Development and Validation of a Novel Microcoding System for Parent and Child Emotion-Related Behavior

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Abstract

Microcoding systems can facilitate detection of parent-child interaction *processes*, which cannot be disentangled through self-report or global coding methods. Yet, existing microcoding approaches focus on a relatively narrow range of behavior, particularly for children. The current study aimed to evaluate the reliability and validity of a novel microcoding system for capturing second-by-second changes in parent and child emotion-related behavior. A 6-minute videorecorded conflict resolution task was double-coded for 159 parent-child (age 6-16 years, M_{age} = 11.17, SD_{age} = 3.43, 49.1% female; 26.4% White, non-Hispanic; 44.7% early caregiving-related adversity-exposed) dyads. Results provided strong evidence of interrater reliability and concurrent validity with respect to global ratings. There was mixed evidence of nomological validity vis-à-vis mental health outcomes. As expected, greater parent depressive symptoms were associated with less parent positive social communication and more child non-autonomous behavior; child ADHD symptoms were associated with more parent off-task behavior. Surprisingly, parent active social engagement, reflecting efforts to socialize emotions or support autonomy, was positively associated with child anxiety (specifically among adolescents); child behaviors were not associated with child mental health. On average, children's positive social communication increased the likelihood of subsequent parent positive communication, and vice versa. Parents were typically more likely to engage in active social engagement behavior immediately following child withdrawal, and children were more likely to withdraw following parent active social engagement. Results offer initial support for the reliability, validity, and utility of our microcoding approach in elucidating bidirectional parent-child dynamics, and warrant replication in additional samples and interaction contexts.

Keywords: parent-child interaction, microcoding, dyadic behavior, emotion-related socialization

Public Significance Statement:

Microanalytic coding systems facilitate detection of bidirectional interaction processes between children and their parents, which can help to better understand the complexity of mental health problems in families and to develop and refine assessment and intervention strategies. We developed and evaluated a system for coding moment-to-moment changes in parent's and children's emotion-related behavior; establishment of interrater reliability, validity, and utility suggests its promise for future research and application in clinical settings.

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Whereas explanatory models of mental health have primarily focused on intraindividual mechanisms, uncovering the origins of youth mental health warrants careful consideration of the *interpersonal* context in which these problems emerge (Somers et al., 2023). Research on interpersonal emotion regulation highlights that people are both intrinsically motivated to use others to regulate their emotions *and* people may also be motivated to modify others' emotional expressions and experiences (Niven & Lopez-Perez, 2025). Within the domain of extrinsic interpersonal emotion regulation lies parent emotion socialization, which includes aspects of the household emotional climate, parental modeling, and specific parenting practices that shape how children learn about emotions and how to manage them (e.g., Eisenberg et al., 1998; Morris et al., 2007; Morris et al., 2017). Notably, children are not merely passive recipients of parenting: Children differ in their reception to parents' emotion coaching or problem-solving efforts (Altinoz et al., 2024; Gregson et al., 2016) and in the extent to which they elicit unsupportive parenting, which may contribute to their elevated risk for mental health problems (Cole, 2016; Morris et al., 2007). Assessing bidirectional emotion-related processes between parents and their children during interactions is therefore essential for evaluating interaction processes that can be targeted to prevent or ameliorate youth mental health problems.

Limitations of Current Microcoding Approaches

Within a multi-method approach to assessing parent-child interactions, observational methods are often considered to be the most clinically useful because of their ability to generate data that could not otherwise be obtained due to limitations in awareness, vocabulary, or

reporting biases (Hawes & Dadds, 2006; Kerig, 2015; Mash & Hunsley, 2005; Niven & Lopez-Perez, 2025). Observational approaches can be divided into macrocoding (global) approaches, in which each family receives a single score per rating scale, or microcoding approaches, in which families are repeatedly assessed on items across an interaction. In contrast to the static "snapshot" of the overall quality of interactions offered from global coding approaches, microcoding is the *only* approach that allows for rigorous, fine-grained examination of dynamic parent-child *processes*. Assessment of real-time contingencies between parents' and children's emotion-related behavior provides the most rigorous evidence of interpersonal influence that underlies the ongoing socialization and regulation of emotions and behavior during social interaction (Cole et al., 2004; Gross, 1998; Manian & Bornstein, 2009; Niven & Lopez-Perez, 2025). Given their temporally-sensitive lens and ability to facilitate within-dyad analyses, microcoding approaches hold promise not only for evaluating and refining theories of parenting and youth mental health, but also for innovating prevention and intervention strategies and identifying targets based on interaction processes (Granic et al., 2007; Hawes et al., 2013).

Though much has been gained from extant microcoding systems, widely-used microcoding systems are relatively narrow in their focus (e.g., on affect; Coan & Gottman, 1995; Hollenstein et al., 2004; Hops et al., 1994; parenting practices related to child compliance; Eyberg et al., 2013; or on warmth and dominance; Benjamin & Cushing, 2000; Hopwood et al., 2018), and none encompass the full range of emotion-related behaviors (i.e., parents' warmth or hostility, affect expression, and responses to their children's emotions) addressed in emotion socialization theories (Eisenberg et al., 1998; Morris et al., 2007). Although there are coding systems for capturing moment-to-moment changes in parent emotion socialization (Martin et al., unpublished), parent meta-emotion philosophy (i.e., emotion-coaching or emotion-dismissing;

e.g., Hersh & Hussong, 2009; Lunkenheimer et al., 2007; Sperling & Repetti, 2018), and emotion coregulation (e.g., Lougheed & Hollenstein, 2011), these approaches are often unpublished and used by single research groups. Further, the limited coverage of child behaviors (except in Lougheed & Hollenstein, 2011) may preclude detection of *bidirectional* processes central to transactional models of parenting (Morris et al., 2007; Sameroff, 2009), including often-overlooked "child effects" on parenting behavior (Cummings & Schermerhorn, 2003; Hollenstein, 2013; Morelen & Suveg, 2012).

Representing a broader concern, there have been few efforts to assess whether microcoding approaches maintain reliability and validity across diverse coders and participant populations. Coder decisions are subject to coders' own perceptions; preliminary evidence suggests coder characteristics influence momentary ratings and measures of interpersonal processes (Babcock & Banks, 2018; Ramer et al., 2023). Further, generalizability and replication of results across studies is undermined by disagreement among common measures (Ross et al., 2017). Thus, there is a strong need not only for open sharing of coding manuals, but also for greater transparency in coder training and evaluation of how characteristics of coders and the families whose interactions are being coded influence coding decisions and reliability.

A Dyadic Microcoding System for Emotion-Related Behavior During Parent-Child Interactions

To address these limitations, we developed an open source, dyadic microcoding system for parent and child emotion-related behavior during social interactions. Our focus was on addressing the need for an approach that could capture in-the-moment emotion-related parenting practices and corresponding youth behavior (Spinrad et al., 2020), while recognizing that the outcome of potentially constructive or destructive behavior depends on a variety of factors,

including immediate contextual influences and individual family characteristics. Informed by theories of emotion socialization (Eisenberg et al., 1998; Gottman et al., 1997; Morris et al., 2007, 2017), our coding manual encompasses specific parent emotion-related behaviors, including meta-emotion philosophy (Gottman et al., 1997) and emotion socialization behavior (Eisenberg et al., 1998), and aspects of the family emotional climate that are thought to influence youth mental health (Eisenberg et al., 1998). Parents scaffold their children's developing emotion regulation and problem-solving skills indirectly and directly through their responses to children's emotions and discussions about emotionally-salient topics (e.g., Eisenberg et al., 1998; Spinrad et al., 2020). Aspects of the household emotional climate, particularly parents' positive emotional tone and mood, are thought to model appropriate expression and regulation of emotions (Morris et al., 2007; Spinrad et al., 2020) and lay the relational foundation for children to benefit from parental support provision. Parents may also scaffold their children's developing regulatory abilities and socioemotional competence via direct instruction or emotion coaching, which includes helping children learn strategies for dealing with emotions or problem-solving (Gottman et al., 1997; Morris et al., 2018). Though emotion socialization theories have long acknowledged that children's behavior reciprocally influences the outcomes of parent emotion-related behavior in the moment and in future interactions (Eisenberg et al., 1998), youth behavior in the context of emotion-related parenting is seldom assessed (Altinoz et al., 2024). Thus, in parallel with emotion-related parent behaviors, we also captured corresponding child behaviors that reflect youth capacity and motivation to receive parental support and acquire new perspectives or skills.

Drawing on emotion socialization theories and the broader literature on interpersonal emotion regulation (Niven et al., 2009), our mutually exclusive and exhaustive emotion-related

microcodes reflect potentially constructive (affect-improving) and destructive (affect-worsening) emotion-related behavior (see Table 1). Encompassing a broad range of emotion-related behaviors, these codes are secondarily classified by the primary means with which they achieve emotion socialization or regulatory goals, consistent with prior empirical work that distinguishes between relationship-oriented strategies (e.g., engaging in actions designed to indirectly influence another person through the relationship) and engagement (e.g., directly engaging with another person about their emotions or behavior in a situation; Niven et al., 2009). Many behaviors could constitute emotion socialization or interpersonal emotion regulation during emotionally-salient interactions (e.g., conflict resolution); without knowledge of individual motivations or perceptions of behavior, it can be difficult to adjudicate between emotion and non-emotion related behavior. Nevertheless, emotion socialization and interpersonal emotion regulation frameworks highlight the importance of the dyadic social context (Niven & Lopez-Perez, 2025); thus, nonsocial, ambiguous, and/or non-emotion related behaviors (e.g., discussing facts and events outside of the problem-solving context) were not considered emotion-related behavior.

Following the distinction in emotion socialization theories (e.g., Eisenberg et al., 1998) between emotion-related behaviors that contribute to a supportive emotional climate and specific emotion-related parenting behaviors (similar to Niven et al.'s (2009) distinction between relationship-oriented and engagement affect-improving strategies), our microcoding approach distinguished between warmth, responsiveness, and openness to others ("positive social communication") and behaviors that require active efforts to validate specific emotions, coach or guide emotional understanding or regulation, or support autonomy and collaborative problem-solving ("active social engagement"). These emotion-related behaviors were selected to reflect

the breadth of potentially supportive behaviors described in emotion socialization theories and to yield sufficient within-person variability for micro-level analyses (relative to potentially low base rates of more narrowly defined emotion socialization behaviors). Notably, as youth reception of parenting is a necessary, but often overlooked, component of bidirectional parent-child interaction dynamics (Altinoz et al., 2024; Gregson et al., 2016), we observed these potentially constructive behaviors in both parents and their children.

In contrast to potentially constructive behaviors, parent behaviors that may compromise youth psychological adjustment include unregulated or excessive negative emotional expression and emotion-dismissing behaviors that ignore, minimize, denigrate, or punish children's emotion expression (Gottman et al., 1996; Spinrad et al., 2020). Likewise, negative youth behaviors (e.g., unregulated anger and hostility) predict parenting behavior (Eisenberg et al., 2008), highlighting the importance of assessing both parents' and children's behavior and reactions to each other's behavior during ongoing interactions. Though there are a myriad of ways to conceptualize these potentially destructive behaviors, we drew upon functional theories of emotion (e.g., Campos et al., 1994) and interpersonal emotion regulation (Niven et al., 2009), which are well-suited to capture momentary shifts in emotion-behavior pairings related to changes in motivational engagement (e.g., angry or aggressive behavior and thwarted approach goals; Carver & Harmon-Jones, 2009), can be applied to both members of the parent-child dyad, and are supported by empirical data on parent-child interactions (Eisenberg et al., 2008; Ferrar et al., 2022). Specifically, we distinguished potentially destructive behavior in terms of parent and youth avoidant or approach-oriented behavior that may occur during parent-child conversations. Avoidant behaviors included excessive reassurance-seeking, complaints and self-derogatory statements, and other behaviors that reflected a lack of self-efficacy or autonomy in coping with

role or task demands ("non-autonomous") or nonconfrontational withdrawal from the interaction ("withdrawal"). Put another way, avoidant behaviors reflect avoidance of conflict or difficult emotions. Approach-oriented behaviors are confrontational and reflected invalidating, domineering, or rejecting responses ("rejecting"). We were also interested in off-task behavior, which may not be emotionally-motivated (e.g., may occur due to distraction or loss of interest in the task at hand) but may elicit an emotional response in one's partner ("off-task").

Current Study Aims

The purpose of the present study was to develop and evaluate a microcoding approach for evaluating potentially constructive and destructive parent and child emotion-related behavior, among a diverse sample of parents, school-aged children, and adolescents who participated in a parent-child conflict discussion task. Though our approach is not specific to conflict resolution, we focused on this task for our initial validation given that conflict during middle childhood and adolescence is frequent (Laursen & Hafen, 2010), generates strong emotions that influence each person's behavior and the dyad's ability to reach a resolution (Moed et al., 2015), and influences youth socioemotional functioning (Missotten et al., 2017). We had three primary aims. First, we sought to establish interrater reliability on our coding system. Although we expected our extensive training would mitigate potential biases in the implementation of our coding system, we sought to contribute to gaps in the literature by evaluating specific coder perceptions and family characteristics (child gender, age; family type; mode of data collection) that may influence coding decisions and reliability of our coding system. Second, we sought to establish concurrent validity with respect to ratings from an established global coding system from which our microcodes were adapted, given significant changes in the timescale (e.g., microlevel, second-by-second v. global codes) and nature of the codes (e.g., binary v. frequency-based,

mutually-exclusive v. independent codes). We also sought to establish nomological validity (Sireci & Sukin, 2013) vis-à-vis parent-report of their own and their child's mental health given strong theoretical and empirical support for associations between emotion-related behavior and youth mental health (Eisenberg et al., 1998; Morris et al., 2007; Morris et al., 2017). For both parents and children, we anticipated our microcodes would be positively associated with corresponding global codes, and that our assessment of constructive behavior would be negatively associated with both parent and child mental health outcomes whereas our assessment of destructive behavior would be positively associated with parent and child mental health outcomes (indicating poorer wellbeing). In our third aim, we sought to illustrate the utility of a microcoding approach by evaluating bidirectional parent-child interaction contingencies, which can only be captured with moment-to-moment microcoded data. Consistent with a transactional perspective to emotion-related behavior (e.g., Morris et al., 2017), for both parents and children, we expected that constructive behavior would increase the probability that their partner would subsequently engage in constructive behavior; conversely, we expected that destructive behavior would increase the probability that their partner would subsequently engage in destructive behavior.

Methods

Participants

The sample consists of 159 parent-child dyads from 112 families (see **"Analytic Strategy"** for how clustering of child participants in families was handled) who participated in a videorecorded conflict discussion task as part of a broader examination of the effects of early caregiving adversity on physical, cognitive, and emotional development, the *Mind, Brain, and Body* study. Upon review of videorecorded interactions, two families who participated in the broader study did not adhere to task instructions and were not included in the present analyses.

Parents were eligible to participate in the *Mind, Brain, and Body* if they were aged 18 years or older, had at least one child between 6-16 years of age, and could read and write in English. The University of California, Los Angeles IRB approved all study procedures prior to study inception.

Half of children in the sample lived continuously with their biological parents and had never experienced maltreatment (Comparison group; *n*=88; 55.3%); the other half of children experienced significant early caregiving-related adversity in the form of removal or surrender from their biological parents' care or maltreatment by a parent who was no longer living with the child at study enrollment (Caregiving-related Early Adversity [crEA] group (*N*=71; 44.7%). Most parents enrolled one child in the study; the average number of children enrolled was 1.4 (range: 1-5). Sample characteristics are shown in Table 2.

Recruitment

Families were recruited through multiple methods, including flyers in community centers, street fairs and community gathering events, referrals from community organization partnerships, and online advertising. Families who expressed interest in participating were contacted for a brief telephone interview to assess eligibility. Exclusion criteria included lack of fluency in the English language; uncorrected vision; and parent- or youth-report of youth mental health concern or disability that would interfere with their ability to comply with study procedures.

Procedure

After parents provided informed consent and children assented to study procedures, children and their parents completed an assessment including questionnaires and a videorecorded parent-child conflict discussion task. The dyads were given 1 minute to select area(s) of conflict from the Issues Checklist (Prinz et al., 1979) and were then asked to spend 5 minutes discussing

these source(s) of conflict and to generate solutions. Data were collected from December 2019 to March 2022. Following the onset of the global COVID-19 pandemic, data collection took place remotely over Zoom, while families were in their homes; prior to the pandemic, data collection occurred in the laboratory (*n*=27; 17%).

Measures

Microcoded Parent and Child Behavior

Following recommended procedures (Chorney et al., 2015), we developed our microcoding system by modifying operational definitions of emotion-related codes from an existing, extensive global coding approach, the Family Interaction Macro-coding System (FIMS; Holmbeck et al., 2007; Richmond et al., 2020), that is relatively resource-efficient and has been well-validated by independent research groups in multiple studies of parents and school-aged and adolescent youth. During our manual development phase, we consulted with experts; then, we piloted our approach over three months with two independent teams of coders who evaluated parent-child interactions among two unique samples with school-aged (6-16 years) children. We subsequently refined the manual, which led to the present evaluation and validation. Our final microFIMS coding system (see Supplemental Material for manual) consisted of six binary, mutually-exclusive and exhaustive codes: two potentially constructive (positive social communication and active social engagement) and four potentially destructive (off-task, withdrawn, non-autonomous, and rejecting behavior) codes, applied separately to each parent and child speech act. A neutral behavior code was applied for behaviors that were below the threshold for coding criteria or did not meet any criteria for these codes. An "uncodable" code was applied when the participant's speech was unintelligible (e.g., due to recording quality or low or unclear utterances), the participant's behavior could not be clearly discerned (e.g., the

participant moved out of camera view), or the participant spoke in a language other than English. One parent code and one child code were applied to each 1-second epoch of the videorecorded conflict discussion, resulting in two 360-epoch long time series of parent and child behavior during the 6-minute interaction. All coding was conducted in the open source software ELAN (ELAN, 2024).

Undergraduate coders (100% female; 75% Asian, 25% White; 100% non-Hispanic; 50% international students) participated in approximately 85 hours of certification training over 13 weeks, prior to coding the videorecorded interactions. The initial training involved a didactic introduction with the primary manual developer (the first author), introduction to the coding software, and live review of a coded parent-child interaction. Then, coders completed a certification process, in which each coder independently coded five interactions for reliability assessment (three from the conflict discussion task and two from another task not used in the present study) and achieved a minimum $\kappa = .60$ on each video and minimum average $\kappa = .65$ against the primary manual developer before coding for the present study. During this phase, coders met weekly with the primary manual developer to review practice videos and also participated in ongoing discussion via a Slack channel. Because of the close attention and focus required by microcoding and potential for fatigue, each training session was limited to 1-to-1.5 hours (Sadler et al., 2009). At the conclusion of training, the average percent agreement with the manual developer was 88.2 (SD = 0.99) and average κ was 0.72 (SD = 0.02).

Following certification, two teams of two certified coders double-coded each videorecorded conflict discussion task. Coders were not aware of child adversity exposure. Coders were instructed to code in a fixed order, with parent behavior coded prior to child behavior, in order to minimize the potential impact of any carryover effects. Coders coded four

videorecorded interactions per week, and reported that on average, coding each dyad member took 33.60 minutes (SD = 12.21). After coding each interaction, coders completed an anonymous post-coding questionnaire in which they answered the questions "How likable is this person to you" and "How familiar is this person to you" (i.e., how similar is this person to people you personally know) for the child and parent, on a scale of 1 (not very likable/familiar) to 5 (very likable/familiar). Coders also provided anonymous feedback on the coding experience. Agreement on codes and kappa were checked weekly, and weekly meetings were held to discuss difficult interactions and to minimize coder drift. For each videorecorded interaction, one coder was randomly assigned to be the "primary" coder and the other coder was randomly assigned to be the "reliability" coder; coders were not aware of their assignment. Codes from the assigned "primary" coder were used in validity analyses, unless kappa was poor ($\kappa < .4$; Bakeman & Quera, 2011; Bakeman et al., 1997), in which case a third coder was assigned to code the interaction and serve as a "tie-breaker" and primary coder. The total proportion of time spent in each behavioral state (i.e., number of seconds in which the code was assigned divided by the total number of codable seconds) was used in primary validity analyses. Time series data from the "primary" coder were used in lag-sequential analyses.

Global Ratings of Parent and Child Behavior

The Family Interaction Macro-coding System (FIMS; Holmbeck et al., 2007; Richmond et al., 2020) was used to obtain global ratings of parent and child behavior during the conflict discussion task. The FIMS is a validated global coding system, with items that capture positivity or warmth (e.g., verbal warmth, supportiveness), social communication (e.g., requesting input from other family members, promoting dialogue and collaboration), and negative behaviors (e.g., withdrawal from conflict, pressuring others to agree), with each item coded separately for the

child and their parent (Richmond et al., 2020). In the present study, we included data on 17 emotion-related items that informed the operational definitions of our microcoding approach. Although descriptions of an 18th item ("active catering to the child") in the FIMS manual also informed operational definitions of our non-autonomous code, this FIMS item was not coded in the present study, consistent with prior work among physically healthy populations (Richmond et al., 2020). For each item, behavior is rated on a 5-point Likert-type scale (1 = *not at all;* 2 = *rarely*; 3 = *sometimes*; 4 = *frequently*; 5 = *very often*).

Coder training involved an initial tutorial with a trainer (an experienced coder), coding interactions (from an independent training dataset), and reviewing these interactions with the trainer. During training, coders independently coded five interactions for reliability assessment and achieved a minimum 90% agreement rate (i.e., no more than a one-point difference for each code) on practice videos before coding for the present study. Teams of two trained coders (who were not microFIMS coders) double-coded each videorecorded task for parent and child behavior. ICCs were checked upon completion of coding of all interactions, reflecting absolute agreement in scores when subjects were rated by multiple coders chosen at random from a larger population of possible coders, and the average of their ratings was used (Shrout & Fleiss, 1979). Overall, interrater reliability for behavior during the conflict discussion was fair for parents (ICC average = 0.53, SD = 0.11) and good for children (ICC average = 0.67, SD = 0.07) (Cicchetti & Sparrow, 1981). Two parent codes, "attempted resolution" (ICC = .32) and "dominance" (ICC = .37), were not included in the final analyses due to poor interrater reliability (see Supplemental Table 2 for ICCs for all FIMS codes). Final item scores were obtained by averaging the two coders' scores.

Parents and Youth Mental Health

Parents reported on their depressive symptoms using the Beck Depression Inventory (BDI-II; Beck et al., 1996). Parents responded to 20 items using a 4-point scale from 0 to 3; higher scores correspond to more severe depressive symptoms. One item regarding suicidality was omitted from the original scale for ethical reasons. Internal consistency of the scale (a conservative estimate of scale reliability) was good (Cronbach's alpha = .84). A mean of responses was obtained and used in primary analyses.

Parents reported on their child's mental health symptoms using the *DSM*-oriented depressive/affective, anxiety, attention-deficit/hyperactivity disorder (ADHD), oppositional defiant (ODD), and conduct disorder (CD) subscales of the Child Behavior Checklist (CBCL/6-18; Achenbach and Rescorla 2001; Achenbach et al. 2003). Parents responded to the items comprising the subscales just mentioned using a 3-point scale from 0 to 2; higher scores correspond to more frequent problems. In the present study, two items regarding suicidality were omitted from the affective/depressive scale for ethical reasons; in addition, four items were accidentally omitted, including from the depressive/affective (little interest in activities), ADHD (fails to finish, inattentive), and CD (breaks rule) assessment batteries. Internal consistency of each scale was good (Cronbach's alpha depressive = .80; alpha anxiety = .83; alpha ADHD = 0.82; alpha ODD = 0.82; alpha CD = 0.84). A mean of responses for each *DSM* subscale was obtained and used in primary analyses.

Analytic Strategy

In our first aim, to evaluate interrater reliability, we calculated the percent agreement on each code and kappa, for both parents and children. Per established recommendations (Coan & Gottman, 2007; Bakeman & Quera, 2011), we considered a minimum of 75% agreement and kappa of .65 to indicate acceptable interrater reliability on the overall coding system. Because

kappa as low as 0.40 can still correspond to high accuracy when there is a low prevalence of codes (Bakeman & Quera, 2011; Bakeman et al., 2007), we set a minimum kappa of 0.40 to indicate acceptable interrater reliability on a given video, and as noted above, required a third coder to adjudicate discrepancies in videos that did not meet this threshold. We evaluated bivariate correlations between the average perception and discrepancies in coders' perceptions of likability and familiarity with agreement and interrater reliability on the coding system. We also conducted Pearson correlations and independent samples *t*-tests to evaluate potential differences in the reliability of our coding system due to child gender, child age, child developmental stage (middle childhood v. adolescence), family type (children continuously raised by their biological parent or caregiving-related adversity exposed children), and mode of data collection (in-person or online via Zoom). Analyses were conducted in Rstudio v4.2.3 (R Core Team, 2023) and SPSS v.28.

Second, we sought to establish concurrent validity with respect to global ratings from the FIMS and nomological validity vis-à-vis parent-report of their own and their child's mental health. For comparison with global ratings, we used the total proportion of time spent in each behavioral state for primary validity analyses. Only videos where at least 50% of the epochs were codable were included in validity analyses. To evaluate concurrent validity, we conducted linear regressions predicting global FIMS codes from the corresponding microFIMS code. To evaluate nomological validity, we conducted linear regressions predicting CBCL *DSM* subscale scores and parent BDI scores from each of the microFIMS codes. Linear regression analyses were evaluated in a structural equation modeling framework, using full information maximum likelihood estimation with cluster-robust standard errors, which adjusts for nonindependence due to clustering of child participants within families. Models statistically adjusted for the effects of

covariates (child age and gender; family type; and mode of data collection) on outcomes, and outcomes were allowed to covary. Exploratory multigroup analyses were conducted to evaluate these models within middle childhood (6-11 years) and adolescence (12-16 years). All models were fully saturated. Analyses were conducted in M*Plus* v.8.4 (Muthén & Muthén; 1998-2017).

In our third aim, we evaluated dyadic interaction contingencies, operationalized as the odds of each dyad member's behavior given their partner's prior behavior. Per family, second-by-second parent and child codes were exported from the coding software ELAN (ELAN, 2024) as comma-separated files, which were then converted into Sequential Data Interchange Standard (SDS) for sequential data analysis (Bakeman & Quera, 1992, 2008). SDS files were then modified for lag-sequential analysis in Generalized Sequential Querier software (GSEQ v.5.1: Bakeman & Quera, 2016). For the whole sample and for the middle childhood and adolescent subsamples, pooled odds ratios were computed for parent behavior given the child's behavior during the prior second and for children's behavior given their parent's behavior during the prior second. Odds ratios above 1 indicate that a behavior is more likely to occur after a prior partner behavior whereas odds ratios below 1 indicate that a behavior is less likely to occur after a prior partner behavior; if the 95% confidence interval (CI) for the odds ratio does not contain 1, it is considered statistically significant (Bakeman & Quera, 2011). Pooled odds ratios were only interpreted if joint frequencies across the entire sample were greater than 5 (Bakeman et al., 2011).

Transparency and Openness

Our first two aims and hypotheses were preregistered; our evaluation of interaction contingencies and initial exploration of differences by developmental stage were not preregistered (https://osf.io/ha3rq/?view_only=50216f84497f48b5a43195ad655cd2fc).

Deviations from our preregistration were motivated by characteristics of the data (see Supplemental Materials for more information). Sample size was determined by the parent study, the *Mind, Brain, and Body* study, which offered the unique opportunity to evaluate the reliability and validity of our novel coding system among a sample of biological and birth families of children and adolescents of diverse racial and ethnic backgrounds. Posthoc power analyses conducted in G*Power indicated power = 1.0 to detect medium-sized effects in a linear regression model with up to eight predictors. Due to participant privacy concerns, the raw data are not available; processed data are available from the first author upon reasonable request. We report how we determined our sample size, all data exclusions, all manipulations, and all measures in the study, and we follow JARS-Quant (Applebaum et al., 2018). Coding training materials can be found at https://auburnflowerlab.wixsite.com/the-flower-lab/researchers. The analytic code necessary to reproduce the primary analyses is available at https://osf.io/vq56b/?view_only=319ca4bc2d6e41cc8c540b4e43e748c8.

Results

Aim 1: Interrater Reliability

Figure 1 and Figure 2 present histograms with the percent agreement for each code and kappa, for each parent and child. On average, interrater reliability exceeded acceptable standards of 75% agreement and $\kappa = .65$ (Coan & Gottman, 2007; Bakeman & Quera, 2011). Total agreement was 88.14% (SD = 8.50) for parents and 91.42% (SD = 6.70) for children. On average, κ was 0.78 (SD = 0.16) for parents and 0.79 (SD = 0.14) for children. Most parent videos (87.42%) and most child videos (85.53%) had $\kappa > .65$. Videos for seven (4.40%) parents and two (1.26%) children from eight unique videorecorded interactions (5.03%) had low κ (< .4) that required coding by a third coder to adjudicate discrepancies.

Associations with coder perceptions

Coders' average ratings of parent likability and the absolute difference in coders' ratings of parent likability were not associated with total agreement across parent codes or kappa (all *p*'s > 0.05). Average ratings of parent familiarity and the absolute difference in coders' ratings of parent familiarity (i.e., sense of similarity between the target of coding and people in the coders' social network) were also not associated with total agreement or kappa (all *p*'s > 0.05).

Average ratings of child likability were not associated with total agreement across child codes or kappa (all *p*'s > 0.05). The absolute difference in coders' ratings of child likability was associated with lower total agreement (r = -0.18, p = .03), but not with kappa (r = -0.10, p = .22). Exploratory analyses of associations (see Supplemental Material) suggested that greater discrepancies in coders' ratings of child likability were associated specifically with lower agreement on child neutral behavior and not on any of the primary (constructive or destructive) codes. Average ratings of child familiarity and the absolute difference in coders' ratings of child familiarity were not associated with total agreement or kappa.

Associations with family characteristics

Total agreement on child codes was greater for girls (M = 0.93, SD = 0.05) than for boys (M= 0.90, SD = 0.08), Welch t(132.486) = -2.879, p = .005. Likewise, kappa for child codes was greater for girls (M = 0.82, SD = 0.13) than for boys (M = 0.77, SD = 0.14), t(153) = -2.03, p = .044. Exploratory analyses of differences in agreement on specific codes (see Supplemental Material) suggested that these differences were due to greater agreement on child neutral codes for girls than for boys, rather than systematic differences due to any of the primary codes. Though child developmental stage was neither associated with total agreement or kappa on parent or child codes (all *p*'s > 0.18), child age was also positively associated with total

agreement on parent codes, $r = .92$, $p < .001$; and total kappa on parent codes, $r = .93$, $p < .001$. Exploratory analyses (see Supplemental Material) suggested that these differences were due to greater agreement on parent active social engagement, positive social communication, and rejecting behavior as children were older. Total agreement and kappa on parent codes did not differ by child gender, and total agreement and kappa on child codes was not associated with child age. Neither total agreement nor kappa on child or on parent codes differed by family type or mode of data collection.

Aim 2: Concurrent and Nomological Validity

Preliminary Analyses

Table 3 presents descriptive statistics and bivariate associations among the overall proportion of time spent in each parent and child microcoded behavioral state. Child positive social communication was positively associated with parent active social engagement and positive social communication (p's $< .01$). Surprisingly, child withdrawn behavior was also positively associated with parent positive social communication ($p < .01$). There were low rates of destructive codes (see Figure S2 and S4), such that the majority of children and their parents did not show any destructive behavior during the conflict discussion task. Therefore, we dichotomized the proportion of time spent in each destructive state (0 = none, 1= any time spent in the state) for subsequent validity analyses. Because of their associations with parent or child microcoded behavioral states and globally coded behavior or mental health outcomes (see Supplemental Material), the following covariates were included in primary analyses: child age and gender; family type; and mode of data collection.

Concurrent Validity

Table 4 presents the results of structural equation models in which regression paths from microcoded behavior to their corresponding global codes were evaluated, adjusting for covariates, using maximum likelihood estimation with cluster-robust standard errors. For both parents and children, microFIMS codes generally predicted their corresponding global FIMS codes in the expected directions. However, contrary to expectations, parent non-autonomous behavior positively predicted parent confidence in stating opinions (p = .004). In addition, parent withdrawn behavior did not predict any of its corresponding global codes (p's > 0.10); by contrast, child withdrawn behavior positively predicted each of the corresponding global codes.

Exploratory multigroup analyses were conducted to evaluate concurrent validity within the middle childhood (6-11 years) and adolescent (12-16 years) subsamples. Overall, the pattern of results for each subsample was generally consistent with the pattern obtained for the full sample (see Supplemental Table 4), with the following exceptions. Parent withdrawn behavior was only evident among parents of adolescent youth and was positively but not significantly correlated with corresponding global codes. In contrast, the positive, statistically significant association between child off-task behavior assessed with micro- and macro-FIMS coding systems was only evident among the middle childhood subsample; likewise, the positive association between child non-autonomous behavior and the FIMS "Child is needy" code was only evident for this subsample. For the adolescent subsample, these associations were negative and not statistically significant.

Nomological Validity

Table 5 presents the results of structural equation models in which regression paths from microcoded behavior to mental health outcomes were evaluated, adjusting for covariates, using maximum likelihood estimation with cluster-robust standard errors. Results provided mixed

support for our hypotheses. As expected, parent positive social communication uniquely predicted fewer parent depressive symptoms, standardized Beta = -0.213, SE = 0.069, p = .002. Surprisingly, parent active social engagement uniquely predicted *more* severe child anxiety symptoms, standardized Beta = 0.204, SE = 0.093, p = 0.029.

With regard to potentially destructive behavior, results were also mixed. As expected, parent off-task behavior uniquely predicted greater child ADHD symptoms, standardized Beta = 0.730, p = 0.019, and child non-autonomous behavior predicted greater parent depressive symptoms, standardized Beta = 1.098, p = 0.015. Surprisingly, parent non-autonomous behavior predicted fewer child depressive symptoms (standardized Beta = -0.547, p = .000), anxiety symptoms (standardized Beta = -0.409, p = .035), and conduct problems (standardized Beta = -0.251, p = .021), and fewer parent depressive symptoms (standardized Beta = -0.600, p = .018). In addition, parent withdrawn behavior predicted fewer child depressive symptoms (standardized Beta = -0.401, p = .001).

Exploratory multigroup analyses were conducted to evaluate nomological validity within the middle childhood (6-11 years) and adolescent (12-16 years) subsamples. Overall, the pattern of results for each subsample was consistent with the pattern obtained for the full sample (see Supplemental Table 5), with the following exceptions. The positive association between parent active social engagement and child anxiety symptoms was only evident among the adolescent subsample; in contrast, parent active engagement was marginally negatively associated with child anxiety symptoms among the middle childhood subsample (p = 0.06). In contrast, the negative association between parent non-autonomous behavior and child anxiety symptoms was only evident among the middle childhood subsample; parent non-autonomous behavior was positively but non-significantly associated with adolescent's anxiety symptoms.

There were also some differences in the pattern of results with respect to children's potentially destructive behavior (specifically, off-task and non-autonomous behavior). Surprisingly, among the adolescent subsample, child off-task behavior was significantly negatively associated with child oppositional-defiant and conduct problems; in contrast, among the middle childhood subsample, off-task behavior was non-significantly, positively associated with these problems. Also surprisingly, among the adolescent subsample, child non-autonomous behavior was significantly negatively associated with child depressive and ADHD symptoms, whereas among the middle childhood, child non-autonomous behavior was non-significantly, positively associated with these problems.

Aim 3: Dyadic Interaction Contingencies

Pooled odds ratios for lag-1 sequential analyses among the full sample are presented in Table 6. Conditional probabilities are shown in Supplemental Table 6. Lag-sequential analyses for the middle childhood subsample are shown in Supplemental Table 7 and lag-sequential analyses for the adolescent subsample are shown in Supplemental Table 8. Generally, the pattern of results for each subsample was consistent with the pattern obtained for the full sample, with one exception (see "**Responses to destructive parent behavior**").

Parents' responses to their children's behavior

Responses to constructive child behavior. Child positive social communication increased the probability that their parent's behavior in the next second would be positive social communication [OR = 2.28, 95% CI: 2.13-2.43] but decreased the probability that their parent's subsequent behavior would be active social engagement [OR = 0.38, 95% CI = 0.35-0.40] or off-task [OR = 0.14; 95% CI: 0.06-0.031].

Contrary to expectations, child active social engagement decreased the probability that their parent's behavior in the next second would be active social engagement [OR = 0.22, 95% CI: 0.20-0.24] and increased the probability that their parent's subsequent behavior would be rejecting [OR= 2.02, 95% CI: 1.30-3.15].

Responses to destructive child behavior. As expected, child off-task behavior increased the probability that their parent's behavior in the next second would be off-task [OR = 221.64, 95% CI: 166.06-295.8] or non-autonomous [OR = 157.58, 95% CI: 57.61-431.02], and decreased the probability that their parent's behavior in the next second would be positive social communication [OR = 0.58; 95% CI: 0.46-0.73] or active social engagement [OR = 0.32; 95% CI: 0.20-0.24]. Also, as expected, child rejecting behavior decreased the probability that their parent's subsequent behavior would be positive social communication [OR = 0.27; 95% CI: 0.11-0.65]. Surprisingly, child withdrawn behavior increased the probability that their parent's subsequent behavior would be active social engagement [OR = 1.25; 95% CI: 1.04-1.50].

Children's responses to their parent's behavior

Responses to constructive parent behavior. As expected, parent positive social communication increased the probability that their child's behavior in the next second would be positive social communication [OR = 1.49; 95% CI: 1.38-1.59] and decreased the probability that their child's subsequent behavior would be off-task [OR = 0.56; 95% CI: 0.44-0.71], withdrawn [OR = 0.55; 95% CI: 0.39-0.76], or rejecting [OR = 0.38; 95% CI: 0.18-0.81]. However, parent positive social communication also decreased the probability that their child's behavior in the next second would be active social engagement [OR = 0.71; 95% CI: 0.64-0.78].

Surprisingly, parent active social engagement decreased the probability that their child's behavior in the next second would be active [OR = 0.28; 95% CI: 0.26-0.31] or positive [OR =

0.52; 95% CI: 0.49-0.56] and increased the probability that their child's subsequent behavior would be withdrawn [OR = 1.3; 95% CI: 1.09-1.56] or rejecting [OR = 1.5; 95% CI: 1.06-2.12]. Children were also less likely to be off-task following parent active social engagement [OR = 0.31; 95% CI: 0.25-0.37].

Responses to destructive parent behavior. As expected, parent off-task behavior increased the probability that their child's behavior in the next second would be off-task [OR = 220.06; 95% CI: 164.85-293.7] and, among school-aged children only, decreased the probability that their child's subsequent behavior would be positive social communication [OR = 0.16; 95% CI: 0.08-0.34]; parent non-autonomous behavior also increased the probability that their child's behavior in the next second would be off-task [OR = 157.41; 95% CI: 57.55-430.56]. As expected, parent rejecting behavior increased the probability that their child's behavior in the next second would be withdrawn [OR = 3.67; 95% CI: 1.50-9.02]; surprisingly, parent rejecting behavior also increased the probability that their child's behavior in the next second would be active social engagement [OR = 1.8; 95% CI: 1.14-2.84].

Discussion

To address gaps in existing approaches for coding moment-to-moment changes in emotion-related behavior during parent-child interaction, we developed and validated a microcoding system for parents' and their children's potentially constructive and destructive emotion-related behavior that was guided by well-established emotion socialization theories (Eisenberg et al., 1998; Gottman et al., 1996; Morris et al., 2007; Morris et al., 2017). Following a three-month training period, a team of undergraduate research assistants achieved high rates of interrater reliability, based on exact agreement in each second of the interaction. Consistent with prior evaluations of affect microcoding (Babcock & Banks, 2018), interrater reliability was

higher among families who shared similar characteristics to the coders (e.g., families with older or female children); nonetheless, on average, interrater reliability exceeded accepted standards regardless of child gender, age, biological relatedness to their parent, and mode of data collection (i.e., virtual or in-person). Further, evaluation of coders' perceptions of the participant failed to demonstrate systematic bias in interrater reliability.

Beyond demonstrating the reliability of our coding system, we also sought to evaluate its concurrent and nomological validity. Our results provided evidence of concurrent validity with respect to a well-established global coding system. Although associations between microcoded behavior and global ratings were relatively weaker for parents than they were for children, all parent codes (except for non-autonomous and withdrawn behavior, which had low base rates and lower interrater reliability on the global coding system) exhibited expected associations with corresponding global codes. There was mixed empirical support for nomological validity of microcoded behavior vis-à-vis parent depressive symptoms and child mental health problems. Interestingly, the surprising relationships between avoidant behavior and mental health in our sample were generally specific to families with adolescent youth, suggesting heterotypic continuity in the meaning of emotion-related behaviors during conflict resolution. Illustrating the utility of a microcoding approach, examination of interaction contingencies illuminated the dyadic context in which emotion-related behavior is likely to occur, and provided evidence of bidirectional relations between parent and child emotion-related behavior.

Potentially destructive emotion-related behavior: Differences in avoidant versus approach-oriented behavior

Taken together, our results provided evidence of the validity and utility of coding approach-oriented rejecting behavior. Rejecting behavior demonstrated concurrent validity with

global codes, for both parents and children. Notably, these associations held in both the middle childhood and adolescent subsamples. Surprisingly, neither parent nor child rejecting behavior were associated with mental health outcomes in the full sample; however, expected associations between parent and youth rejecting behavior and youth mental health problems were obtained in the adolescent subsample. When examined at the moment-to-moment timescale of parent-child interaction, across the sample, there was mixed evidence of control complementarity whereby children show submission following parent displays of dominance (Shewark et al., 2022): Parent rejecting behavior increased the likelihood of *both* subsequent child withdrawn behavior *and* subsequent child active social engagement behavior (the latter finding is described in greater detail below). However, as expected, across the full sample, child rejecting behavior was bidirectionally linked with parent positive social communication behavior, such that child rejecting behavior decreased the probability of subsequent parent positive behavior and parent positive social communication decreased the probability of subsequent child rejecting behavior. Whereas the extant literature has focused on reciprocation of anger or aggression in high-risk families (e.g., Schwartz et al., 2014), these results suggest that children's rejecting behavior may also compromise relationship quality through dampening parents' use of positive listening skills and warm behavior that buffer against aversive child behavior.

In contrast to rejecting behavior, there was limited support for our hypotheses regarding avoidant (withdrawn or non-autonomous) behavior codes, particularly among families with adolescents. Avoidant responses were conceptualized as being related to internal emotional distress that motivates withdrawal from social interactions or excessive or otherwise inappropriate reliance on others. However, in the present study, withdrawn parent behavior typically reflected more mild forms of ignoring their child, which can be an effective strategy for

parents to reduce child misbehavior or noncompliance; notably, withdrawn behavior was only observed among parents of adolescents. Likewise, consistent with our interpretation that parent avoidant responses were more closely related to discipline rather than emotion-related responses in this sample, parent non-autonomous behavior occurred almost exclusively in the context of children's off-task behavior. Similarly, for adolescents, we failed to obtain empirical support for the concurrent or nomological validity of avoidant behavior (off-task and non-autonomous behavior), which could be due to the infrequent occurrence of these behaviors in this developmental period as well as heterotypic continuity in the meaning of these behaviors (e.g., age-related shifts to strategic use of off-task behavior to avoid conflict). However, as expected, for younger children, avoidant behavior appeared more closely related to internal distress, reflected in their associations with global codes and associations between child non-autonomous behavior and parent depressive symptoms.

Dyadic interaction patterns involving potentially constructive behavior: Implications for youth internalizing problems

Our results provided consistent support for our hypotheses regarding positive social communication, the broad range of behaviors that contribute to a warm emotional climate. In addition to offering evidence of concurrent validity, our results cohered with the vast literature that has demonstrated depressed parents are less warm and responsive (e.g., for review, Lovejoy et al., 2000). Further, parents and children were likely to reciprocate each other's positive social communication behavior, suggesting positive behavioral synchrony may occur specifically through active listening skills and responsive behaviors. Reciprocation of positive behavior was evident in the full sample as well as each subsample, highlighting the generalizability of positive behavioral synchrony across development.

In contrast, there was mixed empirical support, and somewhat surprising findings, for our hypotheses regarding active social engagement, the narrower set of potentially constructive behaviors that occur specifically in response to emotional displays or conflict resolution efforts. Although there was evidence of concurrent validity of active social engagement, hypotheses regarding associations with mental health outcomes as well as the real-time antecedents and consequences of active social engagement were not supported. Surprisingly, after adjusting for potential confounds (e.g., family type), across the full sample, parent active social engagement was *positively* associated with youth anxiety symptoms; exploration of developmental differences revealed that parent active social engagement was specifically associated with internalizing (anxiety and depression) problems among adolescents *and* their parents. In both the middle childhood and adolescent subsample, there was evidence of negative reciprocation of active social engagement (such that active social engagement was *less* likely to occur after one's partner engaged in active social engagement); active engagement may reflect each dyad member's attempts to engage (or re-engage) their partner during moments of unresolved conflict. Whether or not conflict is resolved satisfactorily requires assessment of longer behavioral chains, and may depend upon characteristics of each dyad member as well as the overall emotional tone of conflict discussions (Garcia-Ruiz et al., 2012).

In the adolescent subsample specifically, there was also evidence of reciprocal exchanges between rejecting behavior and active social engagement. Parent active social engagement may be poorly received if adolescents perceive this behavior as overcontrolling, such as in the case of parental overprotection or overinvolvement, which is linked with child anxiety (for meta-analysis, see Manuele et al., 2023). Likewise, adolescence is characterized as a period of autonomy-striving (e.g., Branje et al., 2012); adolescents' efforts to express their independent

point of view may be challenging for parents. Drawing on research on motives for interpersonal emotion regulation, parents may respond to their adolescent's assertive behaviors in aggressive or rejecting ways in order to give their child "a reality check" or help them achieve socialization goals in the long run (Tran et al., 2025). Research incorporating video-mediated recall paradigms to assess individual motives and perceptions could shed light on when and why individuals are prompted to behave in ways that could worsen others' feelings while discussing sources of conflict or disagreement.

Strengths and Limitations

Our novel dyadic microcoding approach addresses several methodological gaps, including the traditional top-down, parent-driven perspective that can obscure "child effects" on parenting behavior (Bell, 1979; Eisenberg et al., 1998). Not only were undergraduate research assistants able to achieve high levels of interrater reliability on the coding system, but they were also able to do so using videorecordings that were primarily obtained over Zoom, using open source coding software, and with an average coding time of one hour per dyad, underscoring the potential for widespread use of this approach. Our results provided evidence of concurrent validity with respect to a well-established global coding system, and lag-sequential analyses highlighted the additional information about often bidirectional parent-child interaction patterns that can be obtained only from a microcoding approach. Establishing the reliability and validity of these microcoded data also supports the future use of within-dyad methodological approaches, such as state space grids or multilevel survival analyses, that can address outstanding questions about temporally-sensitive *dyadic* processes that unfold during conflict resolution. Evaluation of the concurrent validity, nomological validity, and utility of our coding approach was also strengthened by the diverse sample of families, which included both biological and adoptive

families. We also considered potential differences in the reliability, concurrent and nomological validity, and interaction dynamics between school-aged children versus adolescents; our results demonstrate initial validity of the coding system among children spanning a broad age range, and also point to developmental shifts in parents' and children's behavior (particularly avoidance and active social engagement) during conflict resolution and their correlates that warrant further investigation.

At the same time, our results must be viewed in the context of the study's limitations. Consistent with the majority of microcoding systems (except, e.g., Hopwood et al., 2020), we adopted a binary approach to code the presence or absence of behavior, yet this approach cannot capture the intensity of each behavioral code, which may have contributed to our pattern of results (especially for avoidant behaviors which occurred infrequently). We also sought to develop inclusive codes that would possess sufficient within-person variability for moment-to-moment analyses: Despite the multiple possible manifestations of behavior, our coders achieved high levels of interrater reliability; yet, there may be variability within the codes that we are unable to assess, and some codes were still infrequently observed in our sample. Although we contributed to the limited extant literature on coders' susceptibility to bias, future investigations are needed to better understand the potential impacts of coder impressions (particularly similarity with the individuals whose behaviors they are coding) across the diverse constructs represented in extant coding systems. With regard to potential biases in our specific coding system, our all-female research team precluded assessment of gender bias in coding, and the predominantly female parent sample limited assessment of whether the coding approach may differ for male parents, who are generally understudied in the literature. Replication and extension of our initial validation is warranted, especially given the potential for Type I error given the large number of

path relationships examined in the present study. Validation with respect to other emotion socialization or emotion coregulation microcoding systems and questionnaire measures, additional informants (e.g., youth-report), and other important individual characteristics (e.g., other aspects of parent mental health or personality, child temperament) would also strengthen validity evidence for our coding system. Our results also may not generalize to clinical populations or families who are at higher-risk for emotional problems or maladaptive parenting (e.g., parents who engage in maltreatment; Skowron et al., 2011), and also require validation in other interaction contexts, especially those that are more emotionally demanding. Despite the notable advantages of observational coding, these approaches require experimenter judgment about what behaviors are potentially constructive or destructive, which may differ from families' own perceptions, motivations, and goals, which vary according to their values, cultures, and lived experiences. Future research, including work using video-mediated recall approaches, is needed that takes into account each dyad member's perceptions of their own and their partner's behavior.

Conclusions

The present study addresses methodological gaps in the assessment of parent-child interactions by developing a novel open-source microcoding approach for assessing parents' and children's emotion-related behavior. By affording examination of moment-to-moment changes in parents' and their children's behavior, research using this microcoding approach can advance emotion socialization theories (e.g., Eisenberg et al., 1998; Morris et al., 2007; Morris et al., 2017) by evaluating parent-child interactions on the level these theories are specified: the within-dyad processes that unfold from one moment to the next. Our results provide initial evidence of this coding system's reliability and validity, which require replication and further evaluation in

diverse samples and interaction contexts. Future work also warrants consideration of whether the effects of specific parenting behaviors on youth mental health differ depending on the overall balance of constructive and unconstructive behaviors or differ for adversity-exposed youth versus youth who did not experience early caregiving-related adversity. Further, longitudinal, multilevel analyses are needed to evaluate whether within-dyad interaction contingencies are correlates, consequences, or risk factors for mental health problems, and whether they can buffer against the onset or worsening course of mental health problems, especially for emotionally at-risk youth. In turn, identification of adaptive or maladaptive parent-child interaction processes can spur innovations in prevention and intervention programs that use video feedback or real-time coaching to point out specific aspects of the interaction that promote close relational ties and emotional understanding and regulation.

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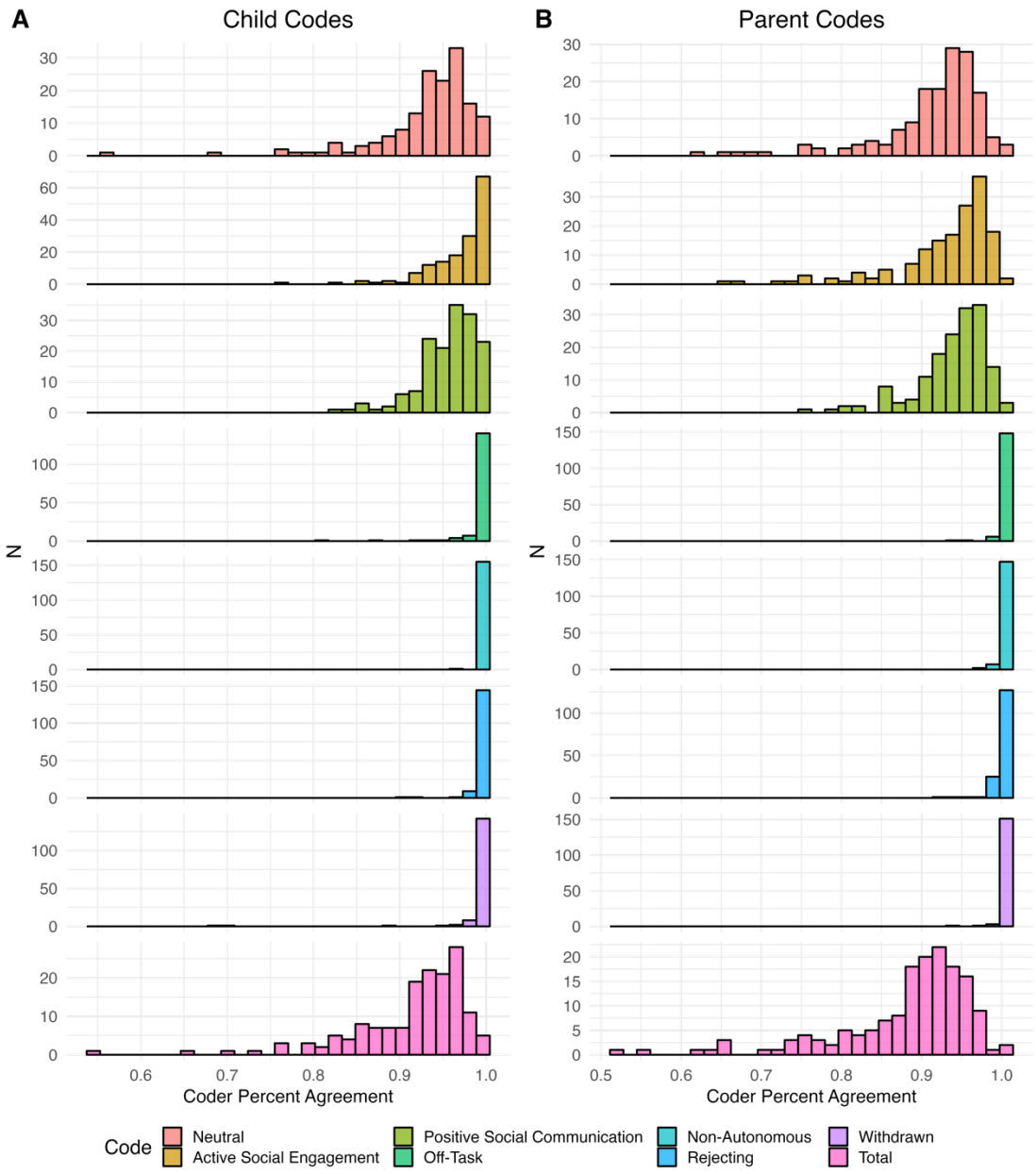

Figure 1. Histograms showing the percent agreement for each microcode, and the overall percent agreement, for each (**A**) child and (**B**) parent whose behavior was coded.

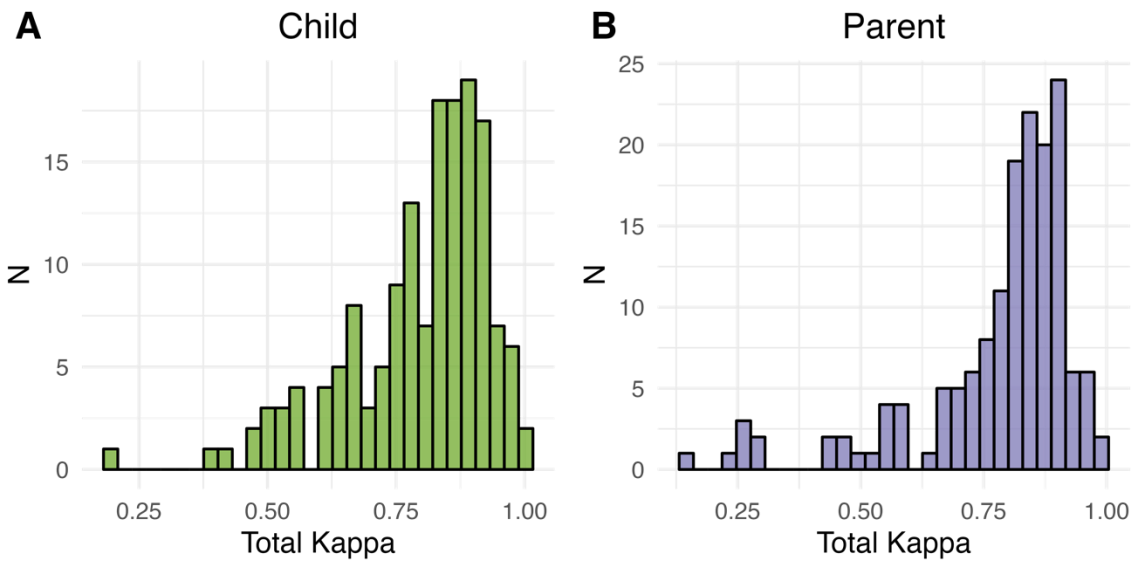

Figure 2. Histograms showing total kappa for each child (A, in green) and parent (B, in purple) whose behavior was coded.

Table 1
Definitions and examples of microFIMS codes

	Potentially constructive codes		Potentially destructive codes				Neutral
	Positive social communication	Active social engagement	Off-task	Withdrawal from interaction	Non-autonomous behavior	Rejecting	Neutral
Definition	Verbal or nonverbal behavior that indicates understanding and interest for others	Active or explicit efforts to help others express their thoughts, feelings, or opinions; share in decision-making and problem-solving toward a shared goal; and/or to see a new perspective	Verbal or nonverbal efforts to distract themselves or others from participating in the task at hand	Nonverbal or verbal behavior that communicates unwillingness to engage or disengagement from interaction	Verbal or nonverbal behavior that reflects a lack of autonomy (e.g., excessive reassurance seeking) or efficacy in responding to role/task demands	Verbal or nonverbal behavior that reflects a rejection of others' opinions, beliefs, feelings, and emotions and/or coercive or hostile behavior	Ambiguous or non-emotion related behavior
Parent Examples	Being nondefensive when others disagree (e.g., "I hear you"); Unlabeled praise (e.g., "You're a great kid")	Requesting a direct opinion about an issue; Scaffolding the child's independent thinking (e.g., "What do you think the next step should be?")	Discussing topics not related to the task/conversation at hand;	Abruptly ending the conversation; Refusal to discuss a topic	Failure to redirect the child's noncompliant behavior; Deferring to child's opinions/ideas without attempt at successful conflict	Coercive "If-Then" Statements; Impatience or actively ignoring the child	Discussing facts or events not related to the conversation at hand

					resolution		
Youth Examples	Good listening behaviors (e.g., attentive body language paired with "mhm" or "yeah"); Affectionate touch; Compliance with a command or request for information	Unsolicited disclosure of one's thoughts or feelings; Asking for clarification or elaboration of their parent's point of view	Discussing topics not related to the task/conversation at hand; Silly or distracted behavior while being disengaged from task demands	Gaze aversion and leaning away; Failure to respond to their parent; Abruptly ending the conversation	Whining and/or complaining about oneself; Explicit physical or verbal reassurance-seeking (e.g., "Am I in trouble?")	Expressing hostility or contempt, including sarcasm; Physically aggressive behavior	Discussing facts or events not related to the conversation at hand

Note. These examples are for illustrative purposes and are not an exhaustive list of behaviors meeting criteria for each code. Additional examples can be found in the coding manual provided in the Supplemental Materials.

Table 2
Sample Characteristics

	Full Sample (N = 159)	Comparison (N = 88)	Early caregiving-related adversity-exposed (N = 71)
Early caregiving experiences (%)			
Adopted at birth or from US foster care	24.5	---	54.9
Adopted from institutional/foster care outside of the US	8.8	---	19.8
Placed in US foster care before entering guardianship care	10.7	---	23.9
Parental maltreatment not resulting in foster care	0.6	---	1.4
Exposure to any potentially traumatic event	25.8	2.3	54.9
Demographics			
Child Age - M(SD)	11.17 (3.43)	11.21 (3.66)	11.12 (3.16)
Child – % Male	50.9	54.5	46.5
Child Race-Ethnicity – % White, non-Hispanic/Latino/a	26.4	23.9	29.6
Parent Race-Ethnicity – % White, non-Hispanic/Latino/a	45.9	25.0	71.8

Table 3

Descriptive statistics and bivariate correlations between parent and child microcodes.

	M	SD	Range	1	2	3	4	5	6	7	8	9	10	11	12
Child Behavioral States															
1. Active Social Engagement	0.11	0.12	0-0.75	--											
2. Positive Social Communication	0.15	0.13	0-0.90	.01	--										
3. Off-Task Behavior	0.02	0.07	0-0.52	-.06	-.10	--									
4. Non-Autonomous Behavior	0	0.01	0-0.07	-.06	-.07	.12	--								
5. Rejecting Behavior	0	0.02	0-0.21	.14	-.07	.05	.13	--							
6. Withdrawn Behavior	0.01	0.05	0-0.5	-.08	.16*	.04	.19*	.23**	--						
Parent Behavioral States															
7. Active Social Engagement	0.32	0.17	0-0.93	.15	.34***	-.14	0	.05	.13	--					
8. Positive Social Communication	0.13	0.07	0-0.4	-.03	.30**	0	-.11	.01	.20**	-.14	--				
9. Off-Task Behavior	0.01	0.05	0-0.5	-.07	-.06	.31***	.07	.07	-.06	-.11	.008	--			
10. Non-Autonomous Behavior	0	0	0-0.04	-.04	-.08	.17	.07	.18	.07	-.20*	.01	-.05	--		
11. Rejecting Behavior	0	0.02	0-0.11	.05	.02	.11	-.01	.09	.06	-.11	-.03	.17	.02	--	
12. Withdrawn Behavior	0	0.01	0-0.1	.01	-.16	.01	-.03	.12	.03	-.10	-.19*	-.04	.21	.26**	--

*** $p < .001$; ** $p < .01$; * $p < .05$; Microcodes represent percent of interaction spent in the behavioral state (positive and active) or any time spent in the behavioral state (binary yes/no; off-task, non-auto, rejecting, and withdrawn). red highlights indicate significant positive correlations, and blue highlights indicate significant negative correlations. Pearson correlations are calculated between each pair of continuous variables, point biserial correlations are calculated between each pair of binary/continuous variables, and phi coefficients are calculated between each pair of binary variables.

Table 4
Structural Equation Models Predicting Global Codes From Microcoded Data

	Parent Behavior		Child Behavior	
	β	*p*-value	β	*p*-value
Positive social communication				
Receptiveness to statements by others	**0.190**	**0.030**	**0.347**	**.000**
Tolerates differences and disagreements	0.159	0.071	**0.304**	**.000**
Verbal warmth	0.123	0.163	**0.242**	**.000**
Supportiveness	0.138	0.175	**0.336**	**.000**
Active social engagement				
Requesting input from others	**0.188**	**0.019**	**0.428**	**.000**
Promoting dialogue and collaboration[a]	0.121	0.236	--	--
Attempted resolution of issues[b]	---	---	**0.213**	**.001**
Promoting autonomy[a]	-0.036	0.737	--	--
Off-task behavior				
Off-task behavior	**1.313**	**0.013**	**0.673**	**.000**
Non-autonomous behavior				
Confidence in stating opinions	**0.752**	**0.004**	-0.243	.694
Dominance	---	---	**-0.606**	**.022**
Child is needy[a]	---	---	**1.337**	**.029**
Withdrawn				
Withdrawal from conflict	1.375	0.102	**0.559**	**.000**
Intensity of dysphoric affect	0.433	0.460	**0.625**	**.000**
Frequency of dysphoric affect	0.491	0.426	**0.588**	**.000**
Rejecting				
Pressures to agree	0.437	0.077	**1.358**	**.000**
Anger	**0.743**	**0.003**	**1.083**	**.000**
Intensity of aggressive affect	**0.677**	**0.006**	**1.175**	**.000**
Frequency of aggressive Affect	**0.570**	**0.013**	**1.116**	**.000**

Note. Standardized regression coefficients are reported. Estimates shown in bold are statistically significant, $p < 0.05$. For visual clarity, effects of covariates (child age and gender; family type; and mode of data collection) and correlations between endogenous variables (global FIMS codes) are not shown.

[a]In the global FIMS manual, this code is only coded for parents or children.

[b]Missing due to low interrater reliability on global code

Table 5
Structural Equation Models Predicting Mental Health Outcomes From Microcoded Data

	Parent Behavior		Child Behavior	
	β	*p*-value	β	*p*-value
Positive social communication				
Child depressive symptoms	0.007	0.915	0.052	0.497
Child anxiety symptoms	-0.066	0.453	-0.018	0.848
Child ADHD symptoms	-0.085	0.290	-0.099	0.166
Child oppositional-defiant symptoms	0.028	0.771	-0.055	0.417
Child conduct problems	-0.069	0.569	-0.059	0.596
Parent depressive symptoms	**-0.213**	**0.002**	-0.058	0.432
Active social engagement				
Child depressive symptoms	0.177	0.062	0.062	0.516
Child anxiety symptoms	**0.204**	**0.029**	0.118	0.304
Child ADHD symptoms	0.020	0.790	0.004	0.958
Child oppositional-defiant symptoms	0.001	0.987	0.160	0.081
Child conduct problems	0.067	0.473	0.181	0.076
Parent depressive symptoms	0.088	0.327	-0.020	0.778
Off-task behavior				
Child depressive symptoms	0.746	0.117	0.334	0.125
Child anxiety symptoms	0.409	0.208	-0.010	0.955
Child ADHD symptoms	**0.730**	**0.019**	0.282	0.173
Child oppositional-defiant symptoms	0.712	0.056	0.200	0.324
Child conduct problems	0.550	0.145	0.207	0.345
Parent depressive symptoms	0.080	0.822	0.251	0.226
Non-autonomous behavior				
Child depressive symptoms	**-0.547**	**0.000**	0.184	0.648
Child anxiety symptoms	**-0.409**	**0.035**	0.673	0.097
Child ADHD symptoms	-0.176	0.454	0.442	0.334
Child oppositional-defiant symptoms	-0.336	0.424	0.533	0.148
Child conduct problems	**-0.251**	**0.021**	0.126	0.760
Parent depressive symptoms	**-0.600**	**0.018**	**1.098**	**0.015**
Withdrawn				
Child depressive symptoms	**-0.401**	**0.001**	-0.032	0.846
Child anxiety symptoms	-0.092	0.604	0.119	0.481
Child ADHD symptoms	-0.108	0.621	0.064	0.699
Child oppositional-defiant symptoms	-0.028	0.940	0.119	0.494
Child conduct problems	-0.026	0.877	0.024	0.880

Parent depressive symptoms	0.234	0.640	-0.104	0.535
Rejecting				
Child depressive symptoms	0.153	0.526	0.226	0.368
Child anxiety symptoms	0.064	0.785	0.083	0.660
Child ADHD symptoms	0.328	0.100	0.312	0.139
Child oppositional-defiant symptoms	0.405	0.076	0.295	0.209
Child conduct problems	0.234	0.299	-0.016	0.925
Parent depressive symptoms	0.246	0.405	0.056	0.805

Note. Standardized regression coefficients are reported. Estimates shown in bold are statistically significant, $p < 0.05$. For visual clarity, effects of covariates (child age and gender; family type; and mode of data collection) and correlations between endogenous variables (mental health outcomes) are not shown.

Table 6
Lag-Sequential Analysis of Children's and Parent's Responses to Their Partner's Behavior

Given	Odds of Behavior at time t+1						
Partner Behavior at time t	Neutral	Active	Positive	Off-task	Withdrawn	Non-auto.	Reject.
C. Neutral	**0.54**	**3.49**	**0.61**	**0.09**	**5.14**	---	**0.63**
C. Active	**2.9**	**0.22**	1.01	---	---	---	**2.02**
C. Positive	**1.33**	**0.38**	**2.28**	**0.14**	---	---	1.06
C. Off-task	0.97	**0.32**	**0.58**	**221.64**	---	**157.58**	---
C. Withdrawn	0.91	**1.25**	0.82	---	---	---	---
C. Non-auto.	1.09	1.02	0.86	---	---	---	---
C. Reject.	1.34	0.96	**0.27**	---	---	---	---
P. Neutral	**0.51**	**3.09**	**1.40**	1.01	0.98	1.22	0.94
P. Active	**2.62**	**0.28**	**0.52**	**0.31**	**1.30**	1.21	**1.50**
P. Positive	0.97	**0.71**	**1.49**	**0.56**	**0.55**	---	**0.38**
P. Off-task	**0.08**	---	**0.16**	**220.06**	---	---	---
P. Withdrawn	**2.39**	---	---	---	---	---	---
P. Non-auto.	---	---	---	**157.41**	---	---	---
P. Reject.	0.9	**1.80**	0.57	---	**3.67**	---	---

Note. P = Parent. C = Child. Non-auto. = Non-autonomous. Reject = Rejecting. Bold indicates 95% confidence interval (CI) of pooled odds ratio did not contain 1. --- Indicates joint frequency was less than 5.