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Children's Expressions of Positive Emotion are Sustained by Smiling, Touching, and Playing with Parents and Siblings: A Naturalistic Observational Study of Family Life

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Abstract

Research on family socialization of positive emotion has primarily focused on the infant and toddler stages of development, and relied on observations of parent-child interactions in highly structured laboratory environments. Little is known about how children's spontaneous expressions of positive emotion are maintained in the uncontrolled settings of daily life, particularly within the family and during the school-age years. This naturalistic observational study examines three family behaviors - mutual display of positive emotion, touch and joint leisure – that surround 8 to 12 year-old children's spontaneous expressions of positive emotion, and tests whether these behaviors help to sustain children's expressions. Recordings taken of 31 families in their homes and communities over two days were screened for moments when children spontaneously expressed positive emotion in the presence of at least one parent. Children were more likely to sustain their expressions of positive emotion when mothers, fathers or siblings showed positive emotion, touched, or participated in a leisure activity. There were few differences in the ways that mothers and fathers socialized their sons' and daughters' positive emotion expressions. This study takes a unique, ecologically valid approach to assess how family members connect to children's expressions of positive emotion in middle childhood. Future observational studies should continue to explore mechanisms of family socialization of positive emotion, in laboratory and naturalistic settings.

Keywords

positive emotion; naturalistic research methods; parent-child interaction; emotion socialization; touch

A proclivity to express and sustain positive emotion confers an enormous advantage in life. Happiness, pride, joy and other positive emotions signal and promote action, social connectedness, motivation, and cognitive flexibility (Fredrickson, 2001). Positive emotion is associated with more pro-sociality and empathy toward peers, fewer externalizing problems, and resilience in the face of adversity (Isley, O'Neil, Clatfelter, & Parke, 1999);

Lunkenheimer, Olson, Hollenstein, Sameroff, & Winter, 2011; Schultz, Ambike, Buckingham-Howes, & Cheah, 2008; Wachs, 2006). It is important to understand how families foster the experience and expression of this class of emotions in childhood. One way that they may do this is by facilitating brief extensions of positive emotion states.

Family members socialize children to regulate their emotions by direct modeling and through their responses to child displays of emotions (Denham, Basset & Wyatt, 2014). Emotion regulation refers to altering the trajectory of an emotion, by decreasing or increasing its magnitude or duration (Gross, 2015). For example, a parent might help shorten a child's expression of anger by ignoring it. Among adults, capitalization, defined as communicating and sharing about pleasant event with others, has been identified as one interactive strategy that can prolong or increase positive mood (Ramsey & Gentzler, 2015; Monfort et al., 2014). Given the benefits of positive emotion for development and health, including its role in promoting social connectedness (Fredrickson, 2001), it is important to understand how family members act to increase or maintain positive emotion in children. However, in comparison to negative emotion regulation, current understanding of family influences on the regulation of positive emotion in school-age children is limited. Most existing studies are restricted to either infant or adult samples, and focus on positive mood or traits rather than emotions (Ramsey & Gentzler, 2015). The current study examines how naturally occurring family behaviors may contribute to one important aspect of emotion regulation: brief sustainment of displays of positive emotion.

The research literature that investigates how families may influence the development of positive emotion makes use of parent report data (e.g., Halberstadt & Eaton, 2002; Katz et al., 2014) and observations of parent-child dyads during structured and semi-structured interactions. For example, a parent and child may be instructed to prepare a meal for 45 minutes (Barry & Kochanska, 2010); or to plan a positive event together for 20 minutes (Yap, Allen, Leve, & Katz, 2008). These laboratory and semi-naturalistic contexts provide standardization and consistency across participants, but the situations that are studied represent only a thin sliver of the full range of daily family experiences. The naturalistic observational study described here supplements the existing research literature with an investigation of the behaviors of mothers, fathers, and siblings that surround and sustain school-age children's *spontaneous* expressions of positive emotion during the course of daily life. These unique data were collected as part of a larger effort by the UCLA Center on Everyday Lives of Families (CELFL), which recorded the daily lives of 32 families on four days, yielding over 50 hours of video footage per family (Ochs & Kremer-Sadlik, 2013).

Family Influences on School-Age Children's Expressive Displays

Research on family socialization of positive emotion has focused primarily on the infant and toddler stages of development. Middle childhood is marked by an increase in autonomy from parents with shifts in parent-child relations and significant gains in understanding of emotions (Wray-Lake, Crouter, & McHale, 2010). Children spend less time with parents and, when they are together, displays of parental warmth and physical affection are less overt (Collins, Madsen, & Susman-Stillman, 2002; Larson, 1997; Shanahan, McHale, Crouter, & Wayne, 2007). By the school years, children have internalized much of the warm

and sensitive care that their parents have provided since infancy, along with early and direct efforts at emotion socialization (Klimes-Dougan & Zeman, 2007). The family remains an important context for emotional development (Denham, Bassett, & Wyatt, 2014; Michalik et al., 2007), but more sophisticated emotion understanding at later ages is complemented by more subtle parent socializing behaviors. The propensity to express positive emotion also fluctuates with development (Sallquist et al., 2010). For example, the frequency of children's positive emotion expressions during structured interaction tasks increased linearly from infancy to age 9 (Olino, et al., 2011). In contrast, another study found that maternal expressions decreased from infancy to preschool age (Sallquist et al., 2010). This study contributes to an emotion socialization literature that is focused primarily on the early stages of development by examining family influences on the expression and sustainment of positive emotion in a sample of children between the ages of 8 and 12.

Developmentalists have described a number of parenting constructs, such as positive emotion expressivity (Halberstadt & Eaton, 2002; Sallquist et al., 2010), responsiveness (Davidov & Grusec, 2006), and warmth (Zhou et al., 2002), that are associated with children's displays of positive emotion. More parent-child emotional reciprocation, shared positive emotion, and co-responsiveness predict more pro-social behavior and fewer externalizing problems (Deater-Deckard & Petrill, 2004; Lunkenheimer et al., 2011). In contrast, less accepting and more minimizing or disapproving responses to adolescent displays of positive emotions are linked to higher levels of depressive symptoms (Katz et al., 2014; Yap et al., 2008).

Naturalistic observational approach

Complex parenting constructs like those common in the emotion socialization literature are usually assessed either through questionnaires that capture parental attitudes and beliefs about emotion, or by observing behaviors in standardized laboratory settings. With questionnaire measures, participants are usually instructed to report the extent to which they typically demonstrate the construct of interest; they attempt to recall and summarize across hundreds or thousands of relevant interactions that have taken place in the past. In most observational designs, parents and their children are instructed to engage in a uniform set of interactions that have been designed to provide opportunities to observe particular parenting constructs so that researchers can assess how well each parent demonstrates, for instance, warmth or responsiveness. Together, these methods assume that parents' beliefs and attitudes shape parenting styles, which in turn affect parenting behaviors in everyday life (Denham et al., 2014).

The data collected in these two common designs are quite different from observations of families in their everyday lives (Repetti, Reynolds & Sears, 2015). Naturalistic recordings, like those collected by CELF, include a myriad of multifaceted situations; it is rare to observe moments that resemble the very simple and highly structured conditions that are created in laboratory studies (Repetti, Wang & Sears, 2013; Repetti, Saxbe & Wang, 2013; Wang, Repetti & Campos, 2011). Rather, in these recordings, contextual factors such as the physical location of the child and the number of social partners are fluid; simultaneous social interactions, behaviors and activities are common. Inferences about the intentions of

child and family member behaviors are impossible to make with naturalistic data because they lack the control and consistency across situations that are afforded by laboratory-based observational designs. Moreover, most real-life family situations do not call for displays of, say, sensitivity or warmth from a parent (e.g., two siblings watching television while parents sit at a nearby table paying bills). Thus, rather than try to assess the elicitors of children's positive emotion expressions or make inferences about constructs like warmth, approval and sensitivity under a wide range of unique family circumstances, the current study took a different approach. We chose three concrete family behaviors that are related to those constructs and are observed across many different situations - mutual expressive displays of positive emotion, touch, and joint leisure - and chronicled how those naturally occurring behaviors were linked with spontaneous expressions and sustainment of positive emotion in everyday life.

Mutual display of positive emotion

Children's expressive displays of positive emotion are closely correlated with those of their family members. Children observe and emulate their parents, who can reinforce their offsprings' displays of positive emotion with rewarding responses, such as smiles (Cole, Martin, & Dennis, 2004; Morris, Silk, Steinberg, Myers, & Robinson, 2007). Ongoing cycles of positive feedback between parent and child facilitate the maintenance of each partner's positive emotion states and sustain a positive and synchronous interaction; interruptions reduce the child's display of positive emotion (Adamson & Frick, 2003; Cole et al., 2004; Feldman, 2003; Weinberg & Tronick, 1996). Consistent with this pattern, structured and semi-structured dyadic interactions involving infants and school-age children show a bidirectional association between child and parent displays of positive emotion and warmth (Barry & Kochanska, 2010; Cassidy, Parke, Butkovsky, & Braungart, 1992; Davidov & Grusec, 2006; Denham & Grout, 1993; Isley et al., 1999).

Emotion transmission describes a positive association between the emotion or mood states of two social partners (Barry & Kochanska, 2010; Larson & Richards, 1994). Although the transmission of negative emotion between parents and children has been well documented, less is known about the transmission of positive emotion, especially in school-age children, despite its importance for synchronous family interactions and healthy development (Almeida, Wethington, & Chandler, 1999; Downey, Purdie, & Schaffer-Neitz, 1999). Moreover, the time frame over which transmission occurs is not well understood. One experience sampling study found modest associations between fathers' and adolescents' positive and negative mood, when they were physically together; mothers' mood was correlated with sons' but not daughters' mood (Larson & Richards, 1994). In contrast, another study of adolescents and single mothers found that one partner's positive mood did not predict the other's positive mood an hour later, whereas transmission was observed for anger (Larson & Gillman, 1999). Although the findings based on mood ratings do not present as consistent a picture, the observational data focusing on more immediate processes (mostly based on samples of much younger children) suggest that in the course of everyday family life, one of the ways that children's expressions of positive emotion may be supported and sustained is by exposure to the positive emotion of others around them.

Touch

Touch can be one way to express positive emotion. For example, physical affection, like hugs, can serve as an overt display of love. Even though evidence suggests that touch between family members decreases as children mature (Collins et al., 2002), it continues to be an important social behavior that can help communicate positive and negative emotions (Hertenstein et al., 2009). In adults, touch is associated with daily reports of more positive mood (Debrot, Schoebi, Perrez, & Horn, 2013), and with less secretion of cortisol, a stress hormone, an effect mediated by increased positive affect (Ditzen, Hoppmann, & Klumb, 2008). Experimental studies of infants and adults show that physical contact with a parent or other supportive partner modulates physiological reactivity to acute stressors (Hostinar, Sullivan, & Gunnar, 2014).

Despite significant changes in parent displays of affection from infancy to middle childhood, and the continued benefits of touch into adulthood, infant studies predominate in the literature on parent-child touch (e.g., Ferber, Feldman, & Makhoul, 2008; Field, 2010). Although physical affection is often included as a behavioral indicator of parental warmth in structured observational studies involving school-age children (e.g., Isley et al., 1999), the effects of family members' touch *per se* on children's emotion expression and behavior have not been examined in this age group. And there are no observational studies of touch during everyday family interactions.

Leisure Activities

Observational studies of mother-infant interactions indicate that face-to-face play, such as peek-a-boo, affords children opportunities to experience and express positive emotions, and for parents to prolong these emotional experiences (Tamis-LaMonda, Uzgiris & Bornstein, 2002). Among preschool- and school-age children, the presence or involvement of peers in a fun activity increases displays of positive emotion (Chapman & Wright, 1976; Gaspar & Esteves, 2012); family members may take on some of the functions of playmates when these children are at home. At this age, face-to-face play is replaced by a very wide range of fun activities, including everything from watching television, to playing video games and riding bicycles. Leisure activities like these provide parents with opportunities to engage with children and share in their enjoyment (Ginsburg, 2007). We know of no naturalistic observational studies of families that assess family members' voluntary involvement in children's leisure activities. Our study examines joint leisure as one family behavior that might surround and help to sustain children's spontaneous displays of positive emotion.

Mothers, Fathers and Siblings as Social Partners

Unlike structured interactions in the laboratory, in real family settings, children with two parents and siblings are constantly interacting with different permutations of people. The CELF recordings show that, over relatively short periods, a child's potential social partners in a shared space may fluctuate with respect to the number and combination of family members (Campos, Graesch, Repetti, Bradbury & Ochs, 2009). The CELF data therefore offer a rare opportunity to examine mothers', fathers' and siblings' engagement in all three of the behaviors discussed above. Prior research based on laboratory observations and

questionnaires suggest that fathers express more positive emotion, promote more emotional arousal, and interact with children with a warmer emotional tone than mothers do (Brand & Klimes-Dougan, 2010; Campos et al., 2013; Denham, Bassett, & Wyatt, 2010). Some scholars have attributed the differences to a father's tendency to act as a fun playmate, compared to a mother's tendency to help children regulate negative and positive emotions (Denham et al., 2010).

There are surprisingly few investigations of sibling influences on children's expressive displays of positive emotion, despite evidence that children spend more time with siblings than with mothers and fathers in middle childhood (McHale & Crouter, 1996). In a longitudinal study of toddlers, the frequency of speaking about emotions to an older sibling increased over 14 months, whereas emotion talk with mothers declined (Brown & Dunn, 1992; Dunn, 2014). Moreover, the balance of warmth and conflict in the sibling dyad appears to play a role in children's social competence and peer relationships (Bedford & Volling, 2004; Dunn, 2011). Interestingly, more warmth and support between adolescent brothers increased the younger sibling's likelihood of emulating his brother's deviant behavior (Slomkowski et al., 2001). Thus, despite evidence that siblings help to shape each others' socio-emotional development, we know of no research examining their influence on expressive displays of positive emotion.

Meta-analyses of observational and questionnaire studies indicate that girls display more positive emotion than boys do, but boys may exhibit high-intensity positive emotions more often than girls do (Chaplin & Aldao, 2013; Else-Quest, Hyde, Hill, & Van Hulle, 2006). Although parent socialization of child negative emotions appears to vary by parent and child sex (Chaplin, Cole, & Zahn-Waxler, 2005), child sex differences have rarely been tested with respect to the socialization of positive emotion. Notably, in a study of kindergarteners, parent and child displays of positive emotion were correlated regardless of parent or child sex (Isley et al., 1999). In contrast, a study of adolescents found that, among sons, mood was correlated with both mothers' and fathers' mood, but among daughters, mood was correlated only with their fathers' mood (Larson & Richards, 1994). The current study uniquely examines mother, father and sibling behaviors that are linked with boys' and girls' displays of positive emotion in daily life.

The Current Study

This study describes the social context of 8 to 12 year-old children's spontaneous displays of positive emotion by analyzing video recordings of 31 families, taken in homes and community settings on one weekday and one weekend day. Two specific aims are addressed. First, a review of a research literature based on questionnaire measures and observations made in controlled settings pointed us to three family behaviors that may surround children's positive emotion expressions and that could be assessed across the wide range of situations represented in the CELF recordings: mutual display of positive emotion, touch, and joint leisure. Possible differences in the occurrence of those behaviors depending on the child's social partner - mother, father, sibling – are also tested. Second, the study examines whether these behaviors contribute to one aspect of emotion regulation in children by helping to sustain displays of positive emotion over brief periods of time. In addition to

the use of naturalistic recordings of family life, the focus on positive emotion expression and sustainment in school-age children and the consideration of the role of siblings represent unique features of this study within the emotion socialization research literature.

Methods

Participants

Dual-earner middle class families living in the Greater Los Angeles area were recruited for an interdisciplinary study on the everyday lives of working families. Each of the 32 participating families included two cohabitating adults, both of whom worked at least 35 hours per week, and two to three children living at home. One child between the ages of 8 to 12 years was designated as the “target child” (Ochs & Kremer-Sadlik, 2013). Data from one family was excluded from the analyses presented here because the intended target child was younger than 8 years old. The 31 target children included 14 girls and 17 boys with a mean age of 9.4 years ($SD = 1.2$). Twenty (64.5%) target children were European American, 6 (19.4%) identified as mixed race, 3 (9.7%) were Asian American, 1 (3.2%) was Latino, and 1 (3.2%) was African-American. Two families were headed by male same-sex couples and 29 were headed by heterosexual couples. For the two families headed by two fathers, data from one randomly chosen parent was included in the analyses presented here. The sample thus included 29 mothers and 31 fathers with a mean age of 41.5 years ($SD=5.6$).

Nine (29.0%) of the target children had two siblings, and 22 (71.0%) had one. In total, the behaviors of 39 siblings (18 girls; 21 boys) were coded in the study. The mean age of siblings was 8.21 years ($SD=4.14$, $Median=7.39$, $Range=1.2-17.2$). Among the target children from 22 two-children families, 16 were older, 2 were same-aged twins, and 4 were younger in comparison to their siblings. Of the target children from 9 three-children families, 3 were oldest, 4 were middle, and 2 were the youngest among their siblings. Eight (28.9%) target children had same-sex siblings only, whereas 23 (74.2%) had at least one sibling of a different sex.

Data Collection Procedures

Each family was compensated \$1,000 for their participation. The study included extensive data collection procedures, most of which are described elsewhere (Ochs & Kremer-Sadlik, 2013). Parents’ informed consent and children’s informed assent were obtained prior to the start of data collection.

The everyday activities and behaviors of the 31 families were filmed over two weekdays and two weekend days, resulting in a total of over 1,600 hours of recordings (approximately 50 hours per family). On weekdays, filming began when the family members awoke and continued until they left for school or work. Filming resumed at the first contact between a parent and a child after school, and ended at the children’s bedtime. Over the weekend, families were filmed on Saturday morning, and on Sunday morning and evening. Two cameras were assigned to each household at all times. One was designated to follow the mother, and the other, the father. The videographers accompanied the assigned parent both in and out of the home (Ochs & Kremer-Sadlik, 2013).

Data Reduction and Coding Procedures

Video data reduction—The first step to imposing order and organization on observations collected in uncontrolled settings is the selection of relevant video segments for further coding (Repetti, Wang & Sears, 2013). Of the 1600 hours of video observations accumulated across two weekdays and two weekend days, every segment of video in which the mother or father appeared on screen with the target child for at least 30 seconds was selected. Each segment that was longer than 30 seconds long was divided into 30-second clips. Next, for each camera, we chose the one weekday and the one weekend day that maximized the number of parent-child video clips available for further analysis. We then coded up to 200 30-second clips (100 minutes) of parent-child video footage per day per camera, for a total of up to 800 30-second clips (400 minutes) per family (Sperling, 2012).

Unlike laboratory studies in which the length of observation time is standardized, the time that each child was on screen with a parent varied across days and children. The 200-clip cap was imposed to avoid over-representation of data from any single parent on a particular day, although, not every parent had 200 clips of video footage with the target child on a filming day. The average total number of coded clips in each of the four subsets of our data (mother versus father camera, weekday versus weekend day) ranged from 110 to 134. The average total number of coded clips across the two days was 258 for mother-child clips ($SD=86$, $Range=54-400$), and 243 for father-child clips ($SD=107$, $Range=49-400$). On average, each family contributed 498 clips ($SD=181$, $Range=103-798$), for a combined total of 15,071 mother-child and father-child clips across 31 families (Sears, Repetti, Reynolds, & Sperling, 2014; Sperling, 2012).

Identification of children's positive emotion clips—A trained team of 19 ethnically diverse undergraduate student coders coded the 15,071 clips for target child expressive display of positive emotion, surprise, sadness, disgust, fear and anger (Ekman & Rosenberg, 1997). Unfortunately, observational coding strategies developed for use in laboratory or semi-structured settings are not well suited to, nor validated for, naturalistic recordings. We therefore drew from and adapted existing coding systems for this study (Sperling, 2012). In order to maximize our use of the data, we based our coding of emotion expression on a full range of verbal and non-verbal cues. Video coding procedures for emotions other than positive emotion are described elsewhere (Sears, et al., 2014; Sperling, 2012). Any clip in which the target child showed at least one of the following 17 expressive displays of positive emotion was coded as a positive emotion expression clip (PE clip): smiling (Ekman & Rosenberg, 1997), cheering, clapping, dancing, jumping in excitement, laughing audibly, singing, showing eagerness (Hubbard, 2001), giggling (Cole, Teti & Zahn-Waxler, 2003), raising cheeks, pulling up lip corners, crinkling eyes, showing affection, smirking, speaking in a warm emotional tone, using terms of endearment, and physical touching. Although it was possible for the basic emotion, surprise, to have a positive valence, it was excluded from further analysis of positive emotion because of its low base rate. Two coders independently coded each clip and met to resolve all disagreements. Cohen's Kappa for target child positive emotion was .76 and the percent agreement was 90%, prior to resolving disagreements in the coding (Sperling, 2012).

The average proportion of clips in which the target child expressed positive emotion, out of clips in which the child was present with a parent (mother or father), for each type of day (weekday or weekend day) ranged from .29 to .34 across the four subsets of our data; the average proportion of all mother-child clips with child positive emotion expression was .32 ($SD=.13$, $Range=.09-.57$) and the average proportion of all father clips with child positive emotion expression was .31 ($SD=.13$, $Range=.01-.56$; $t(28) = 0.63$) (Sperling, 2012). The clips that included at least one display of positive emotion by the target child (PE clip) were selected for further analysis.

A small subset of PE clips was considered duplicative if two parents simultaneously shared the same space with the child, and both cameras captured the same moments with the target child. Duplicate clips were identified and one was discarded, leaving a total of 4,045 unique PE clips in which the target child displayed positive emotion in the presence of at least one parent. The PE clips were approximately evenly divided between weekday ($n_{clip}=1,949$, 48.2%) and weekend ($n_{clip}=2,096$, 51.8%) observations. All PE clips retained for further analysis were chronologically sorted by day and time of filming, which allowed us to preserve any consecutive series of clips in which children continuously displayed positive emotion.

Coding behavior in the positive emotion expression clips—A new team of 13 trained undergraduate students coded the 4,045 PE clips for behaviors of family members. Three coders were male, 9 female, and coders were ethnically diverse; 5 were European American, 6 were Asian American, 1 was Latina and 1 was African American. Though many of the clips contained more than one discrete positive emotion expression, each clip was analyzed as a whole, treating discrete behaviors within 30 seconds as a single positive emotion process.

As is appropriate for the coding of naturalistic observations, the manual for coding characteristics of the surrounding family interactions was created through an iterative process (Repetti, Wang & Sears, 2013). First, a small team piloted a prototype manual; variables with consistently low inter-rater reliability or low variance were discarded. Coders were paired at random and inter-rater reliability was monitored weekly. The final coding system (Bai & Repetti, 2012) included a series of dichotomous variables in which coders indicated whether the behavior was observed at least once within the clip. Abbreviated definitions, examples and inter-rater reliability scores for each variable are shown in Table 1.

Naturalistic video recordings differ from laboratory observations in many ways; multiple family members, simultaneous conversations, lack of structure and the participants' freedom to move throughout their homes are just some of the complexities faced by coders. To address the resulting challenges to reliability, two people coded every clip, and met weekly to resolve all disagreements in their ratings. The analyses presented here use the 100% agreed-upon codes, but the inter-rater reliabilities were calculated using the ratings provided prior to the resolution of disagreements.

The coding system identifies any family member who was in the presence of the target child during the 30-second clip: *mother* ($\kappa = .93$, *percent agreement* = 97.5), *father* ($\kappa = .95$, *percent agreement* = 97.8), *sibling(s)* ($\kappa = .92$, *percent agreement* = 96.3). If there was more than one sibling in the family, variables representing the presence of individual siblings were collapsed into a single variable; *overall sibling presence* indicates at least one sibling was present with the target child. The presence and activities of adults and children outside of the immediate family were not included in the analyses because non-family members were rarely on screen.

Family social interaction: *Interaction* was coded for each family member who was present and socially engaged (e.g., conversations, shared eye contact, and physical affection) with the target child during the 30-second period. *Overall sibling interaction* indicates that at least one sibling interacted with the target child. A missing value indicates that a particular family member was not present. Three family behaviors were then coded.

Mutual display of positive emotion (PE): *Mutual display of PE* was coded for each family member who was socially interacting with the target child and expressed a positive emotion. The family member's positive emotion expression (e.g., a smile, laughter, or empathetic nodding) need not be specifically directed toward the target child. The exception to this rule was instances in which the only sign of other family member's positive emotion was touch. In those cases, *mutual display of PE* was coded only if the family member was touching the target child. The variable, *overall sibling mutual display of PE*, which indicates that at least one sibling expressed positive emotion, was used in analyses. A missing value indicated that a particular family member was not present, or was not socially interacting with the target child.

Touch: Separate from the above code, *Touch* was coded whenever the target child had physical contact that was not malicious with any family member. Touch that was intentional or could have been avoided (but was not), such as hands touching briefly, or leaning into a parent's shoulder, as well as physically affectionate behaviors such as hugs and kisses were coded. The fact that touch was an indicator of both child and family member display of positive emotion is taken into account in the analyses and described further in the results.

Leisure: The code for the target child's involvement in a pleasant activity included many different types of fun and common free time activities for children in our target age group, such as playing with a toy, playing a game, watching television, reading, crafting, walks to the beach, or playing sports. Involuntary or obligatory activities such as homework, chores, and meal times were not included. *Leisure* was further dichotomized to indicate whether or not another family member was also participating in the activity; *joint leisure* indicated that another person was engaged in the same activity as the child (e.g., reading together or playing a board game). The family member need not be actively interacting with the target child (e.g., watching television together). *Solitary leisure activity* indicated that no other person was involved in the activity (e.g., playing with action figures alone, bouncing a ball alone).

Sustainment of PE: The sustainment of the target child's positive emotion from one clip into the next clip was coded whenever two conditions were met: (1) a PE clip was followed by a chronologically consecutive PE expression clip without any break in time and (2) the child expressed positive emotion at least once beyond the 21st second of the first clip. Consistent with the rest of the coding scheme, the second criterion was a binary code; the inclusion of this criterion allowed for a more conservative assessment of sustainment.

Multilevel regression models were estimated in most analyses to account for the two-level structure of the data, in which clips are nested within individuals. All analyses were conducted on Stata 13.1 software. Due to the complexity of the models, data analytic strategies are described separately for each result.

Results

Results are presented in two parts. First, we described the extent to which each of three family behaviors – mutual display of positive emotion (PE), touch, and joint leisure - was observed, and tested for child sex differences in the observed proportions. We also assessed whether the odds of observing a particular family behavior depended on the child's social partner (mother, father, sibling) in the clip. Second, we separately tested the three family behaviors as predictors of PE expression sustainment in target children.

Family Behaviors Surrounding Child Expressions of Positive Emotion

A total of 4,045 PE clips nested in 31 children were coded. The number of PE clips varied widely by child, ranging from 29 to 301 clips per child ($M=130.5$, $SD=73.1$). Intra-class coefficients (ICCs), which index the proportion of a code's variance that is attributable to between-individuals differences as opposed to within-individuals differences, ranged from .10 to .21 with a mean of .17 ($SD=.05$) for the 10 variables listed in Table 2, indicating that between-individuals differences accounted for only a small proportion of each code's variance.

Clip level data were aggregated to create proportion scores for each child, for each of the variables that were coded. Two or three family members were usually present with the target child ($M=2.31$, $SD=0.44$, $Range=1.37-3.23$). Since the clips were selected to include at least one parent, the data indicate that another family member (e.g., a second parent or a sibling) was also often on screen. The mean probability of the target child interacting with at least one family member (i.e., mother, father or a sibling) in a PE clip was .93 ($SD=.06$, $Range=.68-1.00$). As shown in Table 2, mothers and fathers interacted with the target child in about 70% of the clips in which they were present, whereas siblings were just as likely not to interact, as they were to interact with the target child.

Mutual display of PE—When they were interacting, mothers, fathers and siblings showed mutual displays of PE more than half the time. The mean proportion of PE clips in which at least one family member was also showing positive emotion was .66 ($SD=.14$, $Range=.26-.85$).

Touch—On average, at least one family member was touching the target child in almost a third of all PE clips, and touch was observed in almost half of the clips in which at least one family member showed a mutual display of PE ($M=.46$, $SD=.17$, $Range=.18-.80$).

Considering only those clips in which mothers, but not fathers or siblings, displayed PE, the proportion that also included mother-child touch was .40 ($SD=.24$, $Range=0-.82$). For fathers, the mean proportion of PE displays that involved touch was .59 ($SD=.27$, $Range=.17-1.00$), and for siblings, the mean proportion was .25 ($SD=.31$, $Range=0-1.00$).

Leisure—The average target child was engaged in a leisure activity with others in about a third of all PE clips; the rate of participating in a leisure activity with others was much higher than solitary leisure activity (.35 vs .09).

Sustainment—A child sustained his or her positive emotion expressions into the next consecutive clip in about a third of all PE clips.

Child sex differences—To compare boys and girls, independent samples t-tests were conducted at the child level. Results are shown in Table 2. There were three statistically significant results out of the ten tests of child sex differences. On average, boys were more likely to be interacting with siblings than were girls. The probability of a father showing a mutual display of PE was higher for daughters than for sons, whereas the probability of a sibling showing a mutual display of PE was higher if the target child was a boy, than a girl.

Differences in the behaviors of different social partners—Nine multilevel logistic regression models tested possible associations between the child's social partner (mother, father or sibling) and each of the three family behaviors (mutual display of PE, touch, and joint leisure) at the level of the 30-second PE clip; clips (level 1) were nested within individual children (level 2). Social interaction with each family member was examined as a level 1 predictor in separate models, and each of the three family behaviors was examined as a separate outcome variable. This approach is represented by the following equation:

$$\begin{aligned} \text{Log} [p_{ij} / (1 - p_{ij})] \\ = B_{00} + B_{10} (\text{interaction with family member}_{ij}) \quad [1] \\ + u_{0j} + u_{1j} (\text{interaction with family member}_{ij}) \end{aligned}$$

In the above equation, p_{ij} refers to the probability of observing a particular family behavior (mutual display of PE, touch, leisure) in clip i of child j . B_{00} is the average log odds of the variable being observed, across all clips and all children; u_{0j} is the error term, representing the deviation of child j from that mean. B_{10} is the change in log odds of a particular family behavior being observed, depending on whether or not the child was interacting with his or her mother, father or sibling; u_{1j} is the error term representing the deviation of child j from the average slope. B_{10} was converted into an odds ratio (OR) with the equation, $OR = e^B$ for ease of interpretation.

Two of the nine models had statistically significant B_{10} coefficients. Target children were more likely to be touching if they were interacting with their fathers ($OR=1.94$, $SE=.55$, $p=.$

02, 95% CI [1.11, 3.38]), and they were more likely to be exposed to mutual displays of PE if they were interacting with siblings ($OR=1.71$, $SE=.21$, $p=.003$, 95% CI [1.20, 2.44]). Of note, the number of siblings (1 versus 2), sibling sex correspondence (same or opposite sex), and target child's birth order (first- or last-born), were not associated with the odds of observing sibling mutual displays of PE, sibling touch, or joint leisure when in the presence of siblings, as shown in Supplemental Table 1.

Parent sex differences—To compare social interactions with mothers versus fathers, we conducted multilevel logistic regressions on a subset of PE clips, that excluded three groups of clips: (1) clips from the two families headed by same-sex parents, (2) clips in which the mother and father were both on screen and (3) clips in which the child did not interact with either parent. A total of 29 target children and 1,719 PE clips were included in these analyses; a mother was present and interacting with the target child in 59.8% and a father was present and interacting with the target child in 40.2% of the clips. Parent sex was examined as a level 1 variable in multilevel logistic regression models (father=0, mother=1), to test whether the sex of the parent predicted the likelihood of observing each of the three family behaviors in a particular clip: mutual display of PE with a parent, touch, and joint leisure. This approach is comparable to equation [1], with the substitution of $parent\ sex_{ij}$ for $interaction\ with\ family\ member_{ij}$. One of the three models showed a marginally significant parent sex difference. Joint leisure was about half as likely to be coded when the child was interacting with his or her mother in comparison to when interacting with his or her father ($OR=.56$, $SE=.17$, $p=.057$, 95% CI [.31, 1.02]).

Predictors of Positive Emotion Expression Sustainment

Multilevel logistic regression models were fitted to test family behaviors as predictors of children's positive emotion expression sustainment. Mutual display of PE in mothers, fathers and siblings, touch, and joint leisure were each examined as level 1 predictors in five separate models; positive emotion expression sustainment was the level 1 outcome variable.

The outcome variable, *sustainment*, indicated whether PE continued from one clip (clip i) to the next clip (clip $i+1$). The models included two control variables. First, since we were interested in testing family behaviors as predictors of sustainment over and above the autocorrelation in child PE expression, sustainment from clip $i-1$ to clip i , was controlled in the analysis. Second, because touch is a family behavior and could also serve as an indicator of the child's expressive display of PE, it would be possible for a single behavioral act (e.g., prolonged contact between mother and child) to serve both as an indicator of touch (a family member behavior) in clip i and as an indicator of sustainment of the child's PE expression from clip i to clip $i+1$. We wanted to ensure that sustainment of PE expression reflected something more than prolonged physical contact (e.g., two family members sitting side by side on the couch with arms touching). Therefore, continued touch in clip $i+1$ was also controlled in the analysis.

Our model is represented by the following equation:

$$\begin{aligned}
 & \text{Log} [p_{ij} / (1 - p_{ij})] \\
 & = B_{00} + B_{10} (\text{family behavior}_{ij}) \\
 & + B_{20} (\text{sustainment}_{(i-1)j}) \quad [2] \\
 & + B_{30} (\text{touch}_{(i+1)j}) \\
 & + u_{0j} + u_{1j} (\text{family behavior}_{ij})
 \end{aligned}$$

In the above equation, B_{10} is the change in log odds of the target child sustaining his or her PE expression from clip i into clip $i + 1$ for child j , associated with the family behavior in clip i , over and above the effect of sustainment from the previous clip, and touch in the next clip.

As seen in Table 3 and Figure 1, even with the control variables included, all five variables were statistically significant predictors of sustainment. The target children were more likely to sustain their PE expression into the subsequent clip, when their mother, father or sibling also displayed PE ($ORs: 1.77-2.02$). Target children were three times more likely to sustain their PE expression when touching another family member, than when they were not, over and above the effect of continued touch in the next clip. The data also indicated that target children's odds of sustaining their PE expression was 1.49 times higher when the children were engaged in a joint leisure activity than otherwise.

Separate analyses were conducted with subsets of clips to examine the effect of touching with different family members. To test the effects of maternal touching, we considered the subset of clips in which only mothers (but not fathers or siblings) could have touched the child and found that target children were more than three times as likely to sustain their PE expression in the context of maternal touch ($OR=3.53, SE=1.12, p < .001, 95\% CI [1.88, 6.63]$). In the subset of clips evaluating the effects of paternal touching, target children were more than twice as likely to sustain their PE expression when there was touch ($OR=2.61, SE=.96, p=.009, 95\% CI [1.27, 5.37]$). In the subset of clips testing the effects of sibling touching, target children were almost twice as likely to sustain their PE expression when there was touch compared to when there was no touch ($OR=1.90, SE=.52, p=.020, 95\% CI [1.11, 3.26]$). The OR for the effect of maternal touch did not differ from the OR for paternal touch ($z=0.61, p=.54$) or sibling touch ($z=1.46, p=.14$). The ORs for paternal and sibling touch also did not differ ($z=.68, p=.50$). Thus, touching mothers, fathers or siblings appeared to have similar effects on target children's odds of sustaining their expressions of positive emotion, in this sample

Parent sex differences—Another set of multilevel logistic regressions were conducted on the subset of clips in which only mothers or only fathers were present, to test whether the associations between family behavior and sustainment differed for clips that captured children with each parent. The statistical interaction between parent sex and each of the three predictor variables (mutual display of PE, touch, joint leisure) was tested in three separate models. This approach builds upon equation [2], with the addition of two terms: $parent\ sex_{ij}$ and $parent\ sex_{ij} \times family\ behavior_{ij}$. All three variables predicted sustainment of

child positive emotion regardless of parent sex. None of the cross product terms were statistically significant: mutual display of PE ($OR=1.45$, $SE=.40$, $p=.178$, $95\% CI [.84, 2.50]$); touch ($OR=1.24$, $SE=.45$, $p=.542$, $95\% CI [.62, 2.51]$); and joint leisure ($OR=.90$, $SE=.25$, $p=.696$; $95\% CI [.52, 1.50]$).

Discussion

Our analysis of a unique archive of naturalistic recordings examined three behaviors that surround and sustain school-age children's spontaneous expressions of positive emotion across a wide range of family situations. Mothers, fathers and siblings appeared to connect with children's spontaneous expressions of positive emotion by displaying positive emotion themselves, by touching, and by participating in leisure activities together. When children expressed positive emotion, a mother, father or sibling was also smiling or showing some other sign of positive emotion more than half the time; a family member and the target child were touching or involved in leisure activities together about a third of the time. Moreover, these behaviors may have helped to prolong children's expressions of positive emotion. On average, about a third of the children's expressions of positive emotion continued from one 30-second clip to the next. However, the odds of sustainment were significantly enhanced when family members also displayed positive emotion, touched or engaged in the same leisure activity with the child.

Positive Emotion and Social Connectedness

Emotions are functional, giving rise to specific patterns of physiological, cognitive and behavioral responses that facilitate adaptation to various demands and opportunities in the environment (Izard, 2007). Positive emotions such as joy, interest and love, promote exploration of surroundings, participation in activities, and perhaps most importantly, social connectedness in close relationships (Fredrickson, 2001). For example, an infant's smile activates the mother's dopamine-associated reward processing regions in the brain, which in turn promotes positive emotion and affiliative behaviors in the mother (Strathearn, Li, Fonagy & Montague, 2008). In turn, this social connectedness promotes more positive emotion, leading to further increases psychological and social resources (e.g., parental warmth and attachment) that can protect children in the face of stressors (Fredrickson, 2001).

The current findings support the notion that positive emotion and social connectedness are reciprocally linked. Unlike negative emotions such as fear, which act to remove a threat (the stimulus), positive emotion become part of an *upward spiral*, such that positive emotion promotes social connectedness, and more warm and responsive close relationships promote more positive emotion (Ramsey & Gentzler, 2015). We found that family members were often displaying positive emotion, touching, or engaging in leisurely activities with the target child when the child was expressing positive emotion. These family behaviors increased the likelihood of the child sustaining his or her positive emotion expression into the next clip. These patterns may reflect short-term processes that help to explain the upward spiral of positive emotion and social connectedness in the context of everyday family life.

Observing Emotion and Behavior in Everyday Family Life

Psychologists' observations of emotion are usually made in situations that are designed to evoke particular emotional states. By recording families in their homes and communities over several days, CELF captured a myriad of situations seldom represented in observational research in psychology (Repetti, Wang & Sears, 2013; Repetti, Saxbe & Wang, 2013). Just a few minutes of a typical weekday evening in the CELF video archive might show a mother preparing dinner while her son attends to homework at the kitchen table, a father entering the scene upon his arrival home from work, a younger sister running between the kitchen and the living room where the television is playing, the boy being distracted by his sister showing her father a toy, and his mother redirecting his attention back to homework. Unlike the laboratory, the social context surrounding the child in daily life is in constant flux. During that short span of time, the boy may smile; but why? Was it the realization that his father was home as he heard the front door unlock, the satisfaction of solving a problem on his math sheet, the sight of his sister or her toy, or was it something else? Inferences like these are impossible to make with naturalistic data because they are missing the essential ingredient of experimental designs: the investigator's control over the number of factors that vary in order to pinpoint causes. Therefore, rather than try to assess the elicitors of children's positive emotion expressions or the intentions or meaning behind family members' behaviors, we described the circumstances that surrounded the spontaneous emotion display in terms of concrete verbal and nonverbal acts that could be reliably coded across many different situations.

Our codes for emotion expression and family behaviors were purposely inclusive. Transient and mild nonverbal behaviors such as "leaning toward the child while nodding his or her head up and down," were counted as indicators of displays of positive emotion, as were verbal expressions, such as saying, "I love you". The operationalization of touch included seemingly trivial actions such as tapping a child's arm as well as more conspicuously affectionate behaviors like hugs and kisses. Likewise, a wide range of fun activities - from passively watching television to playing a board game as a family - were coded as leisure. It may be possible to assess minute changes in facial expression as the primary behavioral indicator of emotion in the laboratory (Ekman & Rosenberg, 1997; Niedenthal & Brauer, 2012) or highly stimulating forms of touch, such as shaking, tickling and nuzzling (Fogel et al., 1997) in studies of young children. However, these methods were not suited to the CELF video archive; the naturalistic observations we used called for an approach that would capitalize on a rare opportunity to code quotidian family behaviors as they are experienced in everyday life by older children (Repetti, Wang & Sears, 2013).

Emotion Socialization in the Family

Our strategy for observing emotion socialization was to describe family behaviors that increased the likelihood of a child's positive emotion display being sustained over a very brief period of time. The analyses suggest that family members help to maintain children's expressions of positive emotion through mutual displays of positive emotion, touch, and involvement in leisure activities. Although parents' overt displays of warmth, such as physical affection, may decline in frequency or become less overt as children grow older (Collins et al., 2002; Ferber et al., 2008), school-age children may be more sensitive to

subtle signals of positive emotion, and respond to less direct displays of affection (Klimes-Dougan & Zeman, 2007). This was apparent in the power of physical contact as coded in this study, which included mundane, non-affectionate touch, to help prolong positive emotion expressions in children. Our attempt to watch emotion socialization in action by focusing on specific family behaviors over brief moments in time complements the emphasis in the research literature on parenting beliefs, attitudes and style (e.g., Katz et al, 2014). In practice, the family behaviors we assessed were closely entwined with the child's expression of emotion; perhaps no better illustrated than by the way that physical affection was both an indicator of child emotion and parent emotion, as well as a type of touch. The fact that child emotion displays and family behaviors co-occur makes it very difficult to discern the causal ordering of these variables, which is consistent with theoretical perspectives that emphasize bi-directional influences (Zahn-Waxler, 2010).

Although self-report diary data have not provided evidence of transmission of positive emotion between parents and children from one hour to the next (Larson & Gillman, 1999), our analyses of the CELF recordings suggest that family members can help to prolong child displays of positive emotion over much briefer time spans. Our data are consistent with laboratory and semi-naturalistic observational studies that find that parents' and children's displays of positive emotion are correlated (Barry & Kochanska, 2010; Isley et al., 1999). Acting to increase or decrease the duration of mild emotional states over seconds or minutes may be a common, though understudied, interpersonal means of regulating positive emotion in the families of older children. These findings call for more in-depth examinations of positive emotion socialization processes in both laboratory and naturalistic settings.

The age range of the CELF target children represents another contribution of this study. The developmental literature on expressive displays of positive emotion has focused primarily on the infant and toddler years, despite enormous changes in children's understanding of emotion and in the dynamics of the parent-child relationship that take place after that period. It is important to understand how families socialize positive emotion expression in school-age children because of the central role that it plays in child development and well being. For example, the over-expression of positive emotion and parents' minimizing responses to youth positive emotion are linked to poor psychological outcomes (Gilbert, 2012; Katz et al., 2014).

Few studies have examined the roles of multiple family members in children's emotion expression, probably because the commonly used observational methods are designed to control as many variables as possible and therefore tend to focus on one social partner at a time. Siblings, in particular, have been largely ignored in this field. We found that, compared to parents, siblings were more likely to express positive emotion in the PE clips. But the sibling composition in the family (gender and number of siblings, the target's birth order) was not associated with differences in sibling behavior. In addition, compared to mothers and siblings, fathers were more likely to touch in the PE clips. Despite these two differences, the *effectiveness* of all three behaviors for sustaining children's displays of positive emotion did not vary by family member. These results indicate siblings may reciprocally contribute to one another's socio-emotional development, just as parents do (Volling, McElwain, & Miller, 2002).

There was one notable difference in parent behaviors associated with boys' versus girls' expressions of emotion. There were more mutual displays of positive emotion in father-daughter PE clips than in father-son PE clips. This pattern seems consistent with evidence suggesting that parents, especially fathers, covertly and perhaps unintentionally attend more to gender-typical emotions, and that girls are more likely to display positive emotion (Chaplin & Aldao, 2012; Chaplin et al., 2005). Although differences in parent socialization of sons' and daughters' emotion expression have mostly been examined with respect to negative emotions, a few studies indicate that parents attend more to daughters' displays of positive emotion (Adams, Kuebli, Boyle, & Fivush, 1995).

Limitations and Future Directions

We had access to a wealth of recordings for each family in the study, but the intensity of CELF's data collection procedures constrained the number of families in the study and, because of that, recruitment was restricted to two-parent, middle-class households. These sample characteristics may limit the generalizability of the findings and our power to assess differences between families. Larger samples of families would afford more power to examine how short-term emotion socialization processes differ according to any number of variables, such as sibling composition, parent sex, ethnicity, and stable attributes of the family social environment. Moreover, genetically sensitive study designs could further explore how shared genetic variance between parent and child contribute to the link between family behaviors and child positive emotion expression.

Like data derived from any methodology, naturalistic observations present scientists with a mixture of advantages and disadvantages (Repetti, Reynolds & Sears, 2015). The designs lack the controllability and standardization of experiments, and do not provide the insights into internal states, intentions, and meaning that are afforded by questionnaire methods. However, the depth and richness of the data collected from each CELF household allowed us to capture within-family effects with robust statistical power and ecological validity. As in other observational settings, the presence of researchers in the home may have led participants to monitor and edit their behaviors, though not to the degree that participants can control self-presentation through their responses on a questionnaire. Additionally, even with some reactivity to the camera, naturalistic observations are more representative of children's actual interactions and experiences than are the behaviors recorded in structured and controlled laboratory settings. These different research approaches complement each other, and in combination, will extend our understanding of emotion regulation in context of the family.

The analyses reported here only begin to scratch the surface of possibilities for investigating emotion socialization through observations of families. Our findings suggest that mechanisms underlying socialization of positive emotion is an important area of research in both naturalistic and laboratory settings. There are countless non-social and social factors that may promote positive emotion. Children could be observed under a wider variety of circumstances, not necessarily restricted to situations in which a parent is present or the child is already displaying positive emotion. In particular, our findings encourage a closer examination of sibling influences and the role of casual forms of physical contact.

Antecedents to the child's emotion displays, and social partners' contingent responses to each other's emotion expressions, could be coded in naturalistic and laboratory settings to study how children's behaviors influence family members' responses to their emotion expressions, and to begin to untangle the direction of effects in emotion transmission. Data derived from naturalistic video observations are well suited to dynamics systems modeling and the examination of emotional flexibility (Hollenstein & Lewis, 2006), which is a highly adaptive trait (Lunkenheimer et al., 2011). In short, naturalistic observations offer new kinds of evidence, new perspectives, and a new approach to the study of emotion socialization.

Positive emotion is linked to positive social relationships, long-term health and well being. Our within-subject findings suggest how a family climate characterized by frequent displays of the simple and ordinary signals of positive emotion, such as smiling, touching or sharing leisure activities, may contribute to individual differences in children's emotionality.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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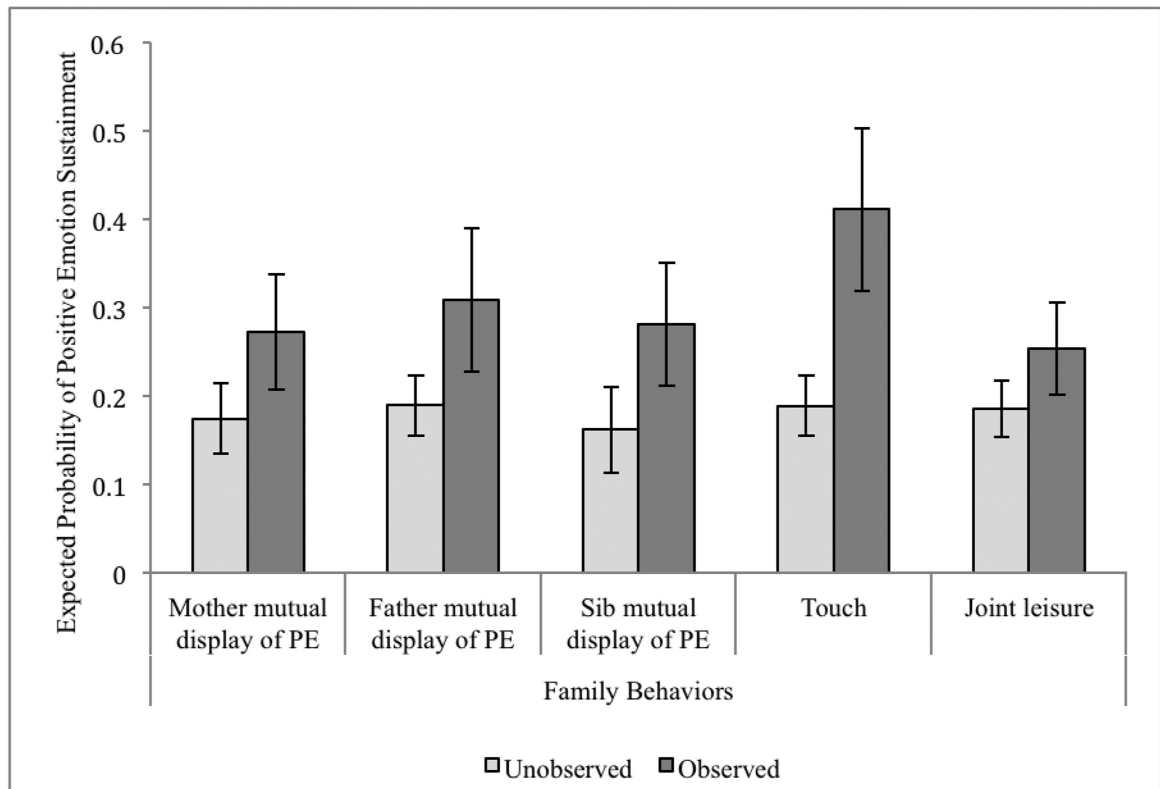
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Note: PE - positive emotion; the error bars are 95% confidence intervals

Figure 1.

Estimated probability of positive emotion expression sustainment associated with the observation of each family behavior

Abbreviated coding definitions and measures of inter-rater reliability for characteristics of family interaction and sustainment of positive emotion

Table 1

Variable	κ	% Agreement	Definition
Social interaction			The child interacted with the family member. Examples: speaking to or being spoken to by others; touching another family member; and responding to others with emotion.
<i>Mother</i>	.77	92.14	
<i>Father</i>	.74	90.61	
<i>Sibling</i>	.68	83.94	
Mutual display of PE			The interacting family member also expressed PE. Examples for adults: using warm voice tones; audible laughter; smiling; touching the target child; and actively leaning towards a speaker while nodding his or her head up and down.
<i>Mother</i>	.71	85.91	Sibling mutual display of PE was coded according to the coding scheme for target child display of PE. Examples for siblings: smiling; showing eagerness; laughing; touching; singing; warm voice tones
<i>Father</i>	.75	88.09	
<i>Sibling</i>	.67	84.21	
Touch	.81	91.71	The child was engaged in non-malicious and non-incident physical contact with another individual. Examples: cuddling; hugging; patting; swiping hair off the face; leaning into a family member; shoulders touching on couch; hands touching when passing objects; and giving high fives.
Leisure	.82	91.17	The child was engaged in a fun or pleasant free time activity, that was not obligatory (e.g., homework, mealtimes). Examples: playing with a real or made-up toy; watching TV; reading; coloring; crafting; playing video games; and playing sports or an instrument.
Joint/solitary leisure	.72	91.72	Joint leisure: another person was also involved in the fun activity with the target child. Examples: bedtime reading; going on a bicycle ride; taking a walk. Solitary leisure: the target child was involved in the fun activity alone. Example: bouncing a ball alone.
Sustainment of PE expression	.69	84.63	PE expression is observed beyond the 21 st second of a clip and followed by a chronologically consecutive positive emotion clip.

Note: PE=positive emotion; Full coding manual available from author upon request

Table 2

Mean proportion of clips in which a family behavior or sustainment was observed (N=31)

	Total			Boys			Girls			T-Test	
	ICC	N	M (SD)	Range	N	M (SD)	Range	N	M (SD)		Range
Family interaction ^a											
With mother	.20	29	.70 (.16)	.38-.92	16	.66 (.17)	.38-.92	13	.74 (.15)	.41-.92	-1.36
With father	.21	31	.69 (.21)	.15-1.00	17	.68 (.24)	.32-1.00	14	.69 (.19)	.15-.90	-0.03
With sibling(s)	.12	31	.51 (.15)	.26-.88	17	.58 (.14)	.26-.88	14	.43 (.13)	.27-.66	3.11**
Mutual display of PE ^b											
With mother	.10	29	.55 (.16)	.28-.85	16	.52 (.17)	.28-.80	13	.59 (.14)	.35-.85	-1.20
With father	.21	31	.53 (.23)	0-.89	17	.43 (.25)	0-.89	14	.66 (.12)	.44-.87	-3.47**
With sibling(s)	.14	31	.55 (.19)	.10-.81	17	.62 (.15)	.33-.81	14	.45 (.21)	.10-.73	2.55*
Touch	.14	31	.30 (.15)	.09-.68	17	.29 (.15)	.09-.68	14	.32 (.15)	.09-.61	-0.59
Joint leisure	.24	31	.35 (.18)	.03-.80	17	.37 (.20)	.03-.80	14	.32 (.17)	.07-.61	0.75
Solitary leisure	.24	31	.09 (.07)	0-.28	17	.10 (.08)	0-.28	14	.07 (.06)	0-.19	1.44
Sustainment	.12	31	.34 (.15)	.06-.67	17	.31 (.16)	.06-.67	14	.37 (.13)	.13-.53	-1.14

Note:

* $p < .05$

** $p < .01$

^a Interaction was coded only when the family member was on screen with the target child.

^b Mutual display of PE for a specific family member was assessed only if he or she had interacted with the target child within the 30-second clip.

Table 3

Results of five multilevel analyses testing family behavior as a predictor of the sustainment of child positive emotion expression

	N _{subjects}	n _{clips}	Fixed Effect				
			OR	SE	Z	p	95% CI
Predictor variables							
Mother mutual display of PE	29	1711	1.77	.34	2.93	.003	[1.21, 2.59]
Father mutual display of PE ^a	30	1688	1.91	.38	3.28	.001	[1.30, 2.81]
Sibling mutual display of PE	31	1123	2.02	.45	3.15	.002	[1.30, 3.12]
Touch	31	3250	3.00	.59	5.58	< .001	[2.04, 2.21]
Joint leisure	31	3250	1.49	.20	3.06	.002	[1.15, 1.93]

Note: OR – Odds ratio represents the fixed effect of the independent measure on PE sustainment. Coefficients were set as random in all five models.

^aOne father did not have any instances of mutual displays of PE with the target child