in the mother sample ranged between 0.51 and 0.95, while for the father sample, they ranged

between 0.52 and 0.90. Item i4 was excluded from the PICTS administered to both mothers and fathers due to its low factor loading in both Exploratory Factor Analysis (EFA) and CFA, its item-total correlation being below 0.30, and the increase in Cronbach's alpha upon its removal. This finding is consistent with the Italian adaptation of the PICTS, in which item i4 was also removed due to its low factor loading (Wigley et al., 2023). Similar patterns observed across different cultural samples suggest that the parenting behavior assessed by item i4 may be interpreted differently depending on cultural context. Supporting this, previous research has shown that parents' tactile caregiving behaviors can be influenced by cultural norms (Hodsoll et al., 2022; Lansford, 2022). Accordingly, the removal of item i4 enhanced both the cultural appropriateness and the psychometric robustness of the scale.

The fit indices obtained from the CFA must meet or exceed acceptable thresholds. Specifically, CMIN/DF < 5, RMSEA < 0.08, CFI > 0.90, RMR < 0.08, SRMR < 0.08, and TLI > 0.90 are considered indicators of acceptable model fit (Aksu et al., 2017; Bae, 2017; Erkorkmaz et al.,

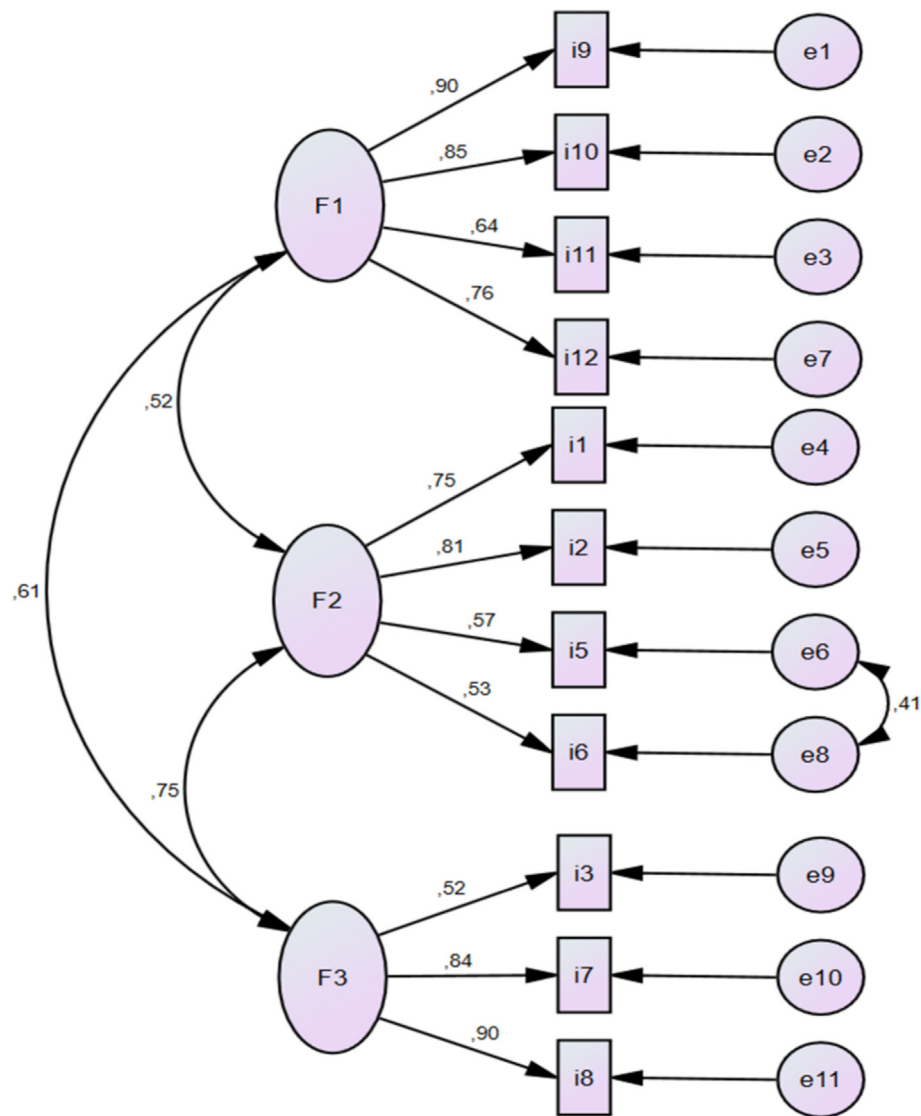


Fig. 2. Confirmatory Factor Analysis Results for Fathers (Three-Factor Structure: Stroking, Holding, Emotional Communication).

2013). According to the CFA results of the present study, most of the fit indices for the PICTS were within acceptable limits in both the mother and father groups, demonstrating that the proposed three-factor structure provides a good fit to the data in both groups. In particular, the NFI values obtained for mothers (0.890) and fathers (0.877) were slightly below the conventional 0.90 threshold but still fall within the “acceptable fit” range (≥ 0.80) reported in the literature (Hu & Bentler, 1999). Furthermore, previous research has emphasized that the NFI is sensitive to sample size and tends to underestimate model fit in samples smaller than 200; therefore, it should not be solely relied upon in the evaluation of model adequacy (Bentler, 1990; Kline, 2023; Mulaik et al., 1989). Similarly, the GFI is known to be affected by sample size and degrees of freedom, often

showing a downward bias in studies with relatively small samples (Sharma et al., 2005). Given these limitations, the relatively lower NFI and GFI values observed in our study are likely attributable to sample size, while the acceptable levels of the other indices provide strong support for the overall validity of the model.

In the study conducted by Koukounari et al. (2015), the CFA results for the three-factor structure of the PICTS were $\chi^2 = 122.661$, $df = 51$, $RMSEA = 0.072$, and $CFI = 0.970$ at week 5; and $\chi^2 = 680.979$, $df = 51$, $RMSEA = 0.121$, and $CFI = 0.954$ at week 9. The CFA fit indices obtained from both mothers and fathers in the current study are consistent with the findings of Koukounari et al. (2015). These results suggest that the revised Turkish version of the PICTS, with item 4 removed, demonstrates construct validity for both mothers and fathers.

Table 3
Confirmatory Factor Analysis Model Fit Indices.

	CMIN/df	GFI	CFI	IFI	NFI	RMR	SRMR	PGFI	PNFI	RMSEA
Mother-PICTS (n = 157)	1.663	0.929	0.952	0.953	0.890	0.050	0.0591	0.577	0.664	0.075
Father-PICTS (n = 156)	2.858	0.885	0.915	0.916	0.877	0.078	0.0724	0.537	0.638	0.078

Table 4
Reliability Analyses of the PICTS and Its Subscales.

Mother-PICTS (n = 157)	Stroking	Holding	Emotional Communication	PICTS	α	Ω	Test and p Results for Upper and Lower 27 % Groups	
							t	p
Stroking	1.000	0.438	0.593	0.845	0.787	0.791	−11.193	0.001
Holding	0.438	1.000	0.353	0.778	0.640	0.659	−9.815	0.001
Emotional Communication	0.593	0.353	1.000	0.711	0.836	0.873	−7.285	0.001
PICTS	0.845	0.778	0.711	1.000	0.810	0.796	−17.400	0.001
Father-PICTS (n = 156)	Stroking	Holding	Emotional Communicationn	PICTS	α	Ω	Test and p Results for Upper and Lower 27 % Groups	
							t	p
Stroking	1.000	0.485	0.576	0.852	0.864	0.866	−13.040	0.001
Holding	0.485	1.000	0.545	0.836	0.759	0.756	−11.746	0.001
Emotional Communication	0.576	0.545	1.000	0.772	0.790	0.830	−7.963	0.001
PICTS	0.852	0.836	0.772	1.000	0.882	0.876	−17.049	0.001

Moreover, the findings indicate that the PICTS is a valid and applicable measurement tool for use in Turkish society.

The modification between items i5 (I pick my baby up) and i6 (I rock my baby) was applied only in the fathers' model. This can be theoretically explained by differences in caregiving patterns between mothers and fathers. Mothers tend to perform these behaviors more independently and routinely, whereas fathers are more likely to engage in them sequentially—picking up the infant often followed immediately by rocking. Such behavioral sequencing may create residual covariance in the fathers' data that does not appear in the mothers' responses. Therefore, the modification reflects natural variation in paternal caregiving practices rather than a weakness in the scale.

In the present study, the reliability of the measurement tool was evaluated using the test-retest method, Cronbach's alpha, and McDonald's omega coefficients (George & Mallery, 2018; Tavşancıl, 2018). A Cronbach's alpha reliability coefficient of ≥ 0.70 is generally considered sufficient (Evci & Aylar, 2017). In the original version of the PICTS, Cronbach's alpha values were reported as 0.795 at week 5 and 0.836 at week 9 (Koukounari et al., 2015). In the current study, the PICTS administered to mothers demonstrated high reliability with a Cronbach's alpha of 0.810, while the PICTS administered to fathers demonstrated high reliability with a Cronbach's alpha of 0.882 (Tavşancıl, 2018).

The McDonald's omega coefficient for the PICTS administered to mothers was found to be 0.796, while for the PICTS administered to fathers, it was 0.876. These values indicate that the PICTS demonstrates acceptable reliability for both mothers and fathers (Pallant, 2020; Seçer, 2015). As a result of the upper and lower 27 % group analyses, statistically significant differences were observed across all subscales and total scores in the PICTS administered to both mothers and fathers ($p < .001$). The PICTS successfully distinguished between individuals with high and low scores in both groups, demonstrating the scale's strong discriminative power (Tavşancıl, 2018). These findings provide evidence that the Turkish version of the PICTS is a reliable measurement tool that can be used to assess both mothers and fathers in Turkish society.

A test-retest analysis was conducted to evaluate the temporal stability of the PICTS (Akyüz, 2018; Pallant, 2020), and the scale was re-administered to 40 parents (20 mothers, 20 fathers) two weeks after the initial administration. Pearson correlation coefficients ranged from 0.913 to 0.988 for mothers and from 0.898 to 0.979 for fathers, all statistically significant ($p < .001$). ICC values ranged from 0.939 to 0.993 for mothers and from 0.941 to 0.987 for fathers. While these findings confirm strong reliability, the exceptionally high coefficients may also be attributable to the relatively short retest interval (two weeks) or the limited variability of responses. Koukounari et al. (2015) reported Cronbach's alpha values of 0.795 and 0.836 at weeks 5 and 9, respectively, and polychoric ordinal alpha values of 0.872 and 0.890. Taken together, these results demonstrate that both classical and modern reliability analyses support the strong temporal consistency of the PICTS.

Limitations/strengths

This study was conducted in only two Family Health Centers located in southeastern Turkey. Therefore, the geographical and socio-demographic characteristics of the sample constitute a limitation of the study. Furthermore, considering that regional cultural norms may influence parents' tactile caregiving behaviors, the generalizability of the findings to parents living in other regions may therefore be limited. Another limitation of the study is that the PICTS is a self-report measure, which limits the objective assessment of parents' tactile behaviors. Despite the good psychometric properties observed in this sample, further studies across different regions of Turkey and diverse clinical contexts are needed to enhance generalizability.

One of the key strengths of this study is the inclusion of both parents (mothers and fathers) in the research. Previous studies involving the original version of the PICTS and other cultural adaptation studies have been conducted exclusively with mothers. This study provided an opportunity to evaluate the tactile caregiving behaviors of both parents and allowed for the comparison of potential differences between them. The inclusion of both mothers and fathers in the Turkish version of the

Table 5
Test-Retest Analysis Results of Mothers' and Fathers' Groups for PICTS Subscales.

Subscale		1st Measurement (Mean \pm SD)	2nd Measurement (Mean \pm SD)	r	p (r)	t	p (t)	ICC
Mother-PICTS (n = 20)	Stroking	16.85 \pm 2.35	16.80 \pm 2.17	0.967	< 0.001	0.370	0.716	0.983
	Holding	14.95 \pm 2.37	15.20 \pm 1.85	0.913	< 0.001	−1.097	0.287	0.939
	Emotional Communication	13.40 \pm 1.93	13.50 \pm 1.96	0.988	< 0.001	−1.453	0.163	0.993
	PICTS Total	45.20 \pm 5.63	45.50 \pm 5.08	0.970	< 0.001	−0.946	0.356	0.982
Father-PICTS (n = 20)	Stroking	13.30 \pm 3.37	13.60 \pm 2.89	0.898	< 0.001	−0.900	0.379	0.941
	Holding	14.35 \pm 2.52	14.65 \pm 2.54	0.942	< 0.001	−1.552	0.137	0.968
	Emotional Communication	12.15 \pm 2.56	12.25 \pm 2.31	0.979	< 0.001	−0.809	0.428	0.987
	PICTS Total	39.80 \pm 7.12	40.50 \pm 6.19	0.969	< 0.001	−1.652	0.115	0.978

Note. F factor; $p < .05$; r = Pearson correlation coefficient; t = Paired samples t-test; ICC = Intraclass correlation coefficient.

scale offers a more comprehensive and holistic perspective on parenting roles and enhances the validity of the data obtained from both groups.

Practice implications

The PICTS is a brief and easy-to-administer scale that enables the systematic assessment of parents' tactile caregiving behaviors (stroking, holding, emotional communication) toward their infants. Its practicality makes it suitable for use in both clinical practice and research to support healthy parent–infant bonding and infant development. In Turkey, pediatric nurses can also use the scale to identify parents who display limited or negative interaction patterns at an early stage and provide education and counseling to strengthen parent–infant interaction.

Conclusion

The findings of this study demonstrate that the Turkish version of the PICTS is a psychometrically sound and practically applicable instrument for assessing the tactile caregiving behaviors of both mothers and fathers toward their infants. The scale can confidently be recommended for use in clinical practice, research, and interventions aimed at enhancing parent–infant relationships in Turkish populations.

Note. α = Cronbach's alpha; Ω = McDonald's omega; t = Independent samples t -test (upper vs. lower 27 %).

CRediT authorship contribution statement

Elif Simay KOÇ: Writing – review & editing, Writing – original draft, Visualization, Validation, Supervision, Software, Resources, Project administration, Methodology, Investigation, Funding acquisition, Formal analysis, Data curation, Conceptualization. **Türkan KADİROĞLU:** Writing – review & editing, Writing – original draft, Visualization, Validation, Supervision, Software, Resources, Project administration, Methodology, Investigation, Funding acquisition, Formal analysis, Data curation, Conceptualization.

Ethical considerations

Ethical approval for this study was obtained from the University Ethics Committee (Date: 02.05.2025, No: B.30.2.XXX.0.01.00/330), and institutional permission was granted by the Provincial Directorate of Health in southeastern Turkey (Date: 04.06.2025, No: E-34007727-605-277,954,963).

Funding

This study did not benefit from any targeted financial support provided by governmental, commercial, or non-profit funding bodies.

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.

Acknowledgements

We extend our sincere thanks to all the parents who contributed to this study.

References

Addabbo, M., Licht, V., & Turati, C. (2021). Past and present experiences with maternal touch affect infants' attention toward emotional faces. *Infant Behavior and Development*, 63, Article 101558. <https://doi.org/10.1016/j.infbeh.2021.101558>.
 Aksu, G., Eser, M. T., & Güzeller, C. O. (2017). *Exploratory and Confirmatory Factor Analysis and Structural Equation Model Applications*. Detail Publishing.

Akyüz, H. E. (2018). Confirmatory factor analysis for construct validity: An applied study. *BEU Journal of Science*, 7(2), 186–198. <https://doi.org/10.17798/bitlisfen.414490>.
 Alpar, R. (2022). *Applied Statistics and Validity-Reliability* (7th. ed.). Ankara: Deta Publishing.
 Bae, B. R. (2017). *Structural Equation Modeling With Amos 24*. Chenngram Books.
 Beaton, D. E., Bombardier, C., Guillemin, F., & Ferraz, M. B. (2000). Guidelines for the process of cross-cultural adaptation of self-report measures. *Spine*, 25(24), 3186–3191. <https://doi.org/10.1097/00007632-200012150-00014>.
 Beebe, B., Jaffe, J., Markese, S., Buck, K., Chen, H., Cohen, P., & Feldstein, S. (2010). The origins of 12-month attachment: A microanalysis of 4-month mother–infant interaction. *Attachment & Human Development*, 12(1–2), 3–141. <https://doi.org/10.1080/14616730903338985>.
 Bentler, P. M. (1990). Comparative fit indexes in structural models. *Psychological Bulletin*, 107(2), 238–246.
 Brown, T. A. (2015). *Confirmatory Factor Analysis for Applied Research* (2nd ed.). The Guilford Press.
 Brzozowska, A., Longo, M. R., Mareschal, D., Wiesemann, F., & Gliga, T. (2021). Capturing touch in parent–infant interaction: A comparison of methods. *Infancy*, 26(3), 494–514. <https://doi.org/10.1111/infa.12394>.
 Cabrera, N. J., & Roggman, L. (2017). Father play: Is it special? *Infant Mental Health Journal*, 38(6), 706–708. <https://doi.org/10.1002/imhj.21680>.
 Carozza, S., & Leong, V. (2021). The role of affectionate caregiver touch in early neurodevelopment and parent–infant interactional synchrony. *Frontiers in Neuroscience*, 14, Article 613378. <https://doi.org/10.3389/fnins.2020.613378>.
 Cordes, K., Egmosse, I., Smith-Nielsen, J., Koppé, S., & Væver, M. S. (2017). Maternal touch in caregiving behavior of mothers with and without postpartum depression. *Infant Behavior and Development*, 49, 182–191. <https://doi.org/10.1016/j.infbeh.2017.09.006>.
 Cordolcini, L., Castagna, A., Mascheroni, E., & Montirosso, R. (2024). Skin-to-skin care and spontaneous touch by fathers in full-term infants: A systematic review. *Behavioral Science*, 14(1), 60. <https://doi.org/10.3390/bs14010060>.
 DeVellis, R. F., & Thorpe, C. T. (2021). *Scale Development: Theory and Applications*. Sage Publications.
 Du, Q., Zhu, H., Guo, M., Yang, Q., Yang, H., & Ma, Y. (2024). The effect of baby touch on premature infants. *Pakistan Journal of Medical Sciences*, 40(10), 2256–2260. <https://doi.org/10.12669/pjms.40.10.9275>.
 Eğrikiliç, D. A., & Dere, Z. (2024). Development and interaction of sensory systems in babies. *Authorea Preprints*, 1–12. <https://doi.org/10.22541/au.170663659.99907989/v1>.
 Erkokmaz, Ü., Etikan, I., Demir, O., Özdamar, K., & Sanisoğlu, S. Y. (2013). Confirmatory factor analysis and fit indices: Review. *Türkiye Klinikleri J Med Sci* 2013, 33(1), 210–223. <https://doi.org/10.5336/medsci.2011-26747>.
 Evci, N., & Aylar, F. (2017). Use of confirmatory factor analysis in scale development studies. *The Journal of Social Science*, 4(10), 389–412. <https://doi.org/10.16990/SOBIDER.3386>.
 Fauzia, R. L., Budihastuti, U. R., & Adriani, R. B. (2022). Meta-analysis: The effect of baby massage in increasing quality of sleep and infant body weight. *Journal of Maternal and Child Health*, 7(1), 64–74. <https://doi.org/10.26911/thejmch.2022.07.01.07>.
 Feldman, R., Singer, M., & Zagoory, O. (2010). Touch attenuates infants' physiological reactivity to stress. *Developmental Science*, 13(2), 271–278. <https://doi.org/10.1111/j.1467-7687.2009.00890.x>.
 Figueiredo, A. R., Moniz, P., & Laureano, M. (2024). Touch: A review of the infant–caregiver relationship in the neonatal field. *International Journal of Psychiatric Trainees*, 3(1), 2–7. <https://doi.org/10.55922/001c.124910>.
 Finch, H. W. (2019). *Exploratory Factor Analysis*. SAGE (Publications).
 George, D., & Mallery, P. (2018). Reliability analysis. *IBM SPSS Statistics 25 Step by Step* (pp. 249–260). Routledge.
 Gökdemir, F., & Yılmaz, T. (2023). Processes of using, modifying, adapting and developing Likert type scales. *Journal of Nursing*, 26(2), 148–160. <https://doi.org/10.5152/JANHS.2023.22260>.
 Heggstad, E. D., Scheaf, D. J., Banks, G. C., Monroe Hausfeld, M., Tonidandel, S., & Williams, E. B. (2019). Scale adaptation in organizational science research: A review and best-practice recommendations. *Journal of Management*, 45(6), 2596–2627. <https://doi.org/10.1177/0149206319850280>.
 Hodson, J., Pickles, A., Bozicevic, L., Supraja, T. A., Hill, J., Chandra, P. S., & Sharp, H. (2022). A comparison of non-verbal maternal care of male and female infants in India and the United Kingdom: The parent–infant caregiving touch scale in two cultures. *Frontiers in Psychology*, 13, Article 852618. <https://doi.org/10.3389/fpsyg.2022.852618>.
 Hu, L., & Bentler, P. M. (1999). Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Structural Equation Modeling: A Multidisciplinary Journal*, 6(1), 1–55. <https://doi.org/10.1080/10705519909540118>.
 Kline, R. B. (2023). *Principles and Practice of Structural Equation Modeling*. Guilford (Publications).
 Koukounari, A., Pickles, A., Hill, J., & Sharp, H. (2015). Psychometric properties of the parent–infant caregiving touch scale. *Frontiers in Psychology*, 6, 1887. <https://doi.org/10.3389/fpsyg.2015.01887>.
 La Rosa, V. L., Geraci, A., Iacono, A., & Commodari, E. (2024). Affective touch in preterm infant development: Neurobiological mechanisms and implications for child–caregiver attachment and neonatal care. *Children*, 11(11), 1407. <https://doi.org/10.3390/children11111407>.
 Lansford, J. E. (2022). Annual research review: Cross-cultural similarities and differences in parenting. *Journal of Child Psychology and Psychiatry*, 63(4), 466–479. <https://doi.org/10.1111/jcpp.13539>.
 Madden-Rusnak, A., Micheletti, M., Bailey, L., & de Barbaro, K. (2025). Soothing touch matters: Patterns of everyday mother–infant physical contact and their real-time

- physiological implications. *Infant Behavior and Development*, 78, Article 102021. <https://doi.org/10.1016/j.infbeh.2024.102021>.
- Morris, A. R., Turner, A., Gilbertson, C. H., Corner, G., Mendez, A. J., & Saxbe, D. E. (2021). Physical touch during father–infant interactions is associated with paternal oxytocin levels. *Infant Behavior and Development*, 64, Article 101613. <https://doi.org/10.1016/j.infbeh.2021.101613>.
- Mulaik, S. A., James, L. R., Van Alstine, J., Bennet, N., Lind, S., & Stilwell, C. D. (1989). Evaluation of goodness-of-fit indices for structural equation models. *Psychological Bulletin*, 105(3), 430–445. <https://doi.org/10.1037/0033-2909.105.3.430>.
- Pallant, J. (2020). *SPSS Survival Manual: A Step by Step Guide to Data Analysis Using IBM SPSS*. McGraw-Hill Education.
- Seçer, İ. (2015). *Developing and Adapting Psychological Tests: SPSS and LISREL Applications*. Anı Yayıncılık.
- Sharma, S., Mukherjee, S., Kumar, A., & Dillon, W. R. (2005). A simulation study to investigate the use of cutoff values for assessing model fit in covariance structure models. *Journal of Business Research*, 58(1), 935–943. <https://doi.org/10.1016/j.jbusres.2003.10.007>.
- Tavşancıl, E. (2018). *Measurement of Attitudes and Data Analysis With SPSS* (6th ed.). Nobel Academic Publishing.
- Wigley, I. L. C. M., Mascheroni, E., Pastore, M., Bonichini, S., & Montiroso, R. (2023). Exploring maternal touch in the infant's first 18 months of life: A study on an Italian sample. *Infant Behavior and Development*, 71, Article 101836. <https://doi.org/10.1016/j.infbeh.2023.101836>.
- Yusoff, M. S. B. (2019). ABC of response process validation and face validity index calculation. *Education in Medicine Journal*, 11(3), 55–61. <https://doi.org/10.21315/eimj2019.11.3.6>.