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## A Longitudinal Investigation of the Affective Environment in Families with Young Children: From Infancy to Early School Age

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### Abstract

We examined the affective environment in 102 families studied longitudinally when children were 7, 15, 25, 38, 52, and 67 months. At each assessment, every mother-child and father-child dyad was observed in typical daily contexts. Each person's emotions of affection, joy, and anger were coded. Both parents rated marital quality when children were 15, 52, and 67 months. Growth curve analyses, using Actor-Partner Interdependence Modeling, examined (a) developmental changes in emotions, (b) within-relationship influence of the partner's emotions, (c) across-relationship influences of emotions in other parent's interactions with the child, and (d) associations between marital quality and emotions over time. Parents' emotional expressiveness was highest early in the child's development, and declined thereafter. Children's anger was highest at 15 months, and declined thereafter, and their positive emotions, particularly with mothers, increased over time. Generally, one's positive emotions and better marital quality were associated with greater positive emotion within- and across-relationships, whereas one's anger was associated with greater anger within- and across-relationships. However, any emotion expression elicited greater affection in the interaction partner. Parents' neuroticism did not account for the convergence of emotions across relationships.

### Keywords

Parent-Child Relationship; Emotions; Marital Quality; Growth Curve Analyses

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Emotions permeate family relationships. The emotional ambience of a marriage reflects and predicts its quality, conflict, enhancement, or dissolution (Gottman & Notarius, 2002). Emotions in parent-child relationships are a critical dimension of development and socialization (Eisenberg, Cumberland, & Spinrad, 1998). In families, emotions profoundly influence mental health of the individuals, including sense of security, coping, personal growth, competence, adjustment, behavior problems, and psychopathology, including recovery and relapse (Clark & Brissette, 2003; Dunn, 2003; Hooley, 2007; Sroufe, 1996; Eisenberg et al., 2001).

Emotions expressed within parent-child interactions are critically important in children's development, particularly during the early years. According to attachment theory, children's emotions signal to caregivers the child's need for comfort and care. The parent's responsiveness to the child's signals is seen as key in the organization of child attachment (Bowlby,

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1969/1982), which, in turn, predicts future developmental trajectories (Berlin, Cassidy, & Appleyard, 2008; Thompson, 2006). Specific emotions serve specialized communicative functions, particularly critical during infancy (Izard, 1971). Children use parents' emotions to "disambiguate" experience and regulate their own behavior through social referencing (Feinman, 1992). Parent-child interactions may also provide opportunities for parents to socialize children's emotional responses (for a review see Malatesta, Culver, Tesman, & Shepard, 1989). Parents' emotional reactions to children's emotions have important consequences for social and emotional development, including children's psychophysiological regulation, coping, emotional understanding, and friendship quality (Eisenberg et al., 1998; McElwain, Halberstadt, & Volling, 2007). Nevertheless, there are few observational descriptive studies of parents' and children's emotion expression in naturalistic family ecology over the first years of life.

The majority of the research on emotion in parent-child interactions has focused on the mother-child dyad, despite explicit calls for studies of the entire family system (Parke & McDowell, 1998). The few studies that have examined emotions expressed in father-child interactions find both similarities and differences across parents (Bridges & Connell, 1991; Kotelchuck, 1976; Lamb, 1977a, 1977b; McElwain et al., 2007). To interpret those differences, researchers have suggested that mothers assume primary responsibility for the routine care and nurturance of the child, whereas the father assumes a primarily affiliative, playmate role (Bridges et al., 1988; Lamb, 1977a, 1997; Parke & Buriel, 2006). However, the extent to which these differences between mother-child and father-child relationships continue or change as the child develops, and mutual influences among emotions in the mother-child and father-child relationships remain largely unexamined.

Indeed, families encompass interconnected subsystems. Developmental research grounded in the ecological theory (Belsky, 1984; Bronfenbrenner, 1979) and clinical research based on family systems (Bowen, 1978; Minuchin, 1985) has robustly demonstrated that processes in one dyadic relationship in the family system influence other family dyads. For example, the birth of an infant influences the marital relationship; the marital relationship influences parent-child interactions (see Erel & Burman, 1995; Johns & Belsky, 2007; Belsky & Jafee, 2006 for reviews); and behavior in parent-child dyads within the same family is significantly interdependent (e.g., Barnett, Deng, Mills-Koonce, Willoughby, & Cox, 2008).

Research into the nature of interdependence within the family system has generally found similarity among family members. For example, children who express greater distress during interactions with mothers are more likely to express greater distress with fathers (Bridges & Connell, 1991). Mothers' and fathers' parenting styles are moderately correlated within families (Barnett et al., 2008; Feinberg, Reiss, Neiderhiser, & Hetherington, 2005).

A lot of family research has focused on marital discord and its impact on other family relationships (see Erel & Burman, 1995, for a meta-analysis; Feinberg et al., 2005). Cumulatively, that research has consistently indicated that the inter-parental relationship has important consequences for children's socio-emotional development, including attachment and emotional security (Cummings & Davies, 2002), adjustment and behavior problems, coping styles, social competence with peers, and academic functioning (Grych & Fincham, 1990; Hetherington & Stanley-Hagan, 1999). Typically, the influence of the marital relationship on the child is thought to be mediated through its impact on the parent-child relationship (Belsky, 1981). Indeed, this hypothesis has garnered some support (Amato & Sobolewski, 2001; Gerard, Krishnakumar, & Buehler, 2006; Gonzales, Pitts, Hill, & Roosa, 2000). Generally, marital harmony and discord are associated with positive and negative processes in the parent-child relationship, respectively, although opposite effects have been

also reported (Belsky, Youngblade, Rovine & Volling, 1991; Brody, Pellegrini, & Sigel, 1986).

There are multiple ways to interpret the mutual emotional influences within the family system. For example, influences between the parent-child relationship and the marital relationship have generally been interpreted as emotional spillover (see Erel & Burman, 1995). *The spillover hypothesis* states that negative or positive mood and affect expressed in the context of one relationship can easily transfer into another (Repetti, 1987). For example, distress in the marital relationship may lead to a negative affective ambience in the parent-child relationship. Similarly, emotional spillover may explain the emotional similarity in parent-child interactions in the same family. For example, anger expressed in the mother-child dyad may lead the child to express greater anger with the father.

Multiple mechanisms have been proposed to explain emotional spillover from the marital relationship to the parent-child relationship. A social learning explanation assumes that the child observes parents' affective behavior with each other and reenacts it in interactions with the parent (Easterbrooks & Emde, 1988). Likewise, affect expressions children observe in interaction with one parent they enact in interactions with other parent (for a review, see Malatesta et al., 1989). The Family Systems theory has proposed that maritally dissatisfied parents focus on the child's faults as a distraction to reduce marital tensions (Minuchin, Rosman, & Baker, 1978). Finally, parents experiencing marital discord may utilize less favorable parenting techniques leading to less optimal affective socialization (Easterbrooks & Emde, 1988). While the explanation suggested by social learning theory suggests that the specific emotions expressed in parents' and children's interactions should be more similar across relationships (e.g., anger should produce anger), the other two seem to imply that what spills over is a more general negative (or positive) affective ambience.

A model alternative to the spillover hypothesis assumes that parents' personality can underlie the quality of *both* the marital and the parent-child relationship (Belsky, 1984; Belsky & Jafee, 2006, for a review, Caspi & Elder, 1988). In particular, the parent's neuroticism and related traits, such as depression, have been associated with both poor marital functioning (Karney & Bradbury, 1995) and dysfunctional parenting (Belsky & Jafee, 2006). To our knowledge, only one study has tested this alternative hypothesis (Cox, Owen, Lewis, & Henderson, 1989).

Despite the richness of previous research on mutual emotional influences across family relationships, several basic issues remain to be addressed. First, although researchers often describe the importance of the specific emotional experiences within families, few studies have actually explicitly and robustly measured *specific emotions* of both the parent and the child in the context of their relationship. Typically, the examined constructs included emotion-related aspects of parenting, such as warmth or hostility, but not the flow of the parent's and the child's "pure" emotion expressions (for exception, see Radke-Yarrow, Nottelmann, Belmont, & Darby Welsh, 1993). Moreover, even when parent-child affect was the focus, most studies that have examined the association between marital quality and parent-child affect have employed self-reports of affect (e.g., Fauchier & Margolin, 2004), examined only parents' affect expression with their child without considering the child's affect (e.g., Crockenberg & Langrock, 2001), or examined broadly defined affects such as "distress" (e.g., Bridges & Connell, 1991).

Second, few investigators have observed the parent-child relationship in lengthy, diverse naturalistic contexts. Such observations allow a window into varied aspects of families' daily lives, such as play, chores, free time, routines, meals, and thus provide richly textured measures of the relationship.

Third, few studies of emotions within families have utilized longitudinal designs to examine emotions over time and links between marital quality and early parent-child relationships.

Because of the enduring quality of marital and parent-child relationships and the possibility of long-term developmental effects stemming from early experiences, this is a significant gap. Individual and relational stability and change raise questions about how the links between marital quality and parent-child interactions may likewise change over time. The few longitudinal studies that have examined mutual influences among family relationships suggest that they continue over time (Belsky et al., 1991; Easterbrooks & Emde, 1988; Gerard et al., 2006). Unfortunately, these studies only examined parent-child interactions at one or two time points, severely limiting developmental inferences. Such studies can test whether change in variables occurs, but they cannot estimate the rate of change over time and whether change accelerates or decelerates during specific developmental periods (i.e., quadratic slopes; Laurenceau, Hayes, & Feldman, 2007).

Fourth, many studies of the flow of emotion in families have failed to control for a more proximal influence on parents' and children's emotions during interactions: the affect of the interaction partner. It is now widely accepted that parents and children influence each other during their interactions. The flow of affect within and across family dyads should be examined while taking into account the effects that interaction partners have on one another.

Fifth, only recently have researchers begun to use advanced statistical approaches to model trajectories of change (DeLucia & Pitts, 2006). Also only recently have they begun to explicitly account for interdependence of data provided by family members (Kenny, Kashy, & Cook, 2006).

The present research sought to address those gaps. First, we focused specifically on the mother's, the father's, and the child's *affection, joy, and anger* expressed during parent-child interactions to examine both the normative developmental trajectories of emotions expressed within these dyads, as well as the mutual influences between dyads.

We examined affection expressed within parent-child dyads because of its role in the formation of the parent-child bond (Bowlby, 1969/1982; Sroufe, 1996), and its prominence in the construct of parental warmth. We selected joy and anger because many researchers have also argued those "hot" emotions are particularly important because of their salience in the family affective fabric (Berscheid & Ammazzalorso, 2004). Additionally, affection, joy, and anger are all key emotions in both the marital and parent-child relationships. Greater negative affectivity and lower positive affectivity characterize distressed marriages (see Gottman, & Notarius, 2002, for a review), as well as dysfunctional parent-child relationships (Rogosch, Cicchetti, & Toth, 2004; Schulz, Waldinger, Hauser, Allen, 2005).

Second, we observed parent-child interactions across multiple diverse and lengthy naturalistic contexts in home and laboratory. The instructions for each context were scripted to provide comparability across families, but each parent-child dyad was free to behave in their own unique way to assure rich across-dyad variability.

Third, we utilized a longitudinal research design to examine the parent-child relationship as it evolved from infancy to early school age. We used robust measures of parents' and children's emotions collected at six time points to examine trajectories of normative developmental change in affection, joy and anger expressed by children, mothers and fathers during parent-child interactions. We were also able to examine mutual influences of interaction partners on one another within dyads over time, as well as associations between the marital relationship and emotional expression.

Fourth, we examined the mutual influence of parents' and children's emotions on one another within the context of the other parents' interactions with the child, as well as the marital

relationship. We also tested whether controlling for the parent's neuroticism eliminated the associations among the inter-parental relationship and the parent-child relationship.

And fifth, we used growth curve analyses to estimate trajectories of change, and Actor-Partner Interdependence Modeling to account for the interdependence of data provided by family members. In any study of family processes and children's outcomes, an extended developmental perspective is particularly critical. The parent-child relationship is substantially transformed over time in all domains as the child develops (Maccoby, 1984). Furthermore, the history of the relationship shapes future interactions (Thompson, 2006). Consequently, analyses of both normative developmental processes across relationships and processes unique to a given relationship are necessary. Toward that end, we adopted an approach that simultaneously examined both between- and within-relationship processes.

## Method

### Participants

A total of 102 two-parent families of normally developing infants volunteered for the study in response to ads in community venues and letters based on birth records. They were seen at Time 1 ( $N = 102$ , 51 girls), when children were 7 months ( $M = 7.21$ ,  $SD = 0.43$ ), at Time 2 ( $N = 101$ , 51 girls) at 15 months ( $M = 15.13$ ,  $SD = 0.42$ ), at Time 3 ( $N = 100$ , 50 girls) at 25 months ( $M = 25.24$ ,  $SD = 0.53$ ), at Time 4 ( $N = 100$ , 50 girls) at 38 months ( $M = 38.17$ ,  $SD = 1.05$ ), at Time 5 ( $N = 99$ , 49 girls) at 52 months ( $M = 52.52$ ,  $SD = 1.10$ ), and at Time 6 ( $N = 91$ , 45 girls) at 67 months ( $M = 66.76$ ,  $SD = 1.32$ ).

The families, mostly from small- to medium-size towns and cities and rural areas in the Midwest, represented a relatively broad range of education and income (percentages refer to mothers and fathers, respectively): high school (24%, 30%), an associate degree (15%, 18%), college (39%, 33%), and post-college education (21%, 20%). Annual family income ranged: under \$10,000 (2%), \$10,001–\$20,000 (6%), \$20,001–\$30,000 (9%), \$30,001–\$40,000 (8%), \$40,001–\$50,000 (17%), \$50,001–\$60,000 (9%), \$60,001–\$70,000 (15%), and over \$70,001 (34%). Most infants were first (42%) or second (35%) born. Mothers' and fathers' average ages were respectively 30.80 years,  $SD = 5.30$  and 32.23 years,  $SD = 6.03$ . In terms of race, 90% of mothers were White, 3% Hispanic, 2% African American, 1% Asian, 1% Pacific Islander, and 3% "other" non-White. Among fathers, 84% were White, 8% Hispanic, 3% African American, 3% Asian, and 2% "other." In 20% of families, one or both parents were non-White.

Emotions of the mother, the father, and the child with each parent were observed and coded at each assessment in lengthy, natural yet scripted interactive parent-child contexts. The coding followed several guidelines: (a) each data set coded by a separate team; (b) at least 15% of cases used for reliability; more for rare codes; (c) once reliable, coders "realigned" periodically to prevent observer drift; and (d) kappas used to indicate reliability. Coded data were then aggregated at multiple levels to increase robustness of measured constructs (Rushton, Brainerd, & Pressley, 1983).

### The Child's and Parents' Positive and Negative Emotions during Interactions

**Coded contexts**—At each assessment, the child was observed in interactive contexts, parallel for both parents, including meal preparation and meal times, routine care, free time, play, daily chores, parent "busy", discipline, etc. The cumulative observed times (across all contexts) were as follows (each for mother with child, father with child, child with each parent): At 7 months, 45 min (thus cumulatively, 180 min per family) at 15 months, 42 min (168 min), at 25 months, 47 min (188 min), at 38 months, 77 min (308 min), at 52 months, 65 min (260

min), and at 67 months, 60 min (240 min). Thus, over the course of the study, each parent was observed for a total of 336 min, and each child for 672 min.

**Coded emotions**—Three emotions were displayed with sufficient frequency and were coded for both the parent and the child. Affection and joy were coded in all contexts at all times. Anger was coded in a subset of the contexts at each time point, beginning at 15 months. Those scores were derived from another coding system that captured parent-child encounters in discipline contexts that revolved around prohibitions and requests, and where anger most frequently occurred.

**Coding**—Child and parent emotions were coded for each 30-sec segment of the interactions. For each segment, affection, joy, and anger were coded for presence and intensity. More than one of these discrete emotions could be coded in a segment, but each only once. The instances when each of these emotions was particularly intense or pervasive (longer than half a segment) were marked. Kappas were computed for each code. Kappas across all time points and many coding teams ranged from .54 to 1.0; consensus coding was occasionally used for rare codes.

**Data aggregation**—To create adjusted composite scores of both *parents' and children's affection and joy*, we adopted the following approach. First, we created (a) a tally of all instances of the discrete emotion (for affection and joy separately), and (b) a tally of all instances of that emotion when it had been marked as intense. Second, because there were some differences across families and parents in the number of 30-sec segments coded (e.g., when an interaction ran 30 seconds longer or shorter than intended), we divided the tallies of emotion by the total number of segments coded to place all families on a comparable scale. Third, we weighted the proportion representing instances of intense emotion by multiplying it by 2. Fourth, we summed these presence and intensity scores for each person's affection and joy scores, respectively. Finally, fifth, because the scores had been divided by total 30-sec segments in which each emotion was expressed, the resulting scores were very small; thus we transformed the scores by multiplying them by 20. Consequently, although intensity was weighted, this transformation increases the scale on which the composites are represented so that they are roughly equivalent to the number of times each emotion was expressed during 10 minutes of interaction (note that multiplying by 2 represents one minute, and then by 10 represents 10 minutes).

To create adjusted composite scores of *anger for parents*, we used all the instances when parental control behavior was charged with annoyance, anger, or irritation. We again implemented a weighting system. First, we created (a) a tally of all instances when the parent displayed a heavy-handed control strategy, for example, raised voice, gave stern commands, and (b) a tally of all instances when the parent physically and aversively controlled the child (spanked, slapped, took object away by force, held the child's hand down). Second, each tally was divided by the number of coded segments. Third, the proportion of segments where physical aversive control took place was multiplied by 2. Fourth, the values were summed. Finally, fifth, we transformed the scores by multiplying them by 20.

To create the scores of *anger for children*, we used a tally of all instances when the child displayed defiance toward the parent during a control encounter, divided by the number of segments, multiplied by 20. Those codes had not been designed to capture varying intensity, and thus could not be weighted. However, for defiance to be coded, the child had to show substantial and poorly regulated anger (stomped feet, yelled, hit, struggled against parent, showed temper tantrum). Thus, this score is likely a conservative estimate of the child's anger.

## Quality of the Marital Relationship

Each parent's perception of the quality of their marriage was measured when children were 15 months, 52 months, and at 67 months, with the 6-item Quality of Marriage Index (QMI; Norton, 1983) that assesses global satisfaction with one's marriage and spouse. Respondents rate their agreement with five statements such as "We have a good relationship" and "My relationship with my partner is very stable", from 1 = "very strong disagreement" to 7 = "very strong agreement." For item 6, respondents rate their overall levels of happiness in the relationship, from 1 = "very unhappy" to 10 = "perfectly happy". The QMI has excellent convergent and discriminant validity and reliability (Heyman, Sayers, & Bellack, 1994). All ratings are summed (range: 7 – 45), with higher scores indicating higher marital satisfaction. Cronbach's alphas were above .96 for mothers and for fathers across time.

## Parents' Neuroticism

At the entry to the study, mothers and fathers completed the 12-item neuroticism subscale, a general tendency to experience negative affects, of the NEO Five-Factor Inventory (NEO-FFI; Costa & McCrae, 1992). The NEO-FFI is a widely used 60-item self-report inventory that measures five basic personality traits. Cronbach's alphas were .85 for mothers and .84 for fathers.

## Results

### Overview of Data Analyses

Preliminary analyses first examined whether missing data were related to variables of interest, and then examined the means and correlations of parents' and children's affection, joy and anger, and parents' marital quality and neuroticism. The relevant discussion will be brief, because the main thrust was on the next set of analyses that relied on hierarchical linear modeling techniques to estimate growth curve models. Growth curve modeling (GCM, Raudenbush & Bryk, 2002), with the HLM 6 computer program (Raudenbush, Bryk, Cheong, & Congdon, 2004) was used to examine the trajectories of parents' and children's affection, joy, and anger during their interactions over time. GCM was also used to examine how parents' and children's emotions during their interactions were associated with one another and with parents' marital quality over time.

GCM with HLM 6 involves a two-stage process. In the first stage (Level 1), a trajectory of change for a longitudinal outcome variable is described by at least two parameters: an intercept (specified in the present study to represent the 7- month estimate of the outcome variable) and a slope (i.e., rate of change of the outcome variable over time). GCM provides tests of whether intercepts and slopes differ significantly from zero and whether there is adequate between-subjects variability in each parameter (Raudenbush & Bryk, 2002). To examine and control for within-subject associations with an outcome variable, additional longitudinal independent variables (i.e., variables measured at three or more points in time) may also be entered into the Level 1 equations.

The second stage of GCM (Level 2) allows for the examination of between-subject differences in trajectories of change in outcomes. For example, one can examine whether between-subjects differences in a variable of interest predict the trajectories of an outcome variable. The HLM 6 program estimates GCMs simultaneously. Therefore, effects of one variable are estimated controlling for effects of other variables in the model.

One of the advantages of this approach is that Level 1 analyses (i.e., analyses using data measured at multiple time points) utilize data provided by all individuals who participate during at least one time point. Therefore, when Level 1 data are missing at random, results can be

interpreted as if there are no missing data (Raudenbush & Bryk, 2002). Alternatively, when Level 2 data are missing, the HLM6 program drops those families from analyses. Level 2 variables in the present study included child gender, and mothers' and fathers' neuroticism. One mother and two fathers did not complete the neuroticism measure. Therefore, because our analyses described under Step 1 only used data collected at multiple waves over time, all 102 families are included in these analyses. Our Step 2 analyses, which use Level 2 data, include 99 families.

Additionally, all models were specified as Actor-Partner Interdependence Models (APIM; Kenny et al., 2006) for mixed independent variables to account for interdependence within families. In the simplest example of an APIM, there are two dyad members and two variables – a predictor and an outcome variable – for each member of the dyad. A person's own predictor may affect his or her own outcome, which is referred to as “an actor effect”. In addition, a person's own predictor may affect his or her partner's outcome, which is referred to as “a partner effect”. When the members of a dyad are distinguishable, as is the case in our sample of parents, there are at least two actor effects – one for mothers and one for fathers – and at least two partner effects – the effect of the mother's predictor on the father's outcome and the effect of the father's predictor on the mother's outcome. The APIM seeks to account for each of these potential sources of variance, as well as for colinearity between parent's predictors and outcomes. Consequently, dyads in the same family (e.g., the mother-child dyad and father-child dyad within each family) were included in the same models following Raudenbush, Brennan, and Barnett's (1995) recommended procedures.

**Step 1**—Our first step was to determine and describe the best-fitting baseline model for each longitudinal variable. To do this, we followed a stepwise sequence beginning with the simplest model and comparing this model to a more complex model (i.e., with more parameters). We used deviance statistics and the hypothesis testing function of HLM 6 to determine whether the added complexity was warranted.

Step 1 comprised three tasks. (a) We estimated the simplest model that only included intercepts for mothers and fathers. (b) We estimated models with mothers' and fathers' linear slopes added and examined the difference in fit. (c) We estimated a model with mothers' and fathers' quadratic slopes added and examined whether this produced a better-fitting model for the data. Quadratic slopes indicate systematic acceleration or deceleration in the rate of change over time. Depending on the magnitude and the direction of the linear and quadratic slopes, the quadratic effect may actually overtake the linear effect of time such that the pattern of change reverses direction and begins to look more concave (Singer & Willett, 2003). Thus, when quadratic effects were identified, we used an equation provided by Singer and Willett (2003) to estimate the point in time at which the longitudinal trajectory changed direction. Of note, this estimate is often between the assessed time points. We only report these estimates if the identified time point was during the course of the study (i.e., between 7 to 67 months). In all cases, quadratic slopes were estimated as fixed to allow the models to run.

Additionally, because mothers and fathers were estimated in the same models, it was necessary to conduct tests of the homogeneity of mothers' and fathers' Level-1 variance for each baseline model. Results were significant for all models except the model of children's affection,  $\chi^2(94) = 103.97, ns$ . This suggested that mothers' and fathers' variance components in all models except children's affection were significantly heterogeneous. Thus, we specified the mothers and fathers as having different central tendencies and variability for all models except children's affection.

Once we found the best baseline model (i.e., model including only intercepts and slopes), we examined the variance components of intercepts and linear slopes to determine whether there



was adequate variability in these parameters to warrant attempting to predict these parameters. In all cases, the variance components of parameters included in baseline models were significant  $\chi^2$ s (96) > 120.48,  $ps < .05$ .

**Step 2**—Our second step was to examine whether there were significant gender differences for parents and children and to examine the predictors of each individuals' emotions. Step 2 included five tasks that were completed in a stepwise sequential pattern. Significant effects were retained at each step.

(a) To examine whether mothers' intercepts and slopes were significantly different from those of fathers, we used the hypothesis-testing function of HLM 6. (b) To examine whether there were significant differences for boys compared to girls, we added child gender as a predictor of the intercepts and slopes. When there were significant child gender differences, we controlled for child gender in subsequent analyses. (c) To examine the reciprocal effects of parents' and children's affection, joy and anger, the actor effects and partner effects of the interaction partner's, affection, joy, and anger were added at Level 1. (d) To examine whether marital quality predicted emotions in each dyad, each parent's rating of marital quality was added to each model at Level 1. (e) To examine whether parents' neuroticism accounted for the associations between parents' and children's emotions, parents' neuroticism was added as a Level 2 predictor of significant associations found between parents' and children's emotions.

We also used the hypothesis-testing function of HLM 6 to compare the magnitudes of the significant predictors of each family member's affection, joy and anger. At each step, non-significant predictors were removed due to the complexity of the models. Also, to conserve space, we generally only report significant findings.

### Preliminary Analyses

We examined whether non-participation was related to any of the variables of interest. Non-participation at any time point was not significantly correlated with any of the variables measured at other time points ( $r$ s ranged from  $-.14$  to  $.18$ ,  $ns$ ).

Means and standard deviations for all variables of interest are in Table 1. Our GCM analyses summarize the mean differences in longitudinal variables. Therefore, we restrict our discussion here to the mean difference and correlation between mothers' and fathers' neuroticism that are not summarized in the GCM analyses. Paired-samples t-tests between mothers' and fathers' neuroticism revealed that mothers reported higher neuroticism than fathers',  $t(98) = 3.09$ ,  $p < .01$ . Mothers' and fathers' scores were uncorrelated,  $.01$ ,  $ns$ .

**Correlations among emotions at each time point**—Within-person correlations among each of the emotions at each time point ranged from non-significance to weak, with only three exceptions. These exceptions included the correlation between the mother's affection and joy at 25 months,  $.33$ ,  $p < .01$ , and the analogous correlation for children with fathers at 52 months,  $.32$ , and 67 months,  $.57$ ,  $ps < .01$ . This pattern of weak correlations suggests that our measures of affection, joy, and anger were generally quite distinct from one another, supporting our decision to analyze them separately.

**Across-time stability and change for each longitudinal variable**—Across-time inter-correlations for mothers' emotions with the child ranged from  $-.12$ ,  $ns$ , to  $.40$ ,  $p < .01$ , for affection,  $.30$  to  $.66$ ,  $ps < .01$ , for joy, and  $-.08$ ,  $ns$ , to  $.70$ ,  $p < .01$ , for anger. For fathers, those correlations ranged from  $.06$ ,  $ns$  to  $.57$ ,  $p < .01$ , for affection,  $.22$  to  $.65$ ,  $ps < .05$ , for joy, and  $.07$ ,  $ns$ , to  $.80$ ,  $p < .01$ , for anger. These correlations generally appeared to be comparatively weaker in magnitude at earlier time points and stronger at later time points. For example, mothers' affection at 7 months did not correlate significantly with mothers' affection at any

other time point, 15 months was weakly correlated with 38 months, 25 months correlated weakly with 38 and 52 months, and 38 through 67 months were moderately inter-correlated. This pattern of correlations for mothers' and fathers' emotions generally appeared to suggest that each emotion became more stable over time. For mothers' and fathers' joy and anger, there also appeared to be a tendency for assessments that were closer in time to one another (e.g., 52 and 67 months) to be more strongly correlated, compared to assessments that were separated by greater lengths of time (e.g., 25 and 67 months). This pattern is commonly observed in longitudinal research.

For children's emotions with mothers, the across-time correlations ranged from  $-.09$ , *ns*, to  $.25$ ,  $p < .05$ , for affection,  $-.06$ , *ns*, to  $.44$ ,  $p < .01$ , for joy, and  $.04$ , *ns*, to  $.58$ ,  $p < .01$ , for anger. For children's emotions with fathers, they ranged from  $-.10$ , *ns*, to  $.25$ ,  $p < .05$ , for affection,  $-.02$ , *ns*, to  $.51$ ,  $p < .01$ , for joy, and  $-.04$ , *ns*, to  $.60$ ,  $p < .01$ , for anger. Children's affection with mothers only demonstrated one significant across time correlation at 52 and 67 months. There did not appear to be discernible patterns of across-time correlations in children's affection with fathers or children's joy or anger with mothers. In contrast, children's joy and anger with fathers appeared, similar to parents' emotions, to become more stable over time. For example, children's joy with fathers at 7 months only correlated significantly with the 15-month assessment and this correlation was weak, whereas, the 38- through 67-month assessments inter-correlated in the moderate to strong range. Additionally, children's anger with mothers appeared more strongly correlated with assessments that occurred more closely in time compared to those that occurred across greater intervals.

Finally, across each of the three assessed time points, marital quality ratings correlated from  $.37$  to  $.53$  for mothers and from  $.25$  to  $.74$ ,  $ps < .05$ , for fathers. The weakest correlation for both parents was between their 15-month assessment and 52-month assessment. For fathers, the strongest correlation was between their 52-and 67-month assessment of marital quality, but for mothers, it was between their 15-and 67-month assessments.

In summary, parents' and children's emotions, and parents' marital quality generally demonstrated both stability and change across time. These results indicate that it was appropriate to analyze the interrelations among these variables over time using GCA.

**Correlations between parents**—The inter-correlations between mothers' and fathers' emotions ranged from  $-.08$ , *ns*, to  $.44$ ,  $p < .01$ , for affection,  $-.01$ , *ns*, to  $.41$ ,  $p < .01$ , for joy, and  $-.04$ , *ns*, to  $.51$ ,  $p < .01$ , for anger. For children's emotions with mothers compared to fathers the correlations ranged from  $-.10$ , *ns*, to  $.52$ ,  $p < .01$ , for affection,  $-.14$  to  $.42$ ,  $ps < .05$ , for joy, and  $-.01$ , *ns*, to  $.64$ ,  $p < .01$ , for anger. Inter-correlations for the mother's and the father's ratings of the quality of their marriage correlated from  $.19$ , *ns*, to  $.68$ ,  $p < .01$ . All significant correlations were positive and within-time point correlations (e.g., the correlation between mothers' anger and fathers' anger at 67 months) generally tended to be stronger than the across-time, across-parent correlations (e.g., mothers' anger at 52 months and fathers' anger at 67 months). For emotions, there did not appear to be any patterns with regard to the magnitude of correlations at earlier compared to later assessments. In contrast, for marital quality, the inter-correlations between mothers and fathers 15 month assessments with their spouses' 52- and 67-month assessments appeared to be weaker than those between 52-and 67-month assessments. Taken as a whole, these results generally demonstrate the interdependence within the family and support our use of APIM models.

### Step 1: Preliminary Baseline Models

**Parents' affection with children**—We found significant linear slopes for both mothers' and fathers' expression of affection with the child,  $b = -.16$ ,  $SE = .01$ , and  $b = -.07$ ,  $SE = .007$ ,  $ps < .001$ , respectively. Additionally, we found significant quadratic slopes for mothers,  $b = .$

002, SE = .0001, and fathers,  $b = .0005$ , SE = .0001,  $ps < .001$ . Based on these results, we estimated that the quadratic effect for mothers overtook the linear effect at approximately 40 months (note that in these analyses we refer to a time point that fell between our assessments). Taken together, these results suggest that on average, parents' expression of affection with the child declined from infancy to 40 months for mothers, and from infancy to 67 months for fathers. The rate of decline in parents' affection was steepest early in the child's life and decelerated over time. After 40 months, mothers' affection began increasing slightly to 67 months.

**Children's affection with parents**—The best fitting model for children's affection with parents only included the intercepts for mothers and fathers. Thus, neither a linear nor quadratic pattern of change over time adequately fit the data for children's affection with parents.

**Parents' joy with children**—We found significant linear slopes for both mothers' and fathers' expression joy with the child,  $b = -.17$ , SE = .02,  $b = -.11$ , SE = .02,  $ps < .001$ , respectively. There were also significant quadratic slopes for mothers,  $b = .002$ , SE = .0002, and fathers,  $b = .001$ , SE = .0001,  $ps < .001$ . Based on these results, we estimated that the quadratic effect for mothers and fathers overtook the linear effect at approximately 43 and 55 months respectively. These results suggest that on average, parents' joy with the child declined from infancy to 43 months for mothers and 55 months for fathers, with greater decline occurring early in the child's life and decelerating over time. After 43 and 55 months respectively, mothers' and fathers' joy increased slightly to 67 months.

**Children's joy with parents**—The model of children's joy with mothers and fathers included significant linear slopes,  $b = -.07$ , SE = .01, and  $b = -.04$ , SE = .01, respectively,  $ps < .05$ , and quadratic slopes,  $b = .0008$ , SE = .0002, and fathers  $b = .0005$ , SE = .0002, respectively,  $ps < .05$ . We estimated that the quadratic effect for children's joy with mothers and fathers overtook the linear effect at approximately 44 and 40 months respectively. Taken together this suggests that on average children's joy with parents' declined until 44 months with mothers, and 40 months with fathers with greater decline occurring early in the child's life. After 44 and 40 months respectively, children's joy with mothers and fathers increased slightly over time to 67 months.

**Parents' anger with children**—We found significant linear slopes,  $b = -.24$ , SE = .03, and  $b = -.18$ , SE = .04,  $ps < .01$ , and quadratic slopes,  $b = .002$ , SE = .0003,  $b = .001$ , SE = .0004,  $ps < .01$ . This indicates that mothers' and fathers' expression of anger declined from 15 months to 67 months. The decline was steepest early in the child's life and decelerated over time.

**Children's anger with parents**—On average, children's anger decreased linearly over time when they interacted with mothers,  $b = -.02$ , SE = .003, and with fathers,  $b = -.01$ , SE = .002,  $ps < .001$ .

### **Summary: Changes in Affection, Joy, and Anger in Parent-Child Dyads from Infancy to Early School Age**

Parents expressed most affection, joy, and anger early in the child's development, and less over time, with the decline being steepest early on. The rate of decline in mothers' affection and joy decelerated until approximately 3.5 years of age, at which time mothers' affection and joy began increasing slightly to 67 months. The rate of decline in fathers' joy with the child decelerated until approximately 4.6 years of age at which time fathers' joy with the child increased slightly to 67 months. Children expressed most anger with parents at 15 months, and joy with mothers and fathers at 7 months, and their anger and joy with both parents generally declined over time. Nevertheless, the rate of decline in joy was steepest early in the child's life

and decelerated until approximately 3.5 years of age, then children's joy increased slightly to 67 months. Children's affection with parents did not show a significant linear or quadratic pattern of change over the course of the study.

**Parents' rating of marital quality**—On average, both mothers and fathers experienced linear declines in marital quality over time,  $b = -.06$ ,  $SE = .02$ , and  $b = -.04$ ,  $SE = .02$ , respectively,  $ps < .001$ .

## Step 2: Gender Differences and Predictors of Parents' and Children's Emotions during Parent-Child Interactions Over Time

**Parents' affection with their children**—We found mothers' intercept, linear slope and quadratic slope were significantly higher than those for fathers,  $\chi^2(1) = 14.04$ ,  $\chi^2(1) = 61.19$ ,  $\chi^2(1) = 66.21$ , respectively,  $ps < .001$ . This suggests that early in development, mothers were more affectionate with their children than were fathers, but mothers' affection declined at a faster rate, compared to fathers', so that as children matured, the difference between mothers and fathers diminished. Children's gender did not predict the intercepts and slopes of parents' affection, suggesting there were no differences in the affection expressed toward girls and boys,  $ts(97) < 1.86$ , *ns*.

Mothers showed more affection toward children who were more affectionate, joyful and angry toward them,  $b = .69$ ,  $SE = .13$ ,  $b = .09$ ,  $SE = .02$ , and  $b = .04$ ,  $SE = .02$ , respectively,  $ps < .05$ . Additionally, mothers were more affectionate toward children who were affectionate with fathers,  $b = .35$ ,  $SE = .12$ ,  $ps < .001$ . There was only one significant finding for parents' neuroticism: In families where fathers' were higher in neuroticism, the association between children's joy and mothers' affection was weaker,  $b = -.005$ ,  $SE = .003$ ,  $p < .05$ . Additionally, the strongest predictor of the mother's affection was the child's affection with her,  $\chi^2(3) > 4.86$ , followed by the child's affection with the father,  $\chi^2(1) > 6.43$ , and by the child's joy with the mother,  $\chi^2(1) = 23.65$ ,  $ps < .05$ .

Fathers also showed more affection towards children who were affectionate, joyful, and angry toward them,  $b = 1.15$ ,  $SE = .19$ ,  $b = .04$ ,  $SE = .01$ , and  $b = .007$ ,  $SE = .02$ , respectively,  $ps < .05$ . Fathers who were happier in their marriages were more affectionate with children  $b = .007$ ,  $SE = .004$ ,  $p < .05$ . Comparisons of the strength of predictors of fathers' affection indicated that the strongest predictor was children's affection with fathers,  $\chi^2(1) > 32.98$ , followed by children's joy,  $\chi^2(1) > 6.95$ ,  $ps < .01$ . There were no significant differences between the magnitude of the effects of children's anger with fathers and fathers' marital quality,  $\chi^2(1) < .42$ , *ns*.

**Children's affection with parents**—The intercept of children's affection with mothers was significantly greater than that for fathers,  $\chi^2(1) = 8.38$ ,  $p < .01$ . This suggests that children were more affectionate with their mothers than with their fathers. Children's gender did not predict the intercepts for children's affection with either parent,  $ts(97) < .70$ , *ns*. This indicates that boys and girls did not differ in their level of expressed affection.

Children showed more affection toward mothers and fathers who were more affectionate with them,  $b = .20$ ,  $SE = .02$ , and  $b = .05$ ,  $SE = .02$ ,  $ps < .001$ , respectively. Parents' neuroticism did not significantly predict children's affection.

**Parent's joy with the child**—The intercept and linear slope for mothers were significantly higher than those for fathers,  $\chi^2(1) = 30.34$ ,  $\chi^2(1) = 4.73$ , respectively,  $ps < .05$ . This suggests that, compared to fathers, mothers were more joyful with their children, but mothers' level of joy declined at a faster rate. Consequently, parents' level of expressed joy became more similar over time. In contrast to parents' gender, children's gender yielded no significant differences

in the level of or rates of change in joy parents expressed toward boys and girls,  $t_s(96) < -1.80$ , *ns*.

Mothers showed more joy interacting with children who were more joyful toward them,  $b = .48$ ,  $SE = .04$ ,  $p < .001$ . Mothers in happier marriages were also more joyful with the child,  $b = .02$ ,  $SE = .009$ ,  $p < .05$ , however, children's joy was a stronger predictor than mothers' marital quality,  $\chi^2(1) = 14.11$ ,  $p < .001$ . Fathers also showed more joy toward children who were more joyful with them,  $b = .46$ ,  $SE = .12$ ,  $p < .001$ . Parents' neuroticism did not significantly predict mothers' joy with children.

**Children's joy with parents**—There were not significant differences in the intercepts or slopes for mothers compared to fathers,  $\chi^2_s(1) < 3.29$ , *ns*, suggesting that, on average, children were equally joyful with their mothers and fathers. Children's gender yielded no significant differences in the level of, or rates of change in, joy expressed by boys versus girls,  $t_s(96) < 1.69$ , *ns*.

Children were more joyful with mothers who were highly affectionate and joyful with them,  $b = .35$ ,  $SE = .12$ , and  $b = .25$ ,  $SE = .04$ , respectively,  $ps < .001$ . Likewise, children were more joyful with more affectionate and joyful fathers,  $b = .59$ ,  $SE = .13$ , and  $b = .49$ ,  $SE = .05$ , respectively,  $ps < .001$ . For either parent, his or her joy and affection were equally potent predictors of child joy,  $\chi^2_s(1) < .54$ , *ns*.

**Parents' anger with the child**—The intercept, linear slope, and quadratic slope for mothers were significantly higher than those for fathers,  $\chi^2(1) = 15.00$ ,  $\chi^2(1) = 16.08$ ,  $\chi^2(1) = 10.73$ , respectively,  $ps < .001$ . This suggests that, compared to fathers, mothers expressed more anger with their children at 15 months, but their amount of anger declined at a faster rate over time. Children's gender predicted the intercepts and slopes of mothers' anger with children,  $b = 1.60$ ,  $SE = .60$ , and  $b = -.03$ ,  $SE = .01$ , respectively, and fathers' anger with children,  $b = 1.44$ ,  $SE = .61$ , and  $b = -.03$ ,  $SE = .01$ , respectively,  $ps < .05$ . This suggests that parents expressed more anger toward boys than toward girls. However, this gender difference declined over time such that as children aged, the difference in anger expressed toward boys and girls declined.

Parents showed more anger toward children who themselves showed more anger when interacting with *either* parent: Children's greater anger with mothers predicted greater anger expressed by both mothers,  $b = .60$ ,  $SE = .07$ , and by fathers,  $b = .13$ ,  $SE = .04$ ,  $ps < .001$ . Similarly, children's greater anger with fathers predicted greater anger expressed by both fathers,  $b = .95$ ,  $SE = .07$ , and by mothers,  $b = .35$ ,  $SE = .07$ ,  $ps < .001$ . In families where fathers were higher in neuroticism, the association between the children's anger and mothers' anger was weaker,  $b = -.04$ ,  $SE = .02$ ,  $p < .01$ .

Additionally, the association between child anger and each parent's anger was significantly stronger within than across dyads,  $\chi^2(1) > 26.09$ ,  $ps < .001$ . For example, child anger with mothers was more strongly associated with mothers' anger with the child than it was with fathers' anger. These results indicate that the child's anger was more strongly associated with the parents' anger when the parent experienced the child's anger directly, during their own interactions with the child.

**Children's anger with parents**—The intercept for children's anger with their mothers was significantly higher than those for fathers,  $\chi^2(1) = 5.03$ ,  $p < .05$ . This suggests that children expressed more anger toward their mothers than toward fathers. We also found significant gender differences for children. Child gender predicted children's anger intercepts with mothers,  $b = .81$ ,  $SE = .29$ , and fathers,  $b = .41$ ,  $SE = .18$ , and the rate of linear change in children's anger with mothers,  $b = -.02$ ,  $SE = .01$ ,  $ps < .05$ . These results suggest that boys

expressed more anger to their parents than did girls; however, the difference between boys' and girls' expression of anger with mothers declined over time.

The actor effect of each parent's anger with the child was the only significant predictor of the child's anger with that parent. Specifically, mothers' greater anger with the child predicted the child's greater anger with her,  $b = .18$ ,  $SE = .03$ , and fathers' greater anger with the child predicted the child's greater anger with him,  $b = .13$ ,  $SE = .04$ ,  $ps < .001$ . Parents' neuroticism did not significantly predict children's anger with parents.

### **Summary: Gender Differences and Predictors of Affection, Joy, and Anger in Parent-Child Dyad**

Mothers were more affectionate, joyful, and angry than fathers, but the difference diminished over time. Children showed more affection toward mothers than fathers throughout all assessments. Children showed equal amounts of joy with both parents. Children were angrier with mothers compared to fathers, but this difference also decreased with time. Compared to girls, boys received and expressed more anger, but both differences declined over time.

Emotions expressed within and across family relationships predicted parents' expression of affection. For example, within relationships, parents responded with greater affection to the child's expression of *either* anger or positive emotions of affection and joy during their own interactions. Across relationships, mothers were more affectionate with children who were more affectionate with fathers, and fathers' who were happier in their marriages were more affectionate with children. Although in two cases fathers' greater neuroticism predicted weaker associations with the interaction partner's emotions, (i.e., predicting a weaker association of children's joy with mothers on mothers' affection, and children's anger with mothers on mothers' anger), in no case did controlling for parents' neuroticism reduce these associations to non-significance. This suggests that parents' neuroticism does not account for the associations between emotions experienced within and across relationships.

Similarly, although the actor effects were the strongest, children's anger within and across relationships predicted parental anger. Parents were angrier with children who were angrier with them or with the other parent. In contrast, children were angrier only towards parents who were angrier toward them.

For joy, the effects were generally within the same relationship, however. Specifically, parents and children were more joyful with the interaction partners who were more joyful with them. Children were more joyful with parents who were also more affectionate with them. The only exception to this pattern was for mothers' joy with children. Mothers' greater joy with their children was associated with mothers' ratings of better marital quality.

## **Discussion**

### **Contributions of the Study**

This research embraces and implements, in concrete methodological terms, the agenda long argued by proponents of the ecological approach. Researchers have long stressed the importance of expanding examinations of children's early experience beyond the infant-mother relationship to include the infant-father and mother-father relationships (Belsky, 1981; Cox, Paley, & Harter, 2001; Parke & Buriel, 2006). Nevertheless, this standard continues to be rarely implemented. Empirical data on fathers' affective dimension of parenting are notoriously thin (Kopp & Neufeld, 2003), despite the growing recognition of father-child emotional interactions as contributors to children's developing affective and peer competence (Isley, O'Neil, Clatfelter, & Parke, 1999). Rarer still is the implementation of an ecological approach using rich observational data, sampling rich and diverse family life contexts, repeatedly over

extended developmental time. Thus, this research provides a detailed examination of the affective environments in families with young children from infancy to early school age focusing on the emotions of affection, joy, and anger.

### **Affection, Joy, and Anger in Mother-Child and Father-Child Relationship from Infancy to Early School Age**

Parents were most expressive when children were very young, and their joy and affection with children generally declined over time. Similarly, children's joy with parents generally declined over time. These findings dovetail with research on attachment, infant-directed speech, and other bodies of developmental research. Early on, parents assume highly positive, even exaggerated, responsive, and comforting tone when interacting with infants and responding to infants' negative and positive emotional signals. They wish to protect and nurture infants who are naturally vulnerable and dependent, and because they wish to support infants' emerging positive social overtures. As children's emotion regulation and other skills unfold, and parents' tasks shift from an exclusive focus on protection and nurturance to control and discipline (Bornstein, 2002; Kopp & Neufeld, 2003), parents' emotional expression naturally reflects that transition. Furthermore, consistent with the nature of development in general, expressed in its many aspects, from motor control to language to social-emotional development, we found that the rate of change in the child's joy with mothers and fathers was fastest during the early period, in infancy, and decelerated as the child aged.

Parents and children were also most angry at 15 months (the first assessment for this emotion) and their expression of anger declined with development. These results may reflect the fact that emotion expression is particularly adaptive in early development with preverbal children. Indeed, these findings are consistent with research suggesting that emotions, particularly "hot" emotions, serve multiple important communicative functions (see Keltner & Haidt, 1999 for a review). For example, anger can emphasize the immediate importance of parental command when the child is about to engage in a dangerous behavior, a likely event at toddler age. The developmental decline in children's anger likely reflects the growth in children's emotion regulation strategies, and the decline in parents' anger -- their appropriate adaptation to children's growing maturity.

The pattern of decline in mothers' affection and joy, and children's joy with both parents, reached a plateau around 3.5 years of age. After this time, mothers' affection and joy, and children's joy with both parents, increased slightly over the remaining assessments. The pattern of decline in fathers' joy with the child reached a plateau at about 4.5 years after which fathers' joy increased slightly over the remaining time assessed. These findings may reflect the child's emergence from the difficult developmental period commonly referred to as the "terrible twos" in which oppositional and challenging behaviors are commonly observed.

We found that mother-child relationships were generally more affectively charged than those for fathers, with both partners expressing more emotions. The only exception was children's joy -- children were equally joyful with mothers and fathers. Nevertheless, the differences in mothers' and fathers' expressiveness, and the differences between children's expression of anger with each parent declined with age, so that mother-child and father-child dyads looked increasingly similar in their levels of joy, and anger as they progressed through toddler and preschool years. These findings both dovetail and contrast, to some extent, with a body of literature that suggests that fathers and children engage in high-intensity positive emotional exchanges more than mothers and children (Lamb, 1997; Parke & Buriel, 1998). In our data, mothers expressed more joy toward their children, but children were equally joyful with both parents.

Despite the absence of mean differences, there were interesting differences in children's reciprocity of joy with mothers versus with fathers, consistent with extant research. Although mothers were more joyful and affectionate with children, children appeared to respond more joyfully to their fathers' expression of positive affect. Thus, in post-hoc analyses we examined whether this was, in fact, the case. We constrained the effects of mothers' and fathers' joy and affection as predictors of child joy to be equal. We found that the fathers' affection and joy were indeed more strongly associated with children's joy compared to mothers' affection and joy,  $\chi^2(1) > 5.77, p < .01$ . These findings demonstrate a strong reciprocity in positive affect in father-child dyads. This is consistent with the view that children and fathers eagerly enter the roles of playmates.

Boys expressed more anger with parents' compared to girls, and parents of boys expressed more anger with their child compared to parents of girls. These findings contrast with studies suggesting that parents may be more permissive in response to boys' anger (Malatesta & Haviland, 1982). Nevertheless, the differences for boys versus girls declined as the child aged.

Additionally, we found reciprocal influences for affection, joy, and anger within relationships. That is, the expression of these emotions by one interaction partner increased the expression of the same emotion in the interaction partner. This may reflect the parent's modeling and the child's learning of emotional responses to environmental stimuli (for a review see Malatesta et al., 1989). Alternatively, consistent with some researchers' definition of intimacy as the emotional influence that two people have on one another (see Bersheid & Ammazalorso, 2004), these reciprocal influences likely indicate a high level of intimacy and connectedness in parent-child dyads.

Finally, although parents and children both responded to one another's affection with increased affection, parents' were more affectionate with children who expressed any emotion, including joy or anger. We suggest that these findings indicate the multiple functions served by parental affection. For example, parental affection in response to children's distress functions to comfort and support the child (Bowlby, 1969/1982). Alternatively, parental affection in response to the child's joy may serve to promote the child's pro-social behavior (Eisenberg et al., 1998).

### **Affective Environment in Interlocking Family Relationships: Evidence that Emotions Experienced in One Relationship are Associated with Emotions Experienced in Other Family Relationships**

Reflecting Belsky's and Bronfenbrenner's ecological framework (Belsky, 1981; Bronfenbrenner, 1979), we found multiple cross-relationship influences. Specifically, parents' anger (but not children's anger) was predicted by both the within-dyad (actor) as well as across-dyad (partner) effects of the child's anger. Additionally, children's affection with fathers predicted mothers' affection with the child. These findings suggest that emotions in one dyad are functionally strongly linked with emotions in the other dyad, reflecting the interconnectedness and interdependence among family relationships (see Bersheid & Ammazalorso, 2004), again linked to the shared intimacy within the family system.

The emotion of joy was one exception to those cross-relationship findings. Parents' and children's joy was only predicted by their experiences within the dyad. Perhaps each parent-child dyad develops idiosyncratic, mutually amusing scripts and routines, and unique shared "good times". Future research should examine this possibility.

Our study also extended previous research findings that the quality of the marital relationship influences the functioning of parent-child relationships (see Erel & Burman, 1995; Johns & Belsky, 2007; Belsky & Jafee, 2006 for reviews). Good marriages were associated with positive emotions expressed in parent-child dyads. Specifically, fathers' marital satisfaction predicted



their own greater affection, and mothers' marital satisfaction predicted their own greater joy. One interpretation of those findings is that high marital quality protects against parental disengagement. This interpretation is consistent with the emotion spillover hypothesis (Repetti, 1987) that has been supported in the research literature (Erel & Burman, 1995). Parents' enduring positive or negative subjective state may carry over from the marital relationship to bias the parents' interactions with the child.

An alternative, and hotly debated, explanation for the links between the quality of parents' marital relationship and the emotions they express with their child claims that individuals with certain personality traits – particularly neuroticism -- express similar emotions across contexts (see Belsky & Jafee, 2006, for a review). Many controversies hinge on questions such as whether the health of the family system is more influenced by relationships or by biological traits of individuals. We were, however, able to rule out parents' neuroticism as an explanatory factor for these findings

### Limitations

Although the results are relatively robust and consistent, several limitations must be noted. First, although our repeated measures design increased the power of our analyses, the sample size of 102 families is modest. Second, in this community sample, the parents were generally quite satisfied with their marriages. Third, although diverse in terms of education and income, and ethnically representative of the Midwest, the samples had a limited number of minority families. Future research should replicate the reported findings in larger samples, more distressed marriages, and with higher-risk and more ethnically diverse populations. In particular, both beneficial and adverse effects of marital quality may be substantially amplified in the presence of stresses that impinge on the family. Consequently, studying families that cope with poverty, neighborhood violence, unemployment, illnesses, and other stresses is a worthwhile research direction.

Fourth, we did not study the flow of emotions in triadic contexts, with all family members interacting with each other. Such triadic interactions would almost certainly yield multiple new insights to the study of family affective environment, as has been often reiterated by family systems clinicians and developmental scholars (Belsky, 1981; Belsky, Putnam, & Crnic, 1996; Bowen, 1978; Feinberg, 2002).

Finally, in contrast to our robust behavioral data on parent-child emotions, our assessment of marital quality consisted of a brief self-report measure repeated at three time points. Although that measure is widely used and broadly established, behavioral measures of marital quality would enhance future research.

### Strengths

The explicit focus on the flow of three discrete emotions between parents and children displayed in observed repeated lengthy interactive contexts is a strength of the study. "Hot" emotions such as joy and anger are thought by many researchers to be particularly important, because they are more likely to be noticed and remembered (see Bersheid & Ammazalorso, 2004). Parents' and children's emotions expressed during daily interactions, and related processes such as emotional communication, affect sharing, social referencing, and dyadic affective regulation, have been long implicated as critical in children's development of emotional competence, security, and psychopathology (Denham, 1998; Dunn, 2003; Feng, Shaw, Skuben, & Laing., 2007; Saarni, Campos, Camras, & Witherington, 2006; Morris, Silk, Steinberg, Myers, & Robinson, 2007; Radke-Yarrow et al., 1993; Sroufe, 1996). However, observational studies of families' affective environment, particularly spanning several years, including both parents, and sampling contexts large enough to assess sufficient amount of

expressed emotion are very scarce. Furthermore, typically, the studied emotions include mostly affectively “tinged” positive or negative mood, by far the most commonly expressed by participants in studies. Our research, however, focused exclusively on much more rare, but presumably more psychologically significant, “full-blown” expressed emotions of affection, joy, and anger.

A longitudinal approach to the exploration of the emotional environment in families of young children that allows for framing the findings within a developmental perspective is another strength of this study. This is particularly important given massive developmental changes in children’s emotional competencies and massive transformations in the parent-child relationship between infancy and early school years. Furthermore, we examine dyadic emotional processes within the context of other family relationships, including the parents’ marital relationship, and the emotions experienced during the child’s interactions with the other parent. To our knowledge, this is the first study to examine discrete emotions in the family system from an explicitly developmental perspective, particularly spanning the critical first six years of life. This approach allows us to better draw inferences heretofore not feasible regarding the mutual influences on emotional processes within family relationships.

Family relationships -- the critical developmental contexts -- are infused with emotions. Rigorous research on parents’ and children’s emotions in natural family ecologies can enhance our understanding of adaptive and maladaptive trajectories of development.

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**Table 1**  
Means and Standard Deviations of Affection, Joy, and Anger in Parent-Child Dyads, Marital Quality, and Parents' Neuroticism

Emotion	Mother-Child				Father-Child			
	Mother to Child		Child to Mother		Father to Child		Child to Father	
	M	SD	M	SD	M	SD	M	SD
<i>Affection</i>								
At 7 Months	3.62	1.54	.04	.16	3.21	1.70	.01	.07
At 15 Months	1.05	.78	.17	.33	1.06	1.07	.15	.28
At 25 Months	.71	.76	.28	.43	.89	1.03	.22	.43
At 38 Months	.75	.70	.16	.34	.61	.61	.12	.23
At 52 Months	.49	.58	.12	.28	.53	.70	.11	.20
At 67 Months	.51	.61	.16	.20	.23	.35	.03	.08
<i>Joy</i>								
At 7 Months	5.55	3.23	3.35	2.39	3.61	3.02	2.56	2.03
At 15 Months	4.52	2.37	1.67	1.39	3.55	2.56	1.72	2.07
At 25 Months	2.71	2.10	1.70	1.55	1.88	1.44	1.76	1.68
At 38 Months	3.08	1.85	2.21	1.40	2.16	1.60	2.21	1.85
At 52 Months	2.07	1.61	1.73	1.70	1.56	1.34	1.79	1.62
At 67 Months	2.53	2.00	1.81	1.49	1.95	1.66	2.21	2.27
<i>Anger</i>								
At 15 Months	5.83	5.30	1.35	1.98	3.93	4.15	.78	1.11
At 25 Months	2.17	3.30	.65	1.41	1.95	2.91	.61	1.31
At 38 Months	1.18	2.33	.70	1.35	1.37	3.02	.64	1.20
At 52 Months	.48	1.57	.34	.73	.55	2.31	.29	1.11
At 67 Months	.22	1.29	.18	.74	.14	.64	.16	.74
<i>Variable</i>								
	Mother				Father			
	M	SD	M	SD	M	SD	M	SD
<i>Marital Quality</i>								
At 15 Months	39.16	6.64			39.00	7.32		
At 52 Months	35.90	9.46			37.79	7.73		
At 67 Months	36.99	7.63			36.84	7.79		

Emotion	Mother-Child		Father-Child	
	Mother to Child	Child to Mother	Father to Child	Child to Father
	M	SD	M	SD
Neuroticism	18.47	7.44	15.23	7.19

*Note.* To create parents' and children's joy and affection and parents' anger scores we first (a) tallied all instances of the discrete emotion, and (b) tallied all intense instances of that emotion. Second, we divided tallies by the total number of segments coded. Third, the proportion representing intense emotion was weighted by multiplying it by 2. Fourth, presence and intensity scores of each emotion were summed for each person. Fifth, we transformed the scale of scores by multiplying them by 20. In contrast, children's anger codes had not been designed to capture varying intensity, and thus could not be weighted. Thus, these scores were tallies of all instances when the child displayed defiance toward the parent during a control encounter, divided by the total number of segments coded, multiplied by 20.