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Dyadic Development in the Family: Stability in Mother-Child Relationship Quality from Infancy to Adolescence

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Abstract

A central concern of family psychology and developmental science is assessing the stability or instability (that is, relative standing) of family-level constructs across time. Almost exclusively, such constructs have heretofore been unitary variables. Using a longitudinal design, for the first time this study traces developmental stability of the dyadic construct of mother-child relationship quality from infancy to adolescence. Multiple age-appropriate measures converging on the construct of relationship quality were assessed in 375 mother-child dyads at 4 times -- 5 months and 4, 10, and 14 years. Mother-child relationship quality showed stability (βs = .18 – .53) in all families together, in families with girls and boys, and when family socioeconomic status was controlled. Consistent patterns of relationship quality are developmentally significant in themselves, convert to broader behavioral tendencies in children, and guide more effective intervention designs.

Keywords

Adolescence; Behavioral measures; Child development; Development; Family relationships

Mother-Child Relationships

Relationships lie at the heart of human interactions and developmental science (Lerner & Hilliard, 2019), and relationship quality determines much of our well-being or ill-being (Vangelisti & Perlman, 2018). The relational developmental systems perspective holds that human development transpires through ongoing transactions between individuals and between individuals with their multiple sociocultural contexts (Lerner, 2018). More specifically, theoretical and empirical literatures alike in family psychology attest that early positive intrafamilial relationships herald wholesome child development (Bowlby, 1982; Masten & Cicchetti, 2010; Sroufe, 2016). Parents' and children's responsiveness to one

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another, shared positive affect, and security of mutual attachment usher constructive socialization and positive ontogenesis (Kochanska, Boldt, & Goffin, 2019).

Curiously, an undercurrent tension pervades our understanding of the developmental trajectory of parent-child relationships. On the one hand, notable scholars of family life have discerned *stability* in intrafamilial, especially parent-child, relationships: "In theories of child-rearing, parental behavior is assumed to have effects on children through a history of experiences. There is faith that, over time, parental influences lead to generalized behavior tendencies that have some durability" (Radke-Yarrow, Zahn-Waxler, & Chapman, 1983, p. 502), and "We can assume that the family system, like any system, has self-stabilizing properties…. Families stabilize around habitual patterns of interaction" (Maccoby, 1984, p. 326), and "…parents have fundamental, pervasive, and enduring childrearing orientations" (Roberts, Block, & Block, 1984, p. 595). On the other hand, equally prominent authorities of family life have posited *instability* in intrafamilial, especially parent-child, relationships: "It is insufficient and inaccurate to characterize a parent in an overall, diffuse way as 'rejecting,' 'overprotective,' 'insecure,' etc. A parent may be unsympathetic and antagonistic to certain of the child's characteristics and accepting and approving of others; overprotective and restrictive of some of the child's activities but not of others; insecure and unsure in specific areas of child-care responsibilities and self-confident and assured in others" (Thomas & Chess, 1977, pp. 78 −79), and "… parents who are highly effective at one stage in the child's life are not necessarily as effective at another; … similar practices do not necessarily produce the same effects at successive stages in child's life" (Baumrind, 1978, p. 189), and parent-child relationships are constantly being re-organized "prompted by pressures on both parents and children to adapt to pronounced physical, behavioral, and social changes in offspring" (Collins & Russell, 1991, p. 102), and "… no parent continues to provide the same caregiving behavior with normally developing children. Good parents cannot continue to engage in the same behavior and maintain the appellation of effective parents" (Holden & Miller, 1999, p. 224).

Which of these positions on so fundamental a developmental question as the stability or instability of parent-child relationships in the family is the more tenable? Or, are both? Like other living systems, families continually strive to attain a dynamic balance amidst the experiences of growth and maturation on the one hand and needs for consistency and predictability on the other. To address this question, we set out to study the stability of mother-child relationship quality in a large sample over an extended duration of childhood. In anticipation, we first describe stability and its significance and then introduce our novel and grounded approach to assessing mother-child relationships through time.

Stability in Development

Stability describes consistency through time in the relative standing in a group of individuals or, in this study, dyads in the family. Along with group mean-level continuity, stability is a central construct in developmental science (Bornstein, Putnick, & Esposito, 2017; Hartmann, Abbott, & Pelzel, 2015). Operationally, a temporally stable construct is one that some individuals or dyads display at relatively high levels at one point in time and again display at relatively high levels at a second later point in time, where other individuals or

dyads display lower levels at both times; an unstable construct is one where individuals or dyads do not maintain relative order in their group through time. This study is concerned with the long-term stability of relationship quality in mother-child dyads in the family.

The study of stability in individuals or dyads through time is important for theoretical, substantive, and methodological reasons. First, theoretically, stable development and child-rearing have appeal because they provide parsimonious models of ontogeny and caregiving. Stability is often assumed as central to family systems functioning and is one cornerstone of key conceptions and theories in developmental and family sciences. For example, attachment theory asserts consistency in neurobiological systems that underpin, and relational behaviors that express, affiliative bonds (Sroufe, Egeland, Carlson, & Collins, 2005). Stability is more economical, organized, and orderly than is instability.

Second, substantively, stability provides basic information about development as it is developmentally informative to describe an individual or dyad as stable or not over time. Developmental science is concerned with description, explanation, prediction, and optimization, and consistency speaks to this essential information. Whether individuals or dyads maintain their relative standing in a group through time informs not only about construct variation, but also contributes to understanding a construct's possible origins, nature, and future. It is often observed that a major predictor of a construct at a given age is that construct at an earlier age (Sternberg, Grigorenko, & Bundy, 2001). Finding stability in individuals or dyads means that individuals or dyads that behave a certain way on one occasion are likely to behave similarly on future occasions. Also, only relatively stable constructs can be expected to quantify differences between individuals or dyads. Furthermore, individuals or dyads who are stable experience, interpret, and affect environments and events in their lives differently from those who are unstable, and so consistency or inconsistency affects future development (Escalona, 1968).

Third, methodologically, stability has multiple implications for measurement. To be psychometrically meaningful, a construct should be stable (at least across short time spans), and stability is a gateway to prediction because it sets a statistical limit on predictive validity (Hartmann et al., 2015). In brief, stability has many basic applications and significant implications in developmental science. Here we asked if the construct of mother-child relationship quality in the family remains stable across child development.

Stability in Mother-Child Relationship Quality

Many studies have assessed stability in parent (mother) or child variables – behaviors or scales (see Bornstein, 2015, for a summary) – but few have assessed stability of mother-child dyadic constructs. Scales in two measures included in this study, the Emotional Availability Scales and the Teaching Task Scales (see below), have shown stabilities (Biringen, Matheny, Bretherton, Renouf, & Sherman, 2000; Bornstein et al., 2010; Weinfield, Ogawa, & Egeland, 2002). Again, however, these reports have tended to focus on individual behaviors and not on configurations of multiple individual variables in a system of global functioning, as we do here. Such configurations have unique meaning and yield unique information about the dyad. Our dyad-centered approach to analysis shifts the focus

from individuals to the relationship between individuals and the overall functioning of the dyad. A dyad-centered analysis of relationship quality focuses on the combination of maternal and child behavioral scale scores, each coded in the context of interaction with one another. Relationship quality is often operationalized through a dyad member's perception of affection, care, closeness, and low conflict. In this study, we operationalize relationship quality through the behaviors of each dyad member in interaction with one another. This approach is valuable because it allows young children to participate in relationship quality (whereas other studies of parent-child relationship quality all take the parent's perspective), removes the subjectiveness of felt relationship quality from the construct, and incorporates multiple dimensions of quality (e.g., positive and negative emotions, supportiveness, responsiveness, collaboration, and noncompliance).

This Study

The present study of stability of relationship quality in mother-child dyads in a substantial number of families over an extended period of child development attempts to make several novel and noteworthy contributions. First, the study applies a deeply dyadic approach to measurement. Against the common individual- or variable-centered approach to assessment that uses behaviors or scales as the main conceptual and analytical unit, we are interested in a family configuration – mother-child dyadic relationship quality.

Although relationships have long been of concern to social and behavioral scientists, investigations of relationships have been hampered by limitations of data and methodology. Here we observed the same mothers and children in interaction longitudinally at multiple ages from infancy to adolescence, and, in an innovative advance to the study of stability, we derived latent variables to represent the relationship quality of dyads in comparable fashions across four developmental waves. Development is dynamic: As children age, tasks and measures appropriate to their age need to change. Similarly, for their parents. The organizational perspective on development posits that the only way to faithfully study stability over the course of development is to examine age-appropriate different yet conceptually related behaviors (Sroufe, 1979). Were one to study the same exact behaviors over time, those behaviors would prove developmentally inappropriate at different times. In consequence, we used different tasks and measures across infancy to adolescence, but to achieve representations of the same underlying construct (relationship quality) at each age we employed a latent variable approach that allowed cross-time stability comparison.

Latent variables, which capture shared variance among their surface indicators, offer many advantages to measuring stability (Kline, 2015). Latent variables allow for implemented tasks, and surface measures of a construct derived from them, to vary across time; that is, the same latent construct may derive from different tasks and have different age-appropriate indicators and different loadings for indicators at different ages. Thus, latent variables advantageously accommodate the perspectives of multiple tasks, raters, domains, and measures of a construct. Latent variables also assess stability with some precision because variance uniquely associated with rater bias, systematic measurement error, or random error for a particular indicator is relegated to an error term. Finally, by using latent variables, we are modeling what is shared between mothers and children across a number of important

dyadic domains. As modeled here, latent variables exclude any unique variance or individual perspectives about relationship quality.

Dyad-centered analyses have previously been used for parent and child Emotional Availability Scales (through averaging mother and child scales, cluster analysis, and latent variables) to measure dyadic relationship quality (Bornstein, Gini, Suwalsky, Putnick, & Haynes, 2006; Kang, 2011; Shachar-Dadon, Gueron-Sela, Weintraub, Maayan-Metzger, & Leshem, 2017), as well as with other mother-father and mother-child relationship constructs (Galovan, Holmes, & Proulx, 2017; Ledermann, & Kenny, 2012). Dyadic relationship quality (as measured by dyadic emotional availability) has moderate relations with clinician ratings of parent-child relationship functioning (Espinet et al., 2013), and with mothers' psychological well-being/distress and child behavior problems/adaptive behavior (Kang, 2011; Shachar-Dadon et al., 2017), evidence for its validity. We are unaware of research on teaching tasks or JOBS measures used here dyadically, but given their similar content we expect that these measures would behave comparably to the Emotional Availability Scales.

Third, we evaluated robustness of the stability of mother-child relationship quality to variation in child gender and family socioeconomic status (SES). It is well established that mothers interact with their daughters and sons in similar but also in dissimilar ways. Many researchers have identified meaningful gender differences in socioemotional function starting in early childhood, even if they are small in magnitude (Hines, 2015). For example, girls and boys are typically socialized with respect to different emotional goals, and so gender differences in emotional expression, experience, and development are expectable. Generally, females display higher levels of social interest, are more affiliative, collaborative, and interpersonally sensitive, and are more invested in social relationships than males (reviewed in Brown & Tam, 2019). Furthermore, Hinde and Stevenson-Hinde (1987) proposed that gender differences would be intensified in relationship contexts (versus situations that emphasize individual performance). These factors might render stabilities of mother-daughter and mother-son relationship quality different. Girls' (contra boys') relationship quality with their mothers may also be influenced by dint of girls spending more sheer time with their more sociable mothers and because children tend primarily to model their same-sex parent (Ruble et al., 2006).

Likewise, families of different SES vary in their parent-child relationships. Parenting, which entails microinteractions and managing activities, is a principal pathway linking family economics to child well-being. For example, economic hardship promotes negative and disengaged parenting, limits sheer time with and so investment in children, and compromises mothers' abilities to meet their children's needs (Turney, 2012). The SES gradient pervades parents' cognitions (attitudes, goals) and practices (warmth, control) with children in expectable ways (reviewed in Hoff & Laursen, 2019; Magnusson & Duncan, 2019).

This study has 4 main aims: (1) to assess the common convergences of multiple mother and child measures on single latent variables of dyadic relationship quality at 5 months and 4, 10, and 14 years, (2) to assess stability of dyadic relationship quality between temporally distributed latent variables from infancy to adolescence, (3) to assess and compare stabilities

of dyadic relationship quality in mother-daughter and mother-son dyads, and (4) to assess the robustness of stability of relationship quality controlling for family SES. On aim 1, we examined possible factor structures for relationship quality of mother-child dyads, and we hypothesized two alternative *a priori* models of dyadic relationship quality at each of the 4 ages. In a one-factor model, all mother and child indicators at a given age were hypothesized to load on a single factor of dyadic relationship quality. In a two-correlated-factors model, all mother indicators at a given age were hypothesized to load on a factor representing mothers' quality of relationships with their children, all child indicators at the same age were hypothesized to load on a factor representing children's quality of relationships with their mothers, and these two factors were hypothesized to covary. On aim 2, we hypothesized and tested an *a priori* model of the stability of relationship quality from infancy to adolescence. On aim 3, we tested whether the stabilities of relationship quality are similar or different for mother-daughter and mother-son pairs. On aim 4, we tested the robustness of stability of mother-child relationship quality, removing the variance associated with family SES to determine whether this variation was promoting stability.

Method

Participants

Altogether, 375 European American mother-child dyads recruited from an East coast U.S. metropolitan area participated in this 13-year 4-wave longitudinal study. Families were recruited through mass mailings, newspaper advertisements, and flyers in pediatricians' offices. Children were healthy firstborns, 45.6% girls, and $M = 5.37$ months ($SD = 0.21$, $n = 374$), 4.05 years ($SD = 0.09$, $n = 255$), 10.24 years ($SD = 0.15$, $n = 199$), and 13.84 years ($SD = 0.26$, $n = 148$) old at the first, second, third, and fourth assessment waves (hereinafter referred to as 5 months, 4, 10, and 14 years, respectively). At the first wave, mothers averaged 29.05 years ($SD = 6.53$). Families represented a full range of SES (Hollingshead, 1975, Index, $M = 49.22$, $SD = 13.74$, *range* = 14 to 66). At the first visit, approximately 22.6% of mothers had received a high school diploma or less education, 20.0% had completed some college or specialized training, 29.1% had a 4-year college degree, and 28.3% had some graduate or professional training; 88.5% were married; and 57.1% were employed. The sample was composed of ethnically homogenous but socioeconomically heterogeneous European American families. European American families were chosen because, first, a majority of the population of the United States at the time of data collection identified as European American (American Community Survey, 2018); second, parent-child relationships vary by ethnicity (Halgunseth, 2019; McLoyd, Hardaway, & Jocson, 2019; Ng & Wang, 2019); and third, ethnicity and socioeconomic status are often confounded (Leyendecker, Harwood, Comparini, & Yalcinkaya, 2005). Therefore, we took the initial step of exploring stability of relationship quality in mother-child dyads in European American families so as not to cloud our findings by mixing ethnicities and with the hope that this strategy would stimulate research on family development in other ethnicities (Bornstein, Jager, & Putnick, 2013; Jager, Putnick, & Bornstein, 2017). Human subjects protection followed the guidelines of the American Psychological Association: Informed consent was obtained from mothers at all ages and assent from children at ages 10 and 14, and the study was approved by the Institutional Review Board of the *Eunice Kennedy*

Shriver National Institute of Child Health and Human Development, Protocol #88-CH-0032, entitled “Specificity of mother-infant interaction: The influence of maternal age, employment status, and parenthood status”.

Procedures and Coding

At each wave, mothers and children were observed and videorecorded together engaging in age-appropriate dyadic tasks and interactions, and age-appropriate scales and codes were applied. At ages 5 months and 10 years, home visits were scheduled; at 4 years and 14 years, laboratory visits were scheduled. Videorecording commenced only after a standard and recommended period of acclimation to the camera and the presence of the researcher (McCune-Nicolich & Fenson, 1984; Stevenson, Leavitt, Roach, Chapman, & Miller, 1986). In all cases, the researcher resisted talking to the mother or child or making eye contact and interacting with or otherwise reacting to the dyad during the filming. Mothers were urged to go about their normal routine, to behave as they normally would do with their child, and to disregard the researcher insofar as possible. Mothers completed demographic questionnaires asking for background information about the child, mother, and family at all 4 waves. All dyadic interactions were coded independently by trained and reliable coders, and no dyad was coded by the same coder at different ages. Coders were blind to hypotheses and purposes of the study and to additional information about the dyads. Intercoder reliability at each age was assessed using average absolute agreement intraclass correlation coefficients (*ICCs*) in two-way random effects models (McGraw & Wong, 1996).

At 5 months, mothers were told that the researcher was interested in the infant’s usual activities at a time when the infant was awake and mother was at home alone with the infant and solely responsible for the infant’s care. Mother-child relationship quality was evaluated using the Emotional Availability Scales: Infancy to Early Childhood Version (EAS 3rd ed.; Biringen, Robinson, & Emde, 1998), a valid and reliable system for measuring dyadic relationship quality (Biringen, Derscheid, Vliegen, Closson, & Easterbrooks, 2014; Bornstein, Gini, Suwalsky, et al., 2006; Bornstein, Gini, Putnick, Haynes, Painter, & Suwalsky, 2006). Six rating scales were used, four focused on maternal behavior and two on infant behavior. The four maternal EAS were: (1) Sensitivity – maternal acceptance, flexibility, affect regulation, conflict resolution, and variety and creativity in play displayed toward the infant ranging from 1 (*highly insensitive*) to 9 (*highly sensitive*); (2) Structuring – the degree to which the mother appropriately scaffolds, facilitates, organizes, and maintains child play, exploration, or routine by providing rules, regulations, and a supportive framework for interaction without compromising the child’s autonomy from 1 (*non-optimal*) to 5 (*optimal*); (3) Nonintrusiveness – maternal support for the infant without interrupting the infant by being overdirective, overstimulating, overprotecting, and/or interfering from 1 (*intrusive*) to 5 (*nonintrusive*); and (4) Nonhostility – maternal speech or behavior directed to the infant in a way that is patient, pleasant, and harmonious and not rejecting, abrasive, or antagonistic from 1 (*markedly hostile*) to 5 (*nonhostile*). The two infant EAS were: (5) Responsiveness – the infant’s age- and context-appropriate balance between autonomous exploration and social reactions to mother as well as the extent of the infant’s enjoyment of the interaction; and (6) Involvement – the infant’s ability and willingness to engage the mother in interaction, both from 1 (*non-optimal*) to 7 (*optimal*). (For more complete

descriptions of the Emotional Availability Scales see Biringen, 2000; Biringen & Robinson, 1991; Easterbrooks & Biringen, 2000, 2005.) The EAS were coded in ½ points by a group of 11 coders. Ranges of coder reliability *ICCs* with an author of the EAS (n=12) were: Sensitivity .87–.97; Structuring .75–.96; Nonintrusiveness .80–.92; Nonhostility .70–.82; Responsiveness .86–.97; and Involvement, .82–.98.

At 4 years, mothers and children sat together in a large comfortable chair or on chairs at a low table and were asked to "read" a picture book entitled *Good Dog, Carl* (Day, 1996) together. The picture book had no written text except for single sentences on the first and last pages. Immediately following the book reading task, mothers and children sat at a low table together and were given a challenging 20-piece picture puzzle. The researcher made sure that the child saw and understood the picture on the puzzle, disassembled it while the child watched, and instructed the child to put it back together again. The mother was told to help the child however she thought best. Immediately following the picture puzzle task, mothers and children, still seated at the low table, were given a piece of drawing paper and colored markers. The child was asked to make a picture of his/her house, and the mother was told to help the child however she thought best. Mother-child relationship quality was evaluated using the Mother, Child, and Dyadic Teaching Tasks Scales (TTS; Egeland et al., 1995). The TTS codes for maternal behaviors were (1) Supportive Presence – maternal involvement and provision of a secure base for the child; (2) Quality of Instruction – maternal ability to provide the child with timely and appropriate clues; (3) Intrusiveness – maternal behaviors that demonstrate a lack of respect for the child's autonomy; and (4) Hostility – maternal behaviors that are dismissive, demeaning, or rejecting of the child. The TTS for child behaviors were (1) Positive Orientation – the degree that the child displayed positive regard and sharing of happy feelings toward the mother; (2) Noncompliance – the child's unwillingness to take maternal suggestions or comply with maternal requests; (3) Persistence – the degree of the child's focus on completing the tasks; and (4) Child Negativity – the child's anger, dislike, or hostility shown toward the mother. All TTS ranged from 1 to 7. A group of 7 coders was trained by a student of the TTS author. Ranges of *ICCs* for individual coders against the trainer (n=16) were: Supportive Presence .83–.92; Quality of Instruction .86–.93; Intrusiveness .71–.95; Hostility .80–.93; Positive Orientation .72–.90; Noncompliance .79–.94, Persistence .69–.91, and Negativity .81–.93. All interactions were coded by two coders. Scores within 1 point were averaged, and disagreements were resolved through consensus discussion.

At 10 years, mothers and children completed a drawing of their home and a page of math problems together. The two sat at a table and were given paper, pencils, and colored markers. For the first task the instructions were to use the piece of paper and some markers to draw a picture of their home. When the drawing task was completed, the second task was a worksheet containing math word problems, and the child was asked to do as many of them as the child could do without expecting to finish the whole page. In both tasks, the mother was told that she could help the child in any way she and the child wanted. Mother-child relationship quality was evaluated using the JOBS Wave II Middle Childhood Observational Coding Scheme for Affective and Behavioral Quality of Mother-Child Interaction (ABQ; Weinfield et al., 1996). The three ABQ scales for maternal behavior were (1) Positive Responsiveness – the mother responding positively to her child's need for emotional support

and providing appropriate, well-timed feedback to her child; (2) Quality of Assistance – the mother providing the child with timely and appropriate clues that are coordinated with the child's ability level and allowing the child to engage in self-directed problem solving whenever possible; and (3) Anger or Hostility – the mother blaming, derisive, or rejecting behaviors towards the child. (This scale was slightly revised to better map onto the behavioral data being coded for the study sample; the original title was "Anger and Hostility.") The three ABQ scales for child behavior were (1) Positive Affect – the child displays positive verbal and non-verbal expressions of positive affect during the session; (2) Persistence and Diligence – the child focuses on completing the tasks; and (3) Anger, Defiance, and Frustration – the child displays anger, hostility, and defiance toward the mother and/or toward the task. All ABQ scales ranged from 1 to 5 and were coded in ½ points by a group of 5 coders. Ranges of *ICCs* for individual coders against one another were: Positive Responsiveness .94–.97; Quality of Assistance .92–.97; Anger or Hostility .86–.97; Positive Affect .93–.97; Persistence and Diligence .89–.98; and Anger, Defiance, and Frustration .94–.98. All interactions were coded by two coders. Scores within 1 point were averaged, and disagreements were resolved through consensus discussion.

At 14 years, mothers and children sat together at a table to plan a day-long outing. The instructions were: *"Pretend that it is a bright sunny weekend morning and the two of you are going to spend the day together doing various errands and fun activities. You have a few errands that you MUST do plus other activities that you can choose to do if you want. You will leave the house at 10:00 in the morning, and you will be attending a movie together at 5:30 pm. Your task is to work together to decide how you will spend the day, fill in the schedule that we have given you, and then draw out your plan in the form of a map."* A dry-erase board and markers were placed near the table. Mother-child relationship quality was evaluated using the Manual for Family Assessment at Age 13 (MFA; Englund, n.d.). The four scales for maternal behavior were: (1) Supportive Presence – how emotionally supportive and available the mother is to the adolescent during the task; (2) Maternal Quality of Assistance – how well the mother assists the adolescent in working toward the goals of the task; (3) Maternal Support of Autonomy – the degree to which the mother acts in a way that recognizes and respects the validity of the adolescent's individuality (i.e., his or her ideas, perspectives, and efforts in the session); and (4) Maternal Hostility – the mother's rejection of the adolescent (his or her ideas, behavior, appearance, etc.) with no expectation that the issue can or will be addressed constructively and resolved. The four scales for adolescent behavior were: (1) Adolescent Positive Affect – the adolescent's expressed pleasure and enjoyment in working on the task and/or in being with the mother; (2) Adolescent Negative Affect – the adolescent's expressions of irritability, petulance, sullenness, belligerence, anger, hostility, fear, and sadness in reaction to the task or the mother; (3) Adolescent Collaborative Attitude – the adolescent's desire to work together with the mother, including both the extent to which the adolescent actively seeks joint understanding with the mother and the eagerness and openness with which the adolescent seeks to connect with the mother; and (4) Adolescent Self-assertiveness – the adolescent's ability to be assertive and confidently express ideas and positions without apprehension, tentativeness, defensiveness, or disengagement/disinterest. This scale also captures the adolescent's confidence in his/her ability to effectively influence mother. All MFA scales

ranged from 1 to 7 and were coded in ½ points by a group of 5 coders. Ranges of *ICCs* for individual coders against one another were: Supportive Presence .80–.96; Quality of Assistance .80–.94; Support of Autonomy .80–.96; Hostility .71–.88; Positive Affect .88–.99; Negative Affect .80–.84; Collaborative Attitude .79–.92; and Self-Assertiveness .78–.94. All interactions were coded by two coders. Scores within 1 point were averaged, and disagreements were resolved through consensus discussion.

Each of the coding scales above focuses on an individual for ease of coding and follows the guidelines in the coding manual for each scale, but each scale is coded in the context of the other person in the interaction and so is essentially dyadic. In principle, a given behavior can be coded in different ways depending on the context and the partner's behavior. For example, a mother who directs a task rather than letting the child direct could be coded as sensitive or as intrusive (or high or low on Quality of Assistance) depending on the child's needs (age and skill level), previous behavior in the task (struggling and disengaged vs. progressing and engaged), and response to mother's behavior (frustrated vs. appreciative). Hence, each scale measures the relationship and not an individual.

Preliminary Analyses and Analytic Plan

Variable distributions were first examined for univariate normality, and standard transformations applied to improve distributions (Tabachnick & Fidell, 2012). Transformed variables were used in analyses; for clarity, untransformed data are presented in reports of descriptive statistics.

Structural equation models (SEMs) were then fit using Maximum Likelihood Functions (MLF) following mathematical models (Bentler & Weeks, 1980) as implemented in EQS 6.1 (Bentler, 2006). Missing data (36.55% of the total data was missing completely at random; Little's MCAR test $\chi^2(df = 130, N = 375) = 150.23, p = .11$) were handled in EQS using full information maximum likelihood with a two-stage Expectation-Maximization (EM) estimation of the structured model and the MLF (Jamshidian & Bentler, 1999). The nonsignificant MCAR test suggests that dropout over time was not systematic and did not bias the results. Monte Carlo studies have demonstrated the superiority of the structured-model EM method implemented in EQS 6.1 compared to other techniques to recover missing data, especially in MCAR normal or slightly nonnormal data (Gold & Bentler, 2000; Yuan & Bentler, 2000). In the course of fitting SEMs, we evaluated coefficients of multivariate kurtosis (Mardia, 1970) and cases that contributed disproportionately to parameter estimates. No significant problems of nonnormality or influential cases emerged.

Model fit was assessed using the robust Yuan-Bentler (Y-B) scaled χ^2 statistic, robust comparative fit index (CFI), the standardized root mean squared residual (SRMR; Browne & Cudeck, 1993), and the root mean square error of approximation (RMSEA). Cutoff values ≈.95, ≈.08, and ≈.06 for CFI, SRMR, and RMSEA, respectively, are indicative of a relatively good fit between the hypothesized model and observed data (Hu & Bentler, 1999). Greater weight was given to the incremental fit indices than to χ^2 because the χ^2 value is sensitive to sample size (Cheung & Rensvold, 2002). Standardized path coefficients are presented and interpreted with respect to Cohen's (1988) estimates of small/weak (.10), medium/moderate (.30), and large/strong (.50) effects. In addition to estimating stability

between adjacent time points, we also tested indirect effects of early measurements on later ones to asses longer-term stability between non-adjacent waves. These indirect effects test whether the earliest assessments of relationship quality affect later ones through intervening assessments (i.e., mediation).

We report the difference in χ^2 statistics and CFI values for nested models between unconstrained and constrained models. If the $\Delta\chi^2$ between unconstrained and constrained models was nonsignificant ($p > .05$) and the ΔCFI ≤ .01, the model was deemed to fit equally well in dyads with girls and boys (Cheung & Rensvold, 2002; Vandenberg & Lance, 2000). Finally, we re-evaluated the stability model for dyadic relationship quality controlling for family SES.

Results

Table 1 provides descriptive statistics, and Supplemental Table 1 presents the pairwise variance covariance matrix, for measures evaluating mother-child dyadic relationship quality at 5 months and 4, 10, and 14 years.

Mother-Child Relationship Quality Measurement Models across 4 Ages

To aim 1, measurement models were fit at each age. Examining possible factor structures for mother-child relationship quality, we hypothesized and tested two alternative *a priori* models of relationship quality at each age. In a one-factor model of relationship quality, all mother and child indicators at a given age were hypothesized to load on a single factor of relationship quality. In a two-correlated-factors model, all mother indicators at a given age were hypothesized to load on a factor representing mothers' quality of interaction with their children, all child indicators at the same given age were hypothesized to load on a factor representing children's quality of interaction with their mothers, and these two factors were hypothesized to covary.

The *a priori* two-correlated-factors models failed to account for some covariation, and Lagrange-Multiplier tests suggested incorporation of error covariances to account for shared source or method variance: mothers' Nonintrusiveness and Nonhostility at 5 months, $\chi^2(1) = 92.24$, $p < .001$; mothers' Supportive Presence and Hostility (negative), $\chi^2(1) = 10.77$, $p = .001$, and Intrusiveness and Hostility at 4 years, $\chi^2(1) = 26.94$, $p < .001$; mothers' Anger or Hostility and children's Anger, Defiance, and Frustration at 10 years, $\chi^2(1) = 23.10$, $p < .001$; mothers' Hostility and adolescent Negative Affect at 14 years, $\chi^2(1) = 20.68$, $p < .001$; mothers' Supportive Presence and adolescent Positive Affect at 14 years, $\chi^2(1) = 13.97$, $p < .001$; and adolescent Negative Affect and Collaborative Attitude (negative) at 14 years, $\chi^2(1) = 18.06$, $p < .001$). Goodness of fit indexes for the final measurement models with these error covariances added were acceptable: robust Y-B scaled $\chi^2(7) = 8.59$, $p = .28$, Robust CFI = 1.00, SRMR = .01, RMSEA = .02, 90% CI = (.00, .07) at 5 months; robust Y-B scaled $\chi^2(17) = 74.43$, $p < .001$, Robust CFI = .94, SRMR = .07, RMSEA = .12, 90% CI = (.09, .14) at 4 years; robust Y-B scaled $\chi^2(7) = 10.92$, $p = .14$, Robust CFI = .99, SRMR = .04, RMSEA = .05, 90% CI = (.00, .11) at 10 years; and robust Y-B scaled $\chi^2(16) = 49.94$, $p < .001$, Robust CFI = .96, SRMR = .06, RMSEA = .12, 90% CI = (.08, .16) at 14 years. The RMSEAs for the 4- and 14-year measurement models were larger than the standard cut-

off. We accepted these models because the other fit statistics were in the acceptable range and RMSEA is known to be too large in small samples (Curran, Bollen, Chen, Paxton, & Kirby, 2003). Due to attrition, these measurement models had smaller *N*s than the stability models that follow.

The χ^2 differences for the two nested models of the dyad one-factor model and the two-correlated-factors model were $\chi^2(1)$s = 87.36, 267.98, 16.69, and 188.14, all *p*s < .001, and ΔCFIs = .04, .22, .03, and .18, respectively, at 5 months and 4, 10, and 14 years, suggesting that the hypothesized two-correlated-factors model fit the data better. The two-correlated-factors model then served as the conceptual model for dyadic relationship quality, and the correlations between mother and child factors (.94, .52, .66, and .53, respectively, at ages 5 months and 4, 10, and 14 years) were represented as second-order factors of dyadic relationship quality latent factors so that stability of dyadic relationship quality could be investigated. All measurement models showed strong factor loadings at the $p \leq .01$ level with factor loadings ranging from .50 to .994 for mother factors and from .29 to .995 for child factors.

Stability of Mother-Child Relationship Quality across 4 Ages

To aim 2, longitudinal stability of mother-child dyadic relationship quality was evaluated using SEM. Figure 1 presents the standardized solution of the mother-child relationship quality stability model. The *a priori* stability model fit the data: robust Y-B scaled $\chi^2(335) = 573.49$, $p < .001$, Robust CFI = 1.00, SRMR = .11, RMSEA = .00. From ages 5 months to 4 years, 4 years to 10 years, and 10 years to 14 years, mother-child dyadic relationship quality was moderately to strongly stable. Indirect effects test whether earlier assessments in a longitudinal model affect later ones through intervening assessments (i.e., mediation). The indirect effects of mother-child relationship quality at 5 months, 4 years, and 10 years on 14-year mother-child relationship quality were .04, .19, and .54, respectively, all *p*s < .001. Stability was measured between unevenly spaced developmental waves, that is 3.5 years (5 months-4 years), 6 years (4–10 years), and 4 years (10–14 years). Finally, to regularize stability estimates to a common metric of 1 year and allow comparisons with other studies that might measure relationship quality stability over shorter time spans, we followed Chung, Hutteman, van Aken, and Denissen (2017) and estimated annual stability by taking the n^{th} root of the stability estimate, where *n* is the number of years between assessments. Assuming constant stability over the unmeasured periods, annual stabilities for dyadic relationship quality in the family ranged from .61 (5 months-4 years) to .84 (4–10 years) to .85 (10–14 years). Even from age 5 months to age 14 years, annual stability could be considered large, but Fisher's exact *z*-tests of the difference in dependent and independent standardized coefficients, respectively, suggest that yearly early stability from 5 months to 4 years is smaller than later stability from 4 to 10 years, $z = -8.08$, $p < .001$, and 10 to 14 years, $z = -8.05$, $p < .001$. These results should be interpreted with caution due to uncertainty in whether the assumption of constant stability over the unmeasured periods holds, as well as changes in measurement across time, that may contribute to higher or lower stability (additional details are in Supplementary Information).

Stability of Mother-Child Relationship Quality with Girls and Boys

After fitting the stability model on the full sample, multiple-group analysis on girls and boys was used to assess aim 3, gender variation in the stability of mother-child relationship quality. All factors in the stability model proved to be similar constructs for mother-daughter and mother-son pairs, allowing tests of gender differences in stability. The difference in χ^2 statistics of two nested models, the more constrained model (with invariance constraints on all factor loadings except Negativity on the 4-year child factor, Positive Affect on the 14-year child factor, and the three stability coefficients) and the less constrained model (with invariance constraints only on factor loadings except 4-year Negativity and 14-year Positive Affect on the child factors), was not significant, $\Delta\chi^2(3) = 5.17$, $p = .16$, ΔCFI = .00. Longitudinal stabilities of mother-child relationship quality from 5 months to 4 years, 4 to 10 years, and 10 to 14 years did not differ between mother-daughter and mother-son pairs, $\Delta\chi^2(3) = 5.17$, $p = .16$, ΔCFI = .00.

Stability of Mother-Child Relationship Quality, Controlling for SES

To aim 4, we re-evaluated the stability model for mother-child dyadic relationship quality controlling for family SES by adding direct paths from the family Hollingshead Index as an exogenous variable to all four second-order relationship quality factors in the SEM. This covariate model fit the data: robust Y-B scaled $\chi^2(359) = 613.04$, $p < .001$, Robust CFI = 1.00, SRMR = .11, RMSEA = .00. Family SES was related to relationship quality factors at 3 of 4 developmental waves: βs = .28, $p < .001$, at 5 months; .42, $p < .001$, at 4 years; −.01, $p = .63$, at 10 years; and .26, $p < .001$, at 14 years. Although controlling for family SES attenuated stability somewhat, mother-child dyadic relationship quality remained stable from 5 months to 4 years, β = .10, $p < .05$, 4 to 10 years, β = .35, $p < .001$, and 10 to 14 years, β = .48, $p < .001$.

Discussion

We set about to study the stability mother-child dyadic relationship quality from infancy to adolescence. The mother–child relationship is a vital dyadic context for the development of multiple and pervasive personal and relational characteristics from self-regulatory abilities to attachment (Diener, Mangelsdorf, McHale, & Frosch, 2002; Sroufe, 1997), and developmental research has revealed that significant variation in behavior (e.g., parent and adolescent negativity and responsivity) is explained by dyadic relationships (Rasbash, Jenkins, O'Connor, Tackett, & Reiss, 2011). Moreover, many child competences originate in the parent-child relationship (Attili, Vermigli, & Roazzi, 2010). Thus, the unique combination of the two people in a family dyad is important for understanding human development. Indeed, as D. W. Winnicott (1964, p. 88) once mused, "… there is no such thing as a baby … if you set out to describe a baby, you will find you are describing a baby and someone. A baby cannot exist alone, but is essentially part of a relationship… ."

We measured mother-child relationship quality at four ages from infancy to adolescence – 5 months and 4, 10, and 14 years -- using age-appropriate tasks, procedures, and coding systems. We found that all indicators of mother-child relationship quality loaded significantly on their factors at each age, which indicated that diverse measures of the

mother-child dyad formed robust, stable, single latent variables of dyadic relationship quality at each age. We also found that the core of that mother-child dyadic relationship configuration is stable from infancy to adolescence, increasingly stable with development (although changes in measurement may account for some of this increase), stable in families with girls and boys, and stable despite wide variation in family socioeconomic status. Like other living systems, families appear to attain and maintain some dynamic balance amidst kaleidoscopically changing experiences on the one hand and requirements for consistency and predictability on the other. As Holden and Miller (1999) concluded based on their meta-analysis, "the nature of child rearing is simultaneously enduring and different" (p. 243). Increasing stability across development charaterizes other behaviors like child language (Bornstein, Hahn, Putnick, & Suwalsky, 2014). Relationships may stabilize through repeated interactions over time as mothers and children set into typical interaction patterns. Relationship quality may be more modifiable earlier in development, suggesting early intervention for troubled relationships.

A notable strength of the results of this study is their robustness. Not only was the sample size adequate, but the findings proved applicable to girls and boys and controlling for family SES. Moreover, the tasks, activities, situations, contexts, measures, and coding systems differed across ages, possibly pulling for varying features of mother-child relationship quality at different ages, so the results likely also reflect conservative underestimates of true stability of mother-child dyadic relationship quality. Reinforcing this point, the scores of mothers and children indicated that, despite the wide SES range, ours was overall a relatively well-functioning sample (Table 1). This pattern points to some restricted variability within the sample that might also attenuate stability. In short, the stability in mother-child dyadic relationship quality in the family transcends time (14 years), tasks and procedures, and child gender as well as family SES, and reported stability coefficients are also likely underestimates. Another strength is that this study did not rely on report, but on observed mother and child behaviors while interacting.

Balanced against these strengths, our study recruited exclusively European American mothers and their typically developing firstborn children. Other samples (parents of varying ethnicity, fathers, or laterborns) are needed to evaluate the generalizability of stability. Certain risk factors, such as prematurity, are associated with lower predictability, whereas other risk factors, such as low maternal literacy, are associated with greater predictability (Weinfield et al., 2002). We recruited an ethnically homogenous community sample as a first step in understanding longitudinal mother-child relationship quality antecedent to more complex studies and analyses with ethnically diverse samples. Because parent-child relationships are known to vary with ethnicity (Bornstein, 2015; Murry, Hill, Witherspoon, Berkel, & Bartz, 2015), by including only European American families we intentionally avoided an ethnicity confound that has vexed the developmental literature and would also cloud our findings (Bornstein et al., 2013). A fuller family systems approach would also examine mother-child relationships in the context of other relationships within the family (Bornstein & Sawyer, 2006; Kerig, 2019). As is common in longitudinal studies covering 14 years, our study suffered some attrition. However, the missing data were random, as indicated by Little's MCAR test, which results in unbiased estimation (Gold & Bentler, 2000), and we used modern statistical techniques to recover missing data. We coded the

behaviors of individual partners and used those individual codes as manifest indicators to quantify a configuration-level dyadic construct, relationship quality. Other coding schemes may be explicitly dyadic and can be used to identify emergent features that cannot be inferred from the behaviors of each partner.

We uncovered a degree of stability in dyadic relationship quality across a long duration of childhood. Observed magnitudes of stability ranged from small (β = .18 from 5 months to 4 years) to large (β = .53 from 10 to 14 years), but annualized assessments were large. Still, each relationship quality latent variable explained only 3 to 28% of the variance in the next latent variable, suggesting that relationship quality changed as it endured. In this context, we note that stability has two valid, if seemingly contradictory, construals: Stability is a sign of resilience but also inflexibility, just as instability is a sign of disorganization but also flexibility. Human beings and relationships exhibit important and necessary consistencies throughout the life course, but the lifespan perspective on development specifies that human beings and relationships are also open systems, and so the plastic nature of many characteristics ensures change through time as well. Social Relational Theory and the relational systems model of development assert on-going dialectics in parent-child relationships and that those relationships are re-negotiated across the life course leading to dynamic shifts in the behavioral tendencies of both parties (Eccles et al., 1993; Kuczynski & Parkin, 2009; Lerner, 2018).

This research has developmental, clinical, and intervention implications because it advocates for family-wide approaches *contra* individual treatment to structuring and re-structuring relationship dynamics. To understand the fuller implications of stability it will be rewarding next to consider development in the parent-child dyad in relation to concurrent and future developmental outcomes. The clear pattern of stability that emerged from our approach might help guide new research and further development of theories about family life. Family and developmental scientists alike assume that a tight pairing of particular parent and particular child behaviors through time likely forecast relatively stable psychological tendencies in children (Joussemet, Landry, & Koestner, 2008). Thus, when patterns of interaction consistently transpire in parent-child encounters, they may convert to broader behavioral tendencies that involve other relationships and other conditions (Bornstein, 2013; Bowlby, 1982). Last, from the transactional perspective, this research suggests that a developmental problem is never located completely in one or another individual but likely resides in their relationship. In this spirit, our stability data also recommend an interventional focus on early family interactions. The stability coefficients we obtained indicate that larger proportions of variance are accounted for between later developmental waves so that infancy and early childhood, when relationship quality may be more malleable, constitute key points of clinical intervention.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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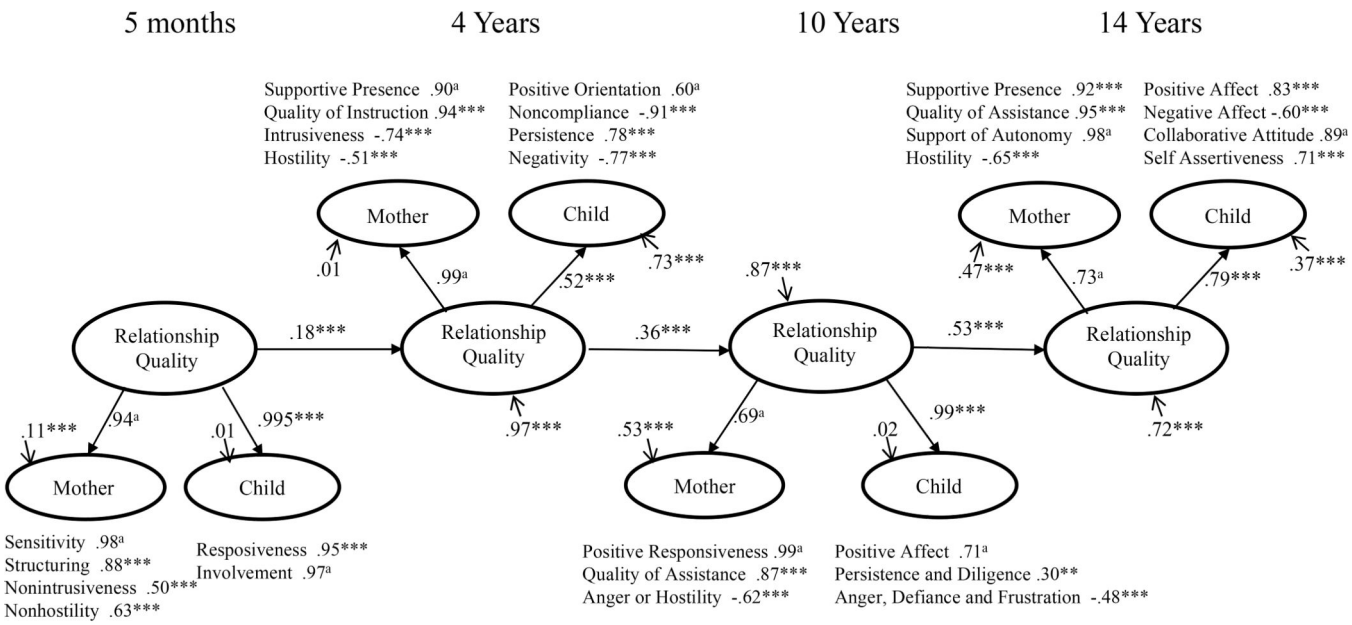

[a] This is the marker indicator of the latent variable.

Figure 1.

Standardized solution for the stability model showing longitudinal stability of mother-child dyadic relationship quality from 5 months to 14 years ($N = 375$). *Note.* Indicators of each latent variable with their factor loadings are listed under or above the latent variable. Marker indicators of the latent variables are indicated with a superscript ([a]). Asterisks show significant paths (**$p < .01$ and ***$p < .001$). Not shown in the Figure (but estimated in the model) were error covariances between mothers' Nonintrusiveness and Nonhostility at 5 months ($\beta = .50$, $p < .001$), mothers' Supportive Presence and Hostility at 4 years ($\beta = -.41$, $p < .001$), mothers' Intrusiveness and Hostility at 4 years ($\beta = .32$, $p < .001$), mothers' Anger or Hostility and children's Anger, Defiance and Frustration at 10 years ($\beta = .35$, $p < .001$), mothers' Hostility and adolescent Negative Affect at 14 years ($\beta = .31$, $p < .001$), mothers' Supportive Presence and adolescent Positive Affect at 14 years ($\beta = .42$, $p < .001$), and adolescent Negative Affect and Collaborative Attitude ($\beta = -.50$, $p < .001$).

Table 1

Descriptive Statistics for Measures Evaluating Dyadic Relationship Quality at 5 Months and 4, 10, and 14 Years

Variable and measure	*M*	*SD*	*Possible range*
5 months: Emotional Availability Scales			
Mother			
Sensitivity	6.24	1.35	1–9
Structuring	4.20	0.74	1–5
Nonintrusiveness	4.77	0.50	1–5
Nonhostility	4.68	0.62	1–5
Child			
Responsiveness	5.08	0.97	1–7
Involvement	5.01	1.01	1–7
4 years: Mother, Child, and Dyadic Teaching Tasks Scales			
Mother			
Supportive Presence	5.34	1.11	1–7
Quality of Instruction	5.04	1.00	1–7
Intrusiveness	2.49	1.19	1–7
Hostility	1.59	0.93	1–7
Child			
Positive Orientation	5.22	0.97	1–7
Noncompliance	2.48	1.32	1–7
Persistence	5.96	1.04	1–7
Negativity	2.17	1.10	1–7
10 years: JOBS Wave II Middle Childhood Observational Coding Scheme			
Mother			
Positive Responsiveness	3.68	0.84	1–5
Quality of Assistance	3.70	0.69	1–5
Anger or Hostility	1.39	0.54	1–5
Child			
Positive Affect	3.53	0.84	1–5
Persistence and Diligence	4.76	0.44	1–5
Anger, Defiance, and Frustration	1.58	0.60	1–5
14 years: Family Assessment			
Mother			
Supportive Presence	5.04	1.24	1–7
Quality of Assistance	4.94	1.24	1–7
Support of Autonomy	5.14	1.26	1–7
Hostility	1.49	0.74	1–7
Adolescent			
Positive Affect	4.08	1.36	1–7
Negative Affect	2.39	1.24	1–7

Variable and measure	*M*	*SD*	*Possible range*
Collaborative Attitude	4.99	1.22	1–7
Self-Assertiveness	4.94	1.19	1–7