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Evaluating child–caregiver attachment beyond infancy when language barriers exist: Longitudinal study in a protracted crisis

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Abstract

Observational coding systems are invaluable for understanding child–caregiver interactions, but their reliance on language comprehension limits their use with linguistically diverse populations. We developed the Behavioral Recognition in Displaced Group Exchanges (BRIDGE) coding system to measure the quality of refugee child–caregiver relationships through paralinguistic cues (e.g., tone) and kinetic behavioral signals (e.g., gestures). Here BRIDGE was tested on 1,092 videos featuring 287 Syrian refugee mothers and their children in Jordan ($M_{\text{age}} = 6$, range 4–8; 1:1 gender ratio). Most coders were unable to understand the language the dyads spoke, yet all demonstrated excellent intra- and interrater reliability across preregistered analyses. Coding patterns also showed convergence, divergence, sensitivity to contextual factors, and temporal stability, establishing BRIDGE as a robust linguistically agnostic tool.

Keywords observational coding, displaced families, sensitivity, synchrony, refugee

Lay summary

Understanding how well caregivers and school-age children interact usually requires knowing the language they speak. We created Behavioral Recognition in Displaced Group Exchanges (BRIDGE), a tool that measures the quality of child–caregiver relationships beyond infancy using tone of voice and body language instead of words. Here BRIDGE was tested on a large set of videos featuring Syrian refugee mothers and their school-age children in Jordan, which were rated by observers from around the world. Even though most observers could not understand Arabic, they were still able to reliably judge the relationships, showing that BRIDGE works across language barriers.

“The real voyage of discovery consists not in seeking new landscapes but in having new eyes.” Marcel Proust

By the end of 2025, it is estimated that 139.3 million people will be displaced due to war and conflict, marking another rise in global

displacement for the 13th consecutive year (UNHCR, 2025). This escalating forced displacement crisis disproportionately affects displaced children, who face heightened psychological distress and educational challenges (Blackmore et al., 2020). As their vulnerabilities become amplified, displaced children become highly

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reliant on their caregivers for their overall wellbeing and development (WHO, 2020). While there are a considerable number of studies that have advanced our understanding of responsive parenting in displaced populations, they primarily rely on self-reported data (Khraisha, Abujaber, et al., 2024), which presents significant limitations. Language barriers, varying literacy levels, and a lack of locally validated measures can skew self-reported information (Hayden et al., 2010; Hinchey et al., 2023), reducing the accuracy of data on parenting interactions.

Behavioral observation

Observational methods, including videotaped interactions, offer a more precise view of parenting behaviors than self-reported methods, because they capture them directly (Hawes & Dadds, 2006). However, due to resource barriers, the use of these methods is constrained in low- and middle-income countries (Bozicevic et al., 2024), where most displaced people reside (UNHCR, 2024a, 2024b). In these locations, displaced caregivers face more significant mental health challenges that, in addition to reducing their emotional availability, distort their self-reported responses by hindering memory retrieval and influencing their perceptions of past events (Meisenberg & Williams, 2008; Prime et al., 2023; WHO, 2020). Though not entirely free from biases, observation of parental behaviors in displacement settings could circumvent recollection and response biases.

Unlike the relatively simple task of completing a self-report checklist or questionnaire, observational tasks require caregivers to manage their behavior in real time, which imposes a higher cognitive load and makes it more challenging to conceal socially undesirable actions (Eysenck et al., 2007). Consequently, observational methods provide a more authentic representation of child-caregiver dynamics, capturing behaviors that might be omitted or misrepresented in self-reports. Reporting biases are especially pronounced in displacement settings, where people usually have insufficient resources and legal protections that increase the pressure on them to respond in ways that align with perceived social or cultural expectations (Aleinikoff & Poellot, 2014; Bozicevic et al., 2024; Meisenberg & Williams, 2008).

In addition to bypassing certain cognitive barriers, behavioral observation captures paralinguistic (vocal elements like tone, pitch, and volume) and kinesic (nonverbal body movements such as gestures, posture, and facial expressions) aspects of child-caregiver interactions that systematically fall outside the scope of self-reports. Two commonly evaluated interactions via observational coding systems are Synchrony, defined as the “matching of behaviours, emotional states, and biological rhythms” (Leclère et al., 2014, p. 3) and Sensitivity, “the attunement of parents to their child’s emotional and cognitive states” (Ainsworth et al., 1974; Borairi et al., 2024, p. 2). For example, paralinguistic and kinesic aspects that are ‘sensitive’ to the child’s actions include stepping back to allow independent problem-solving abilities (Borairi et al., 2024; Mathers et al., 2024).

Sensitivity and Synchrony are fundamental concepts in attachment theory and developmental psychology (Deans, 2020; Leclère et al., 2014), and have been empirically established as key to a child’s emotional security, self-regulation, social competence, and cognitive growth (Davis et al., 2017; Rodrigues et al., 2021). Though all caregivers demonstrate some degree of Sensitivity and Synchrony with their children, cultural differences shape how

these behavioral domains manifest: universality does not equal uniformity (Black et al., 2024). Various forms of parental interactions can also show ‘equifinality’ or fulfill similar developmental functions. In the Middle East, research has demonstrated that Arab and Israeli-Jewish families attained equally high levels of secure infant attachment despite exhibiting differing degrees of Sensitivity (Zreik et al., 2017). Recent research also suggests that Palestinian-Arab mothers employed “high arousal maintenance” during video observations to regulate their children, whereas their Jewish counterparts exhibited an “arousal matching and modulation” pattern (Abu Salih et al., 2023).

Limitations in the literature

Collecting observational data raises several challenges, including ethical and privacy concerns that are acutely felt in displaced populations, who tend to have traumatic histories. Often, refugees tend to distrust authority figures and may be wary of being recorded (Hall & Werner, 2022). In some instances, such distrust has led participants to refuse video recording, forcing researchers to rely on live observation (Lembcke et al., 2020). Cultural differences in gender interactions can further complicate video data collection and analysis; for example, in our study, some mothers were uncomfortable with men on the research team viewing their recordings.

Furthermore, extensive resources are needed when analyzing observational data from non-English-speaking participants, who represent the majority of the displaced population (UNHCR, 2024b). According to the United Nations High Commissioner for Refugees’ latest figures, displaced individuals currently originate from 206 UN-recognized territories, each with its own languages or dialects (UNHCR, 2024a, 2024b). Normally, multiple linguistic groups of the same nationality coexist within the same country. Jordan, where our study was conducted, hosts at the time of writing refugees from 34 nationalities, each speaking multiple languages and dialects (UNHCR, 2024a, 2024b). This includes Syrian refugees, who speak various regional dialects of Arabic (e.g., Damascus, Aleppine) and other languages like Circassian, Turkmen, Kurdish, Kurmanji, and Domari, each with its own respective dialect (Abu Kwaik et al., 2018; Ain, 2016).

Accordingly, earlier efforts to code refugee parental data have faced several methodological limitations. Research often depended on small overall sample sizes, including those used to establish interrater reliability, or was at risk of bias due to reliance on a single coder or a culturally homogeneous team (Dalggaard et al., 2020; Hein et al., 2020; Lebiger-Vogel et al., 2022; Lembcke et al., 2020; Scharpf et al., 2023; van Ee et al., 2013; Wiepkema, 2013). Beyond sample considerations, many of these coding systems were used ‘off-the-shelf’ without integrating their design with knowledge of how displacement and trauma impact parental interactions. For instance, domains pertaining to child-caregiver interactions (e.g., Sensitivity) are often measured through subdomains aligned with that construct (e.g., Sensitivity assessed only through the presence of sensitive behaviors). However, this overlooks the multidimensional nature of child-caregiver interactions (e.g., insensitive behaviors may also surface during sensitive interactions; Beebe et al., 2010; Fogel & Thelen, 1987; Lewis, 2000). Multidimensionality may hold particular significance for refugee populations, as trauma influences caregiving behaviors, leading to contradictory and rapidly shifting behaviors that reflect

ongoing processing of difficult emotions, dissociation, and unresolved grief (Ariav-Paraira et al., 2022; Granqvist et al., 2017).

Finally, longitudinal observational studies of child-caregiver relationships, which are generally sparse (Bergmeier et al., 2015), remain strikingly absent from the refugee literature. As a result, no observational coding system to date has undergone validation across multiple time points in displacement contexts. Without such longitudinal validation, it can be impossible to determine if an observational system is capturing enduring patterns in child-caregiver dynamics (Dishion et al., 2017).

Current study

In light of these gaps and the growing need for observational video data and coding systems necessary to analyze these data in the context of displacement, we conducted the first longitudinal behavioral observational study of displaced populations and developed a relatively low-cost, paralinguistic-kinesic video coding system for ‘refugee caregiving.’ Our aim is to test the reliability and validity of this coding system with displaced Syrians living in Jordan. At the time of data collection, Syrians represented the largest refugee population globally (UNHCR, 2021a), with a substantial proportion residing in Jordan (approximately 660,000 in 2021; UNHCR, 2021b). While contributing directly to the rapidly growing field of ‘refugee caregiving’ and displaced persons more broadly, this study also offers valuable additions to the general parenting literature, particularly research dealing with the paralinguistic-kinesic aspects of parental communications, as well as parenting literature in low-resourced settings and among non-English-speaking populations (Bozicevic et al., 2024; Colegrove & Havighurst, 2017; Mesman, 2021).

Method

Before conducting this study, we obtained formal ethical approval from the Prime Minister’s Office of Jordan and Trinity College

Dublin (01E/2020/10). Recruitment and other procedural data were preregistered, and all the other study materials pertaining to the observational coding system are available online on Open Science Framework (<https://osf.io/2q538/overview>), as is the analysis preregistration for this article. A summary of data collection details is presented in Figure 1, while a detailed description of the methodology is provided in each of the following subsections.

Participants

For this video observational study, we drew our sample from a cohort study that includes Syrian refugee mothers ($n=322$, $M_{\text{age}}=32.61$ years, $SD=7.02$) and their 4- to 8-year-old children ($n=322$, 50% female, $M_{\text{age}}=6.32$ years, $SD=1.18$). Almost all mothers fled to Jordan between 2011 and 2014 and, as such, have been in displacement for about 10 years. Most lived in Amman ($n=235$, 73.3%), with a smaller percentage living in the Zaatari refugee camp ($n=87$, 26.7%), in line with broader trends for living situations among Syrian refugees in Jordan during the time of data collection (UNHCR, 2021a).

Study design

The main objective of the cohort study from which our video observational data was drawn was to evaluate “We Love Reading,” a shared book-reading intervention by Taghyeer (Dajani, 2019), a nonprofit organization founded in Jordan in 2010. The program aims to improve child literacy and attitudes toward reading, with the secondary goals of enhancing family relationships. To test the effectiveness of “We Love Reading,” the cohort study employed a cluster randomized control trial design: participants were assigned to either a ‘treatment’ group that immediately received the intervention ($n=154$) or a wait-listed control group ($n=168$). None had prior experience with the program.

Crucially, once the training was delivered, no statistically significant changes in mother or child behaviors for any primary or

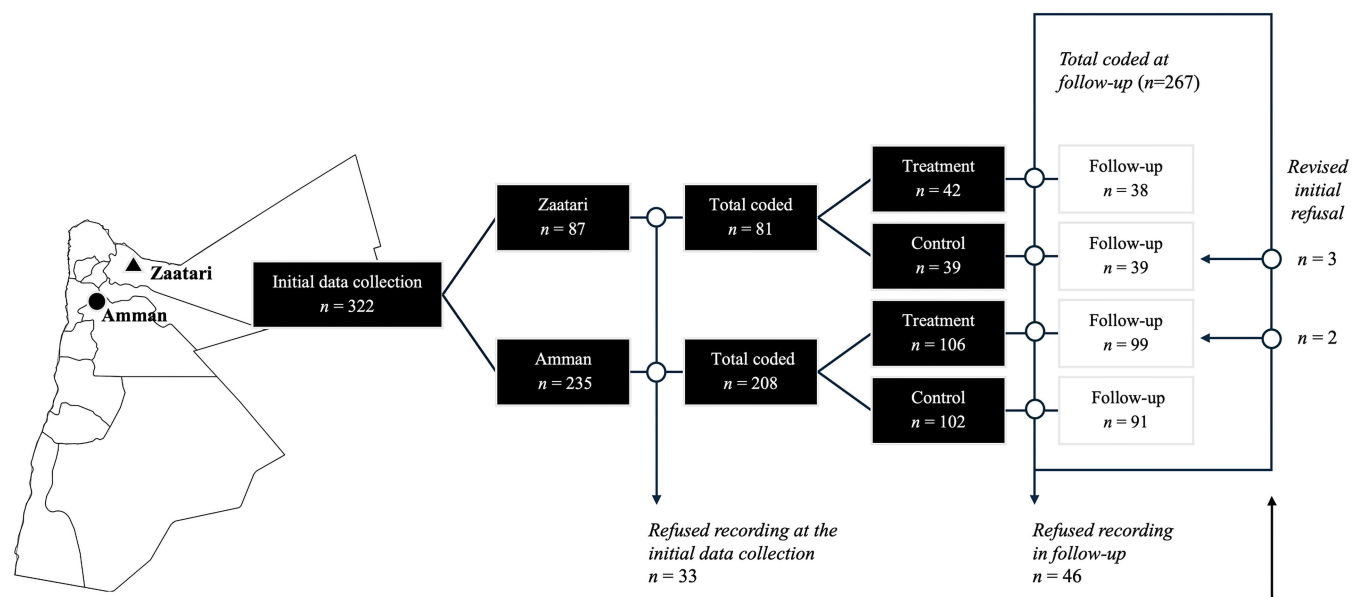


Figure 1 Overview of initial and follow-up video data collection. Note. Four months later, we followed up on the same sample; 27 refugee mothers initially agreed to be recorded but refused at follow-up.

secondary outcomes were reported (Hadfield et al., 2024). Note that the cluster randomized control trial had >90% power to detect small-to-medium effects ($f = .20$, in line with Dowdall et al., 2020), which suggests that the intervention's true effects were either minimal or nonexistent. Based on these findings, our current study shifts focus from the intervention's impact to analyzing the video data for a broader understanding of refugee family relationships. Note that the video recordings were separate from the "We Love Reading" program activities. The actual intervention took place on another day.

Eligibility criteria

For a family to be invited to the cohort study, the parents had to be Syrian, and the primary caregiver of a child aged 4–8 years. If multiple children fit the range, the child closest to 6 was selected. This age range offers both practical and conceptual advantages. Children of this age can generally engage in unstructured tasks, such as the toys used in our study, allowing for meaningful observation of child-caregiver interactions (Hein et al., 2020). This period also represents a significant milestone in cognitive, social, and emotional development, largely shaped by children's interactions with their caregivers and peers (Piaget, 2007).

Three children were slightly outside the age range (all within 1 year of our criteria), but we decided to keep their data in our analysis. All parent participants were biological mothers, except one grandmother, who was the primary caregiver because the child's biological mother had passed away. To simplify the reporting of our analysis, we treated this grandmother as we would treat a mother. With this in mind, everyone who participated in the cohort study, regardless of their assignment group, was invited to participate in these video observations. Most families agreed, with 287 (89% of the total) consenting to be recorded, which constitutes a high participation rate in video observational research (Parry et al., 2016).

Timeline and recruitment procedure

The initial data collection period, which incorporated the first wave of dyadic video recording sessions, began in February 2021 and was completed in May 2021. Follow-up data collection, containing the second wave of dyadic video recording sessions, started in May 2021 and concluded in August 2021. To recruit Syrian refugee mothers, we relied on institutional knowledge and community networking; Taghyeer initially provided a list of organizations that support Syrian refugee mothers in Amman, whom we contacted to provide us with a list of eligible refugee mothers.

The organizations from which we drew our participants included Sanabel Al-Khair ($n = 45$), Al-Yadoudeh Society ($n = 32$), Husun Al-Eman ($n = 35$), Yarub Charity ($n = 27$), and Nasamat Al-Farah ($n = 96$). In the Zaatari refugee camp, we relied on word of mouth; two "reading ambassadors" who had previously volunteered with the "We Love Reading" intervention provided a contact list of mothers who fit the criteria ($n = 47$ and 40, respectively). All our field-workers responsible for conducting video recording sessions spoke Arabic fluently and, in addition to having previous experience collecting data, underwent on-site data collection training, which included the piloting of data collection procedures with 10 dyads.

Home visit protocol

Mothers who expressed interest in learning more about the project received another call from our field-workers, who provided more details and an explanatory sheet via WhatsApp (including the research background, what their participation would entail, etc.). Household visits were arranged for those who agreed to participate. On the day of the visit, two field-workers would introduce themselves and set up the environment, preparing books and setting up toys for the video recording session, which involved play and book activities. All participants were intended to do both activities. Recording was done subsequently to the survey data collection and the experiments (these were not part of this study and included computerized tasks designed to measure emotion and cognition). Doing so provided the participants with more time to become familiar with the project, therefore promoting a more natural mother-child interaction to be captured by the video recordings (Gardner, 2000).

At the start of every recording, one field-worker explained the activity instructions to both the mother and child, while another handled the technical aspects, such as setting up the camera and tripod, displaying the identification paper to the camera, and starting the timer (play activity ~5 min and book activity ~10 min). In most cases, field-workers left the room, but when that was not possible due to the lack of available rooms ($n = 2$), field-workers stayed without interfering in the interaction. Fathers were present rarely ($n = 3$), and most sessions went uninterrupted (only $n = 16$ were interrupted, e.g., another family member walking into the room). Our protocol on the OSF page included specific instructions for handling interruptions. More details on the materials used and activity structure are also included in the protocol.

Coding system

We have developed a coding system called the Behavioral Recognition In Displaced Group Exchanges (BRIDGE) to assess the quality of interactions between refugee mothers and their children (Figure 2). BRIDGE measures refugee child-caregiver interactions via two domains (Sensitivity and Synchrony) with four subdomains each (Table 1) that represent core parenting behaviors (Aspland & Gardner, 2003; Davis et al., 2017; Leclère et al., 2014; Matias, 2006). The system draws inspiration from the Coding of Attachment-Related Parenting (CARP; Matias, 2006) and its short version, the S-CARP (Bennetts et al., 2021), both of which offered openly available training materials and did not require specialized software or training fees. Other systems, including earlier ones used with refugee or displaced populations (see Table 2), were limited by restricted access to training materials, the need for specialized software, or costly training requirements, among other limitations. While CARP and S-CARP provided a helpful starting point, we eventually made substantial adaptations to better suit the context of displacement, given that these systems were designed for English-speaking dyads in high-income countries.

Subdomains, scoring, and training

Some participating mothers were not comfortable having male researchers view their videos. As a result, our male team lead

Table 1 BRIDGE domains and subdomains.

Domain	Subdomain	Definition	Example behaviors
Sensitivity	Responsiveness	How well a caregiver follows child's lead	Turning a page when the child struggles to do so
	Guidance	Caregiver's efforts to structure the interaction	Setting up toys; pointing something to the child
	Autonomy promotion	How the caregiver encourages independent behavior and decision-making in the child	Allow independent playing
	Forcefulness	Reverse scored, gauges control that might hinder the child's independence and responsiveness	Preventing the child from turning a page or taking away an item the child is still interested in
Synchrony	Shared attention	Mutual engagement in activities via eye gaze	Looking at the book together
	Affect matching	Alignment of positive emotional states between caregiver and child	Sharing child's excitement
	Child involvement of the caregiver	Child's openness to the caregiver in interactions	Opportunities the child provides for the caregiver to join the task, regardless of the child's intent
	Contradiction	Reverse scored, identifies disruptions in the natural interaction flow from the caregiver's side	Shuffling between toys or indicating they will give their child a toy but then keeping it

Note. BRIDGE = Behavioral Recognition in Displaced Group Exchanges.

Table 2 Comparing BRIDGE to other systems evaluating child-caregiver bonds in forced displacement.

Reference	Coding system	Key measures	Sample details	Reliability	Language dependency	BRIDGE advantages
Dalgaard et al. (2020)	Marschak Interaction Method Rating System (MIMRS)	Structure, challenge, engagement, nurture	Refugee dyads from 7 countries in Denmark ($n = 21$)	5 videos double coded	Dependent, required translation	Open-source training; measures Synchrony; no translation needed
Hein et al. (2020)	Combined criteria from two different sources (Bernard et al., 2013; Matas et al., 1978)	Sensitivity, intrusiveness, positive regard, disengagement, Synchrony	Refugee dyads from Syria in Germany ($n = 104$)	104 videos double coded	Dependent, required translation	Open-source training; no translation needed
Lebiger-Vogel et al. (2022)	EAS	Sensitivity, structuring, nonintrusiveness, nonhostility	Unspecified who is displaced; total sample originate from 37 countries residing in Germany ($n = 118$)	Unspecified	Unclear ^a	Open-source training; measures Synchrony; no translation needed
Scharpf et al. (2023)	EAS	Sensitivity, structuring, nonintrusiveness, nonhostility	Refugee dyads from Burundi in Tanzania ($n = 222$)	20 videos double coded	Independent due to methodological constraints ^b	Open-source training; measures Synchrony; validated specifically for nonverbal communications

Note. van Ee et al. (2013) and Wiepkema (2013) both used the EAS observational coding on refugee fathers. BRIDGE = Behavioral Recognition In Displaced Group Exchanges; EAS = Emotional Availability Scales.

^a Sensitivity included verbal expressions, but there is no explicit statement on whether translations were needed for coding.

^b Coders focused on nonverbal aspects of the interactions due to the noisy environment of the refugee camps and the generally low level of verbal communication observed in the mother-child dyads.

could not watch the recordings and act as the “master coder,” a common approach where one experienced researcher watches most videos to develop training protocols aligned with their scoring. Instead, two volunteer female research assistants (B. Volta

and C. O'Regan, who do not understand Arabic) with backgrounds in developmental psychology were trained to code $n = 100$ recorded observations of refugee child-caregiver interactions, while Q. Khraisha, who did not view the videos, structured their

observational feedback into a codebook that involved detailed instructions and descriptive examples on which behaviors constituted a particular subdomain, and which behaviors did not. The codebook material can be accessed via the web.

B. Volta and C. O'Regan first received a reading list of academic papers related to parenting and the impact of displacement on child-caregiver relationships (e.g., Bronfenbrenner, 1996; Bryant et al., 2018; Hein et al., 2020; Hodes & Vostanis, 2019; Kuppens & Ceulemans, 2019). Building on his experience at the United Nations High Commissioner for Refugees (UNHCR) as a cognitive interviewer for highly sensitive populations, Q. Khraisha designed and delivered an extensive training on cross-cultural nonverbal behavioral analysis. The training program emphasized awareness of biases that could influence the perception of behavior (Azriel & Bar-Haim, 2020; Harvey, 2007). Coders were introduced to the cognitive bias codex (Manoogian & Benson, 2018) and were advised to focus on objective, observable behaviors rather than subjective interpretations of parental beliefs or intentions behind a behavior (Gardner, 2000; Putnick, 2019). One exercise involved analyzing a zoomed-in image of a tense face, which was interpreted as angry by most coders in training; when shown the full context of the image as a winning moment in a sports match, coders understood how ambiguous information can lead to misinterpretation and inaccurate labeling.

After this initial training, B. Volta and C. O'Regan began independent coding sessions and discussed any divergent interpretations with Q. Khraisha. This process led to refinement in coding guidelines and instructions (this process is illustrated in Figure 3). Within this iterative approach, we introduced new categories for “forcefulness” and “contradiction” to capture interactions that were previously unaccounted for. We established a frequency scale: behaviors were categorized as *none* (zero occurrences), *rarely* (one to three occurrences), *about half of the time* (four to

six occurrences), or *most of the time* (more than six occurrences). This frequency system was calibrated based on observed norms within our specific sample from an initial 100 videos we coded, as standard norms did not exist for these behaviors. In the final scoring, *none* is scored as 0, *rarely* as 1, *about half of the time* as 2, and *most of the time* as 3. The total score for each domain (Sensitivity or Synchrony) can range from 0 to 9, calculated from these subdomain scores. For the majority of families who were coded on both play and book activities, their scores were averaged, in recognition of the fact that observational data are “situationally sensitive” (Krijnen et al., 2023; Mathers et al., 2024); as such, by examining multiple contexts (both play and reading), we can gain a clearer understanding of the quality of the relationship.

Once coders agreed with each other almost every time (we did not perform a statistical test at this stage but rather relied on consensus through discussions), Q. Khraisha codified the set of instructions that yielded high agreement into a final codebook. We subsequently recruited and trained 18 female international coders (2 understood Arabic, the language of the participants). Most were undergraduate students, and none had any previous knowledge or experience in coding or observational research. New coders completed the prescribed background readings (the same as those completed by B. Volta and C. O'Regan), along with other documents on research ethics and handling sensitive data. They were also given a similar training on behavioral assessment and cross-cultural considerations, followed by at least 20 hr of hands-on training sessions conducted over 4 weeks. The training protocol required coding 20–60 practice videos, which had already been completed by experienced coders, with advancement contingent upon specific error thresholds. For example, coders demonstrating errors across three or more subdomains (e.g., two videos had an inaccurate assessment of guidance, autonomy, and forcefulness) in a set of five videos continued practicing with

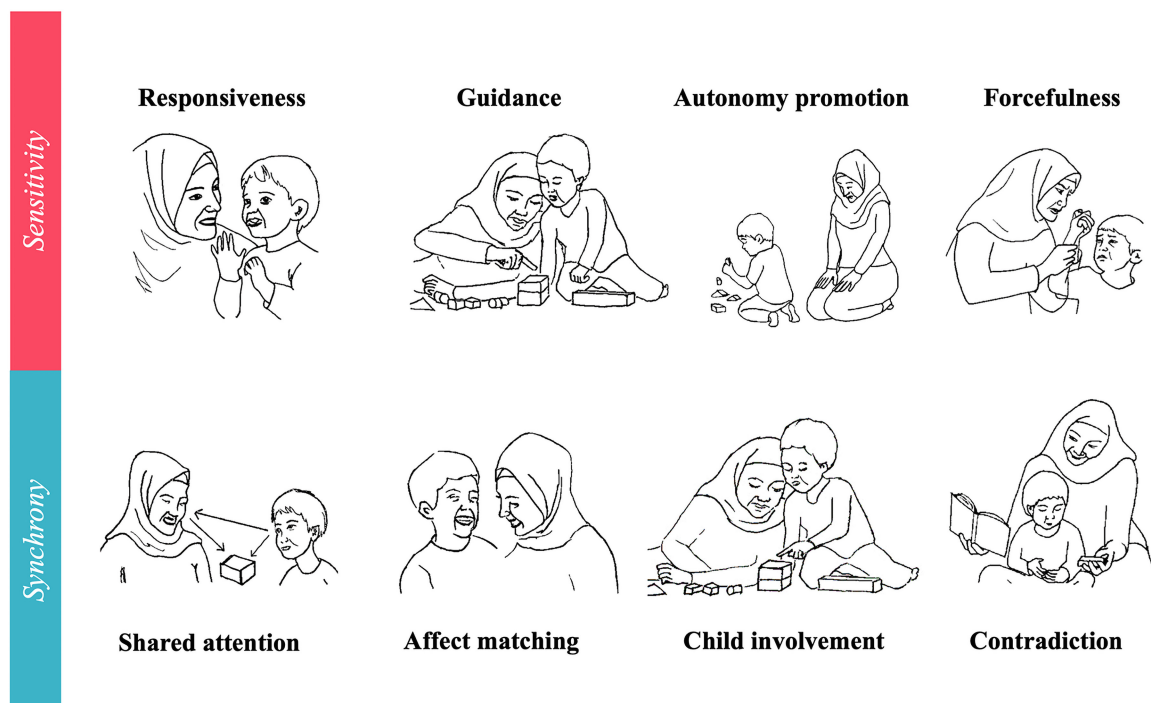


Figure 2 The Behavioral Recognition In Displaced Group Exchanges (BRIDGE) coding system. Note. The total score for each domain (Sensitivity and Synchrony) can range from 1 to 9; “forcefulness” and “contradiction” are reverse scored.

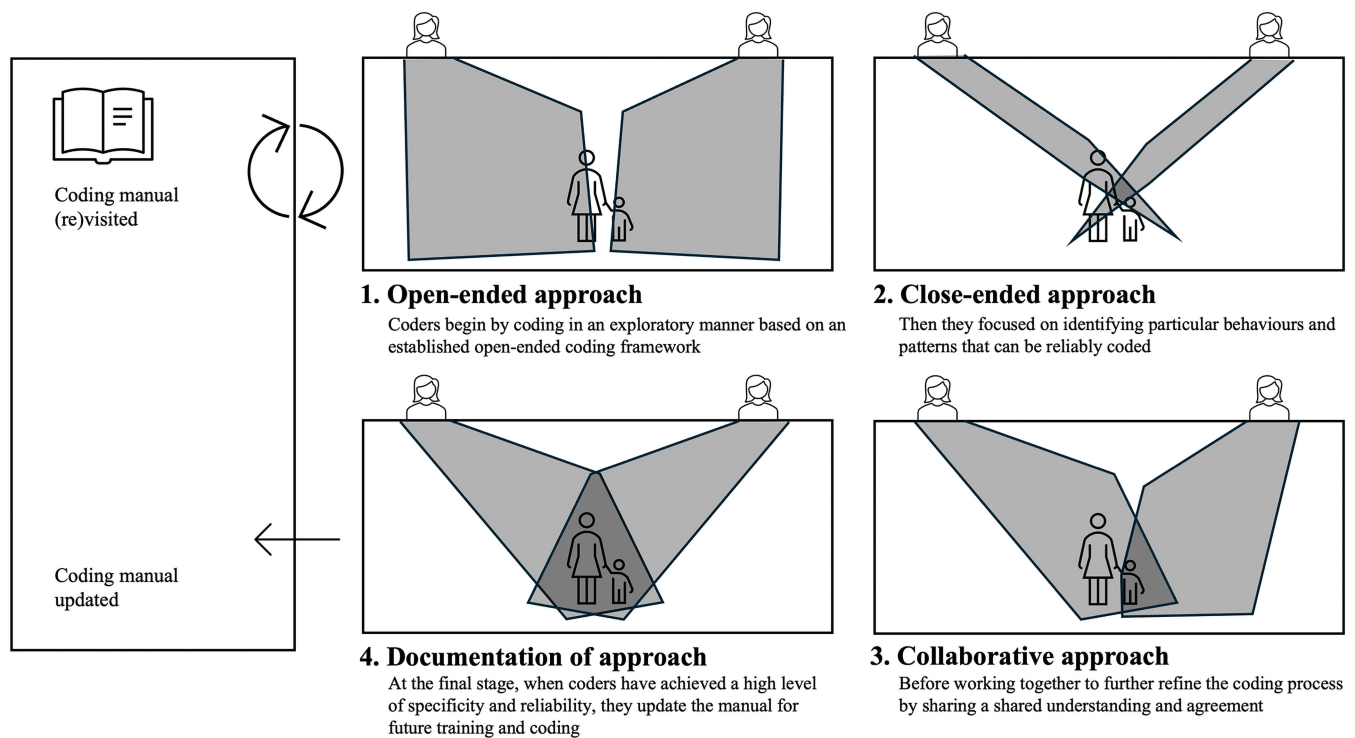


Figure 3 Decentralized coding of Sensitivity and Synchrony: a visual framework.

complete videos until meeting the threshold. Coders showing errors in one or two subdomains engaged in targeted practice within those specific subdomains until achieving an error rate of ≤ 1 per subdomain per video. An error was defined as any coding discrepancy from the “gold-standard” benchmarks established by multiple coders who finished training.

After completing training, the coders met weekly to review scores and address discrepancies to reduce “coder drift,” the gradual change in coding from the standard agreed upon in training (Forrer et al., 2018). At the time of writing, we had coders from the Bahamas, China, Germany, India, Ireland, Italy, Jordan, Luxembourg, Poland, Spain, Turkey, the United Kingdom, and the United States. All coding was done online using a simple survey on Qualtrics. Further details on our training process, material, and manual are available online (<https://osf.io/2q538/files/hcpby>).

It is important to clarify that linguistic background, specifically Arabic language proficiency, was not used as a criterion for coder selection or as an analytical covariate in the coding process. All coders were able to listen to the audio while coding, but were instructed not to consider language content in the coding. While two of our coders understood Arabic, during the training program, they were required to demonstrate interrater reliability that met stringent matching criteria with their peers (who had minimal to no exposure to Arabic language), and that included perfect or near-perfect agreement with non-Arabic-speaking coders (error rate of ≤ 1 per subdomain per video).

Reliability and validity

We preregistered our analysis to evaluate the reliability and validity of the BRIDGE coding system (<https://osf.io/2q538/files/guqvvy>). Systematic variability was first assessed using a paired-sample *t*-test to compare single coder ratings of Sensitivity or Synchrony

against a benchmark set by multiple coders (we supplemented this analysis with Bland–Altman plots; a visual method that can reveal any systematic patterns of disagreement between ratings that the *t*-test may not highlight). Second, we assessed for random variability by examining Cohen’s and weighted kappa, targeting agreement of .53 or higher (Cohen, 1960; Sun, 2011). Third, to measure coder variability, we used the intraclass correlation coefficient (ICC), expecting an ICC above .5 as an indication of low subjectivity.

Fourth, we investigated within-coder variability, the extent to which the same coders agreed with themselves, by conducting a paired-sample *t*-test for coders who accidentally coded the same videos twice. Fifth, we analyzed the time variability (stability) of the coding scheme by comparing videos coded at the initial data collection and follow-up through a paired-sample *t*-test. To account for intraindividual stability of scores, we conducted a Bland–Altman test, while Pearson’s correlational analysis was undertaken to understand rank order differences; these two analyses were not preregistered. We first coded the initial videos and then the follow-up ones; where possible, the same coder was used to code both.

To validate the system, we set out to examine its correlation with parenting and parent–child relationship surveys, including the Pianta Child-Parent Relationship Scale (measured at both initial and follow-up stages; Driscoll & Pianta, 2011; Pianta, 1992), which consists of 15 items on a 5-point Likert scale. This scale includes measures of mother–child closeness (seven positive items, scores ranging from 7 to 35) and conflict (eight negative items, scores ranging from 8 to 40). While data for the Pianta scale were collected from participating mothers at two time points, only at follow-up we administered the Alabama Parenting Questionnaire (short-form APQ; Elgar et al., 2007) to measure positive parenting, poor supervision, and inconsistent discipline,

which was done on a 5-point Likert scale (range of scores between 3 and 15). We hypothesized that BRIDGE measures of Sensitivity and Synchrony would positively correlate with positive parenting and closeness and negatively correlate with conflict, poor supervision, and inconsistent discipline.

Correlational analyses were conducted using IBM SPSS Statistics for Mac, version 29.0.2.0 (IBM Corp., Armonk, NY). Data visualizations and interrater tests were performed using R version 4.4.2 on RStudio, version 2024.04.2+764 (Posit, PBC, Boston, MA).

Results

Reliability

We analyzed 1,092 videos using BRIDGE across two time points (see Figure S1 for score distribution; $\approx 10\%$ of our sample refused to be recorded, see Table S1 for an overview of their characteristics). The initial phase included 564 videos (281 play activities, 283 book-reading activities), while the follow-up phase 4 months later comprised 528 videos (261 play activities, 267 book-reading activities). When comparing each coder scores (coding done individually) against the “benchmark” (videos coded by multiple experienced coders), we found no significant differences ($t = -.11$, $df = 229$, $p = .90$). This suggests low systematic deviation in the coding process (a finding consistent with the visual Bland–Altman analysis, see Figure S2A).

Disagreement between coders did occur (Cohen's $\kappa = .41$), but their magnitude was low; most disagreements were limited to single-point differences (Figure S2B). This was confirmed by the weighted kappa ($\kappa = .74$), which uses squared weights to account for the ordinal nature of the ratings and provide partial credit for near-adjacent ratings (the ICC score was .75, confirming this finding). These intercoder agreement scores are higher than seen elsewhere in the literature (e.g., Lembcke et al., 2020), reflecting strong interrater reliability. Additional reliability checks came from instances where coders coded the same videos twice. Our analysis indicated low within-coder variability and minimal impact of potential coder fatigue or drift for subdomain coding ($t = -0.350$, $df = 175$, $p = 0.726$; note the sample size had excellent power to detect medium effects $d = 0.5$, power $> 99.9\%$, and large effects $d = 0.8$, power $= 100\%$). Controlling for chance agreement, within-coder agreement was $\kappa = .76$, while weighted kappa was even higher at $\kappa = .88$, indicating excellent within-domain consistency.

Furthermore, BRIDGE yielded robust stability (Figures 4 and 5). Sensitivity scores averaged 6.91 ($SD = .98$) at initial collection and 7.30 ($SD = 1.05$) at follow-up. While this difference was statistically significant ($t(261) = -5.09$, $p < .001$, 95% CI $[-.54$ to $-.24]$), it represented only a 4.33% change on our 9-point scale. These Sensitivity scores align with those reported in other non-Western samples using 9-point scales (7.33; Fourment et al., 2021) and are comparable to scores observed among securely attached children in Western samples (Thompson, 2021). Synchrony demonstrated

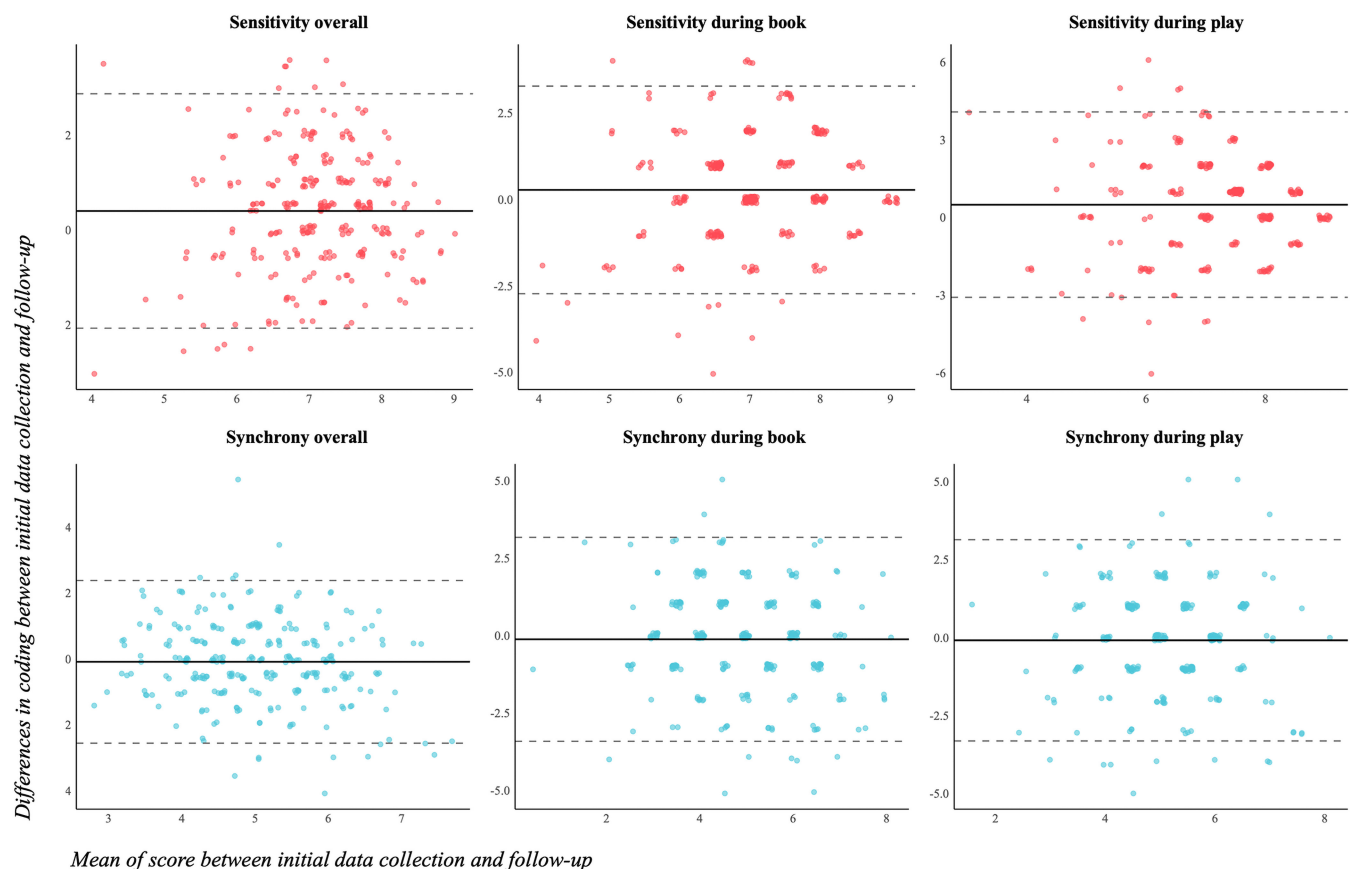


Figure 4 A Bland–Altman plot visually representing systematic variability in coding. *Note.* The dashed red lines represent the upper and lower limits of agreement, calculated as the mean difference ± 1.96 times the standard deviation of the differences: points falling outside these limits may indicate significant disagreements between the raters, reflecting potential outliers or areas of systematic bias in the observational process. The x-axis, representing the average score between the coders, provides a reasonable estimate of each item's “true” value.

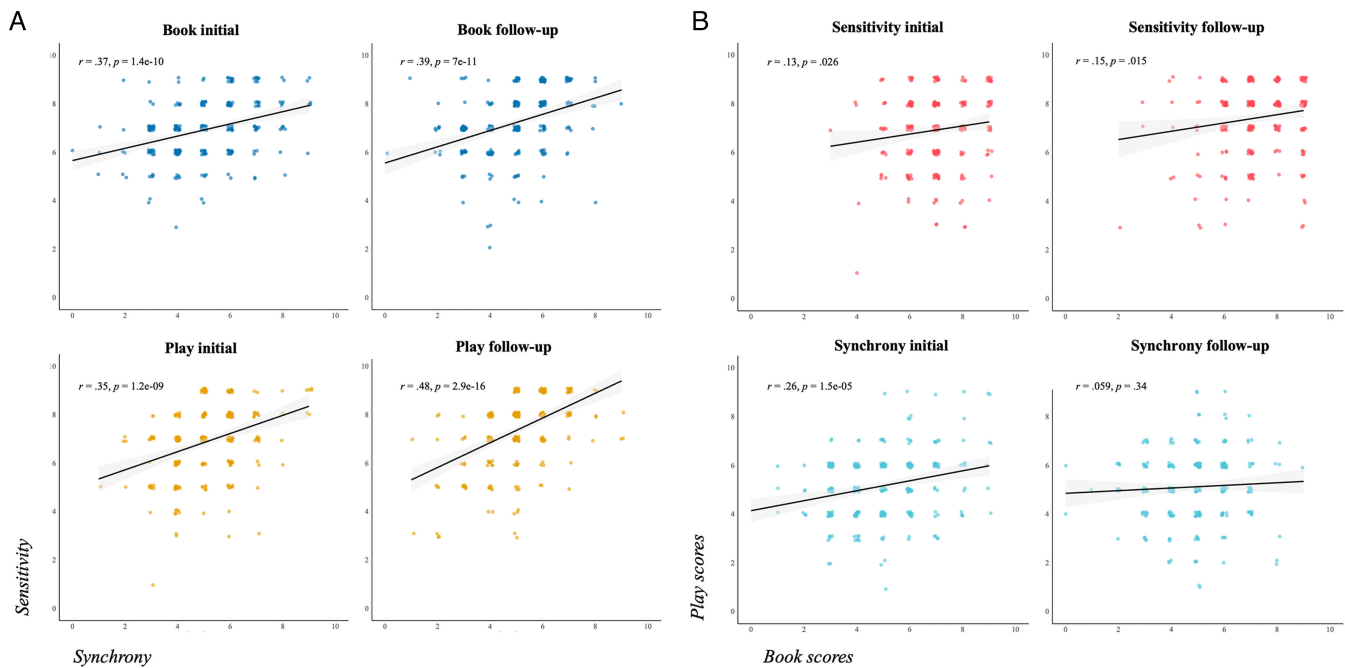


Figure 5 Sensitivity and Synchrony correlations across the same (A) and different contexts (B).

even greater stability, with no significant change between initial ($M = 5.07$, $SD = 1.22$) and follow-up phases ($M = 4.98$, $SD = 1.05$; $t(261) = 1.15$, $p = .252$, 95% CI $[-.06$ to $.24]$), mirroring a similar scoring pattern found in the 9-point Synchrony Global Coding System (3.49; Skuban et al., 2006).

In terms of longitudinal stability at the individual level (as opposed to the group-level averages reported above), our results show that mothers who scored higher in Sensitivity and Synchrony at the initial assessment maintained their relative standing at follow-up (Figure 4) both for Synchrony ($r = .388$, $p < .001$) and Sensitivity ($r = .251$, $p < .001$). A visual inspection of the Bland–Altman plots, which is recommended when assessing reliability over time (Aldridge et al., 2017), demonstrates that the scores for each family stayed fairly consistent. The majority of caregivers showed smaller changes of less than ± 2.5 points, an amount of variation smaller than what other researchers typically find in other studies (Bennetts et al., 2016).

Validity

When self-reporting, nearly all mothers gave themselves maximum or near-maximum scores on closeness with their children (averaging 33 out of 35 points). Except for the conflict subscale administered at follow-up ($\alpha = .717$), all the other Pianta subscales demonstrated low internal consistency ($\alpha < .70$). Similarly, the Alabama parenting questionnaires had low internal consistency: the positive parenting subscale had the highest internal consistency but still was subpar ($\alpha = .629$) compared to the inconsistent discipline domain ($\alpha = .418$) and the poor supervision domain ($\alpha = .580$). However, even this ‘better’ measure suffered from the same ceiling effect problem, as most mothers scored at or near the maximum (range 13–15). Given these substantial psychometric limitations, we focused our analysis on the Pianta conflict subscale at follow-up, which demonstrated adequate reliability (results from the other measures are provided in the

Supplementary materials). While the Pianta conflict did not relate to observed Synchrony ($r = -.096$, $p = .129$), the subscale showed an association with Sensitivity ($r = -.154$, $p = .014$).

In contrast to the problematic self-report measures, our observational assessments of caregiver Sensitivity and Synchrony demonstrated strong psychometric properties and meaningful patterns of association. Within the same context (Figure 5A), Sensitivity and Synchrony predicted each other strongly (book initial: $r = .37$, $p < .001$; follow-up: $r = .39$, $p < .001$; play initial: $r = .35$, $p < .001$; follow-up: $r = .48$, $p < .001$). Both Sensitivity (initial: $r = .13$, $p = .026$; follow-up: $r = .15$, $p = .015$) and Synchrony (initial: $r = .26$, $p < .001$; follow-up: $r = .059$, $p = .342$) also showed modest correlations across play and book-reading contexts (Figure 5B). When averaging across both play and book-reading activities (Figure 6), Sensitivity strongly predicted Synchrony at both initial ($r = .40$, $p < .001$; Figure 6A) and follow-up assessments ($r = .44$, $p < .001$; Figure 6B). These findings reveal an important insight: the strong within-context correlations between Sensitivity and Synchrony, contrasted with weaker cross-context correlations, suggest how parental interactions are situation-specific.

Discussion

Our study introduces BRIDGE, a novel observational coding system designed to assess refugee child-caregiver paralinguistic-kinesic interactions in low- to middle-income countries, where most displacement occurs (UNHCR, 2024a, 2024b). The linguistic diversity of displaced populations makes large-scale coding prohibitively resource-intensive, requiring extensive teams of multilingual coders. This barrier makes minority refugee groups particularly difficult to observe and code. In this study, we demonstrate that coding paralinguistic-kinesic elements can circumvent language barriers while capturing meaningful refugee child-caregiving dynamics. Other studies highlight that paralinguistic communication is a rich aspect of parental interactions across

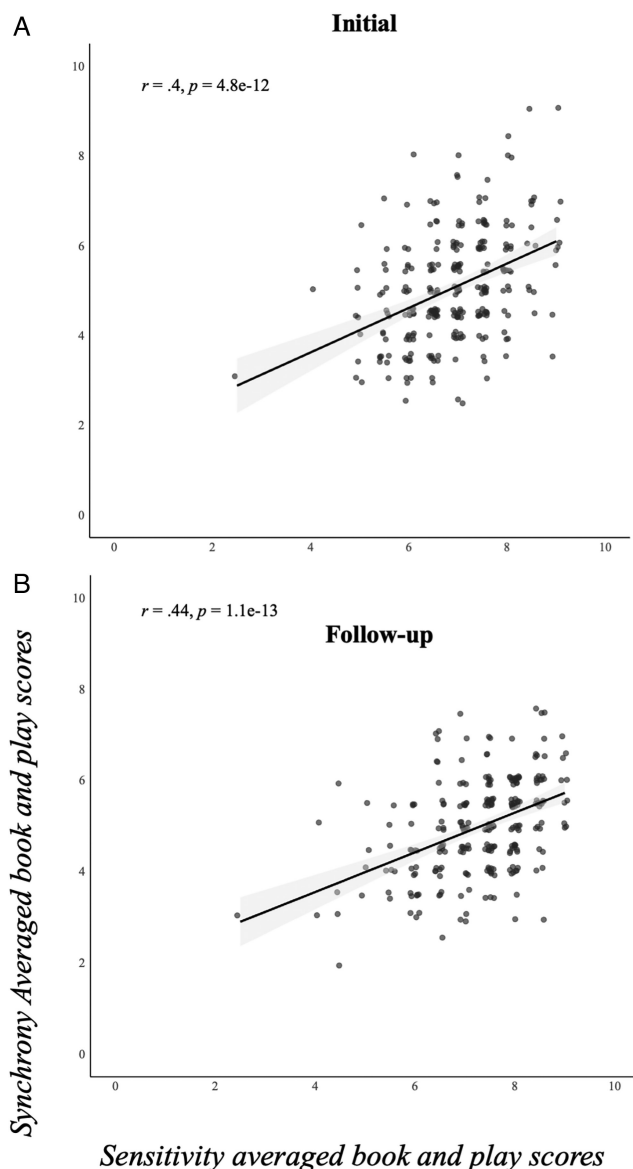


Figure 6 Correlations of Sensitivity and Synchrony averaged across contexts at initial (A) data collection and follow-up (B).

many societies (Abdullah et al., 2021), and that kinesiological elements of caregiving make up a significant part of child-caregiver interactions in low- to middle-income countries (Mesman et al., 2021).

We recognize that child-caregiver communications are inherently multimodal (verbal and nonverbal) and multidimensional (lexical and nonlexical), with *all* elements working in concert together to shape a caregiving interaction. Our goal in developing BRIDGE, therefore, is not to undervalue the lexical elements of parental interactions in displacement contexts but to spotlight the remarkably understudied but important paralinguistic-kinesic caregiving behaviors that surround verbal communications; unlike verbal content, these aspects are less conscious and thus less easily captured through surveys or interviews (Ghandour et al., 2024).

By validating our tool, we form a critical bridge to the rich developmental, clinical, and psychobiological scholarship on nonverbal behaviors conducted among nondisplaced people to

caregiving research with displaced populations (Bennett et al., 2025; Colegrove & Havighurst, 2017). This literature may be especially useful in understanding how war-related stressors affect automatic, less conscious aspects of caregiving (Dalgaard & Montgomery, 2015; Fredman et al., 2017; Measham & Rousseau, 2010). It could lead to a greater understanding of intergenerational trauma transmission in protracted displacement (Scharpf et al., 2021) and may also enhance our understanding of how the persistent “macro” and “daily” stressors influence ‘refugee caregiving’ behaviors (Khraisha, Abujaber, et al., 2024; Miller & Rasmussen, 2017).

Strengths and limitations

Our study represents the only longitudinal research as well as the most extensive cross-sectional analysis of video-based observational methodology to analyze child-caregiver interactions within a forcibly displaced population (Dalgaard et al., 2020; Hein et al., 2020; Lebiger-Vogel et al., 2022; Lembcke et al., 2020; Scharpf et al., 2023; van Ee et al., 2013; Wiepkema, 2013). Beyond scope, we demonstrate two important methodological advances. At the data collection stage, we show how large-scale video recordings and observational coding systems can be executed successfully among refugee communities that have reportedly been uncomfortable with cameras in other studies (e.g., Lembcke et al., 2020). When it came to coding the videos, we successfully ‘decentralised’ the coding approach, which was beneficial in reducing the common cultural bias arising from having one viewpoint dominate the coding system (Bozicevic et al., 2024; Colegrove & Havighurst, 2017).

As a result, our coding reliability was robust: there was minimal coder bias, substantial agreement when accounting for the degree of disagreement, and high consistency, accuracy, and stability over time. These findings echo those of well-established observational measures like the Emotional Availability Scales (EAS) (Biringen et al., 2014) and the CARE-Index (Crittenden, 1981), with the crucial difference of BRIDGE being the only validated, paralinguistic-kinesic observational coding system. This distinction offers important practical advantages because words are expensive to code and difficult to compare meaningfully across populations. As such, BRIDGE paralinguistic-kinesic design enables relatively inexpensive large-scale coding and standardisation across linguistically diverse populations, reducing one major barrier to cross-cultural research (Dalgaard et al., 2020; Hein et al., 2020; Lebiger-Vogel et al., 2022; Lembcke et al., 2020; van Ee et al., 2013; Wiepkema, 2013).

In terms of validity, BRIDGE measured meaningful aspects of ‘refugee caregiving,’ with construct and concurrent validity being supported by multiple lines of evidence. This includes our scoring distributions and theoretical rationales, which show considerable consistency with established research in the field (Fourment et al., 2021; Skuban et al., 2006; Thompson, 2021). Furthermore, intercorrelations between Sensitivity and Synchrony (strong within-context, weak across-context) provide evidence for discriminant and convergent validity. Additionally, the caregiving behaviors BRIDGE captures are context-specific, which aligns with “real-life” everyday parenting (Mathers et al., 2024), suggesting evidence for ecological validity. Finally, as hypothesised, the Sensitivity component in BRIDGE held a negative association with mother-reported, mother-child conflict.

A notable pattern emerged in our psychometric analyses: instruments measuring positive caregiving (such as mother-reported child closeness and positive parenting) consistently exhibited ceiling effects, whereas measures of negative caregiving (mother-reported child conflict and inconsistent discipline) showed normal skewness levels. This is a systematic response bias rather than random measurement error. While social desirability bias and Dunning–Kruger effects partially explain such patterns (Scott, 2020; Van de Mortel, 2008), they cannot fully account for why the caregivers avoided “flooring effects” when reporting conflict (i.e., why mothers did not overwhelmingly report low conflict with their child). The discrepancies we observed may reflect two distinct phenomena. First, some refugee caregivers may indeed be employing appropriate caregiving strategies, yet still experience significant conflict due to child difficulties that are unrelated to caregiving quality, such as trauma-related behavioral challenges or developmental disruptions common in displacement contexts. In these cases, high conflict reports may coexist with genuinely positive caregiving behaviors. Second, other refugee caregivers may be providing care in ways that are less effective but still respond positively on surveys to preserve their dignity. For these caregivers, ceiling effects on positive caregiving measures may mask caregiving difficulties.

Family dignity sits at the heart of caregiving in displacement (Elias et al., 2025; Khraisha, Sawalha, et al., 2024). In this study, translation may have rendered positively worded caregiving questions in our surveys imprecise: all languages have a bias for positivity (Boucher & Osgood, 1969; Dodds et al., 2015), hence positive caregiving terms are more likely to become ambiguous in Arabic, allowing them to be interpreted as dignity judgments. This explains why positive caregiving surveys showed the worst internal consistency. The pattern of low internal consistency for positively worded caregiving measures after translation appears in other research as well, hinting at a systematic measurement problem rooted in the intersection of linguistic bias, translation, and dignity concerns in displacement contexts (Puffer et al., 2017). The observation is theoretically significant because it suggests that binary positive–negative frameworks embedded in ‘refugee caregiving’ research become internalised standards that participants feel compelled to defend (Yashika & Prakash, 2025). It is also why BRIDGE can be especially valuable, as it circumvents issues with reliable reporting of positive caregiving, which may be particularly valuable given that the literature in protracted situations severely lacks documentation of positive caregiving (Khraisha, Abujaber, et al., 2024).

Future directions

BRIDGE paralinguistic–kinesic design opens promising avenues for research and intervention across culturally and linguistically diverse refugee populations, including the 78% living in protracted displacement (UNHCR, 2023). Recent advances in artificial intelligence, particularly neural deep learning algorithms capable of detecting nonverbal cues (Baur et al., 2013; Terhürne et al., 2022; Weng et al., 2025), suggest that automated BRIDGE coding could enable large-scale observational research in resource-constrained conflict and displacement settings. However, scalable data collection must be matched by rigorous cross-cultural validation to ensure meaningful interpretation. Future research is needed to investigate the universality, uniformity, and equifinality

of BRIDGE-assessed attachment constructs. One way would be to examine how Sensitivity and Synchrony predict child developmental outcomes similarly and differently across groups; for example, through longitudinal follow-up of this sample and inclusion of additional refugee and/or host populations.

Conclusion

BRIDGE represents a valuable addition to the toolkit available for researchers studying families affected by war and forced displacement. Through its focus on the paralinguistic–kinesic elements of caregiving interactions, BRIDGE offers a novel approach to understand child–caregiver dynamics in situations where language barriers or cultural differences may impede traditional assessment methods. This focus also eliminates the need for costly and time-consuming translation processes or the recruitment of multilingual coders when coding linguistically diverse displaced populations. We make BRIDGE freely available to democratize access to observational coding systems, enabling a broader range of researchers, especially those in resource-constrained settings, to contribute meaningfully to the field.

Supplementary material

Supplementary material is available at *Child Development* online.

Data availability

The analyses presented here were preregistered and are available at the following URL: <https://osf.io/2q538/files/guqv>. As for the data, material, and analytic code necessary to reproduce the analyses presented here, they are publicly accessible at the following URL: <https://osf.io/2q538/overview>.

Author contributions

Qusai Khraisha (Conceptualization [lead], Data curation [lead], Formal analysis [lead], Funding acquisition [lead], Investigation [supporting], Methodology [lead], Project administration [lead], Resources [lead], Software [lead], Supervision [lead], Validation [lead], Visualization [lead], Writing—original draft [lead]), Sophie Marleen Put (Data curation [supporting], Investigation [equal], Project administration [supporting], Supervision [supporting], Validation [supporting], Writing—review & editing [supporting]), Beatrice Volta (Investigation [equal], Methodology [supporting], Supervision [supporting], Validation [equal], Writing—review & editing [supporting]), Anisha Wadhwa (Investigation [equal], Supervision [supporting], Validation [supporting], Writing—review & editing [supporting]), Maria Lee (Formal analysis [supporting], Investigation [equal], Supervision [supporting], Validation [supporting], Writing—review & editing [supporting]), Erica Dos Santos Ribeiro (Investigation [equal], Supervision [supporting], Validation [supporting]), Ella Catherine Flynn (Investigation [equal], Validation [supporting]), Sarah Sweeney (Investigation [equal], Validation [supporting]), Katherine Farrington (Investigation [equal], Validation [supporting]), Matylda Sulowska (Investigation [equal], Validation [supporting]), Amal El Kharouf (Funding acquisition [supporting]), Sophie von Stumm (Funding acquisition [supporting], Writing—review & editing [supporting]), Rebecca Vining (Investigation [equal],

Supervision [supporting], Writing—review & editing [supporting]), Isabelle Mareschal (Funding acquisition [supporting], Writing—review & editing [equal]), Rana Dajani (Funding acquisition [supporting], Project administration [supporting], Writing—review & editing [supporting]), and Kristin Hadfield (Conceptualization [supporting], Funding acquisition [supporting], Methodology [supporting], Project administration [supporting], Supervision [supporting], Writing—review & editing [lead])

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Conflicts of interest

None.

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