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Children's Physiological Indices of Empathy and Their Socioemotional Adjustment: Does Caregivers' Expressivity Matter?

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Relations of heart rate and skin conductance reactions to mildly evocative empathy-inducing slides with socioemotional functioning were examined for 154 children (mean age = 9 years, 5 months). In addition, maternal expressivity was tested as a moderator of these relations. Parents and teachers rated children's socioemotional functioning, and a behavioral measure of children's regulation was obtained. Boys who exhibited higher skin conductance and higher heart rate to slides depicting negative emotions were better regulated, less emotionally intense, and better adjusted than their peers. Furthermore, boys' regulation and adjustment were positively related to such physiological responding to negative slides if maternal negative expressivity was relatively low or moderate, but not high. Fewer findings were obtained for girls or for positive slides.

Although empathy has been defined in various ways, one representative definition is an affective reaction that stems from the apprehension or comprehension of another's emotional state or condition and is identical or very similar to what the other person is feeling or would be expected to feel (Eisenberg & Fabes, 1990). Depending on how intensely empathy is experienced, empathy is believed to lead to sympathy (i.e., concern or sorrow for another) or personal distress. When empathy is experienced at a moderate level, it is believed to lead to sympathy (Eisenberg, Fabes, Murphy, et al., 1996), whereas intense empathy is expected to result in personal distress, defined by Batson (1991) as a self-focused aversive reaction to another's distress such as discomfort or anxiety. Mild empathy may lead to neither personal distress nor sympathy.

Individuals differ in how physiologically responsive they are to empathy-eliciting situations, and such responding is believed to relate to their regulatory abilities, emotionality, and adjustment for at least two reasons. First, those who cannot adequately regulate their empathic arousal (e.g., are overly reactive to empathy-eliciting situations) are at greater risk for experiencing personal distress, which might result in compromised social functioning. For example, individuals prone to personal distress are relatively low in prosocial behavior (Batson, 1991; Eisenberg & Fabes, 1990), and children who are highly facially reactive to empathy-inducing stimuli involving negative emotions (i.e., exhibit negative emotion while viewing the films) tend to have externalizing problems (e.g., Cole, Zahn-Waxler, Fox, Usher, & Welsh, 1996). Second, and more relevant to this study, a lack of empathic responsivity is viewed as contributing to externalizing problems (e.g., Frick, 1998). Theorists have argued that empathy reduces or inhibits antisocial behavior toward others (Feshbach & Feshbach, 1982; Mehrabian & Epstein, 1972), and empirical findings provide some support for this assumption (Miller & Eisenberg, 1988; Zhou et al., 2002). Moreover, children who are unresponsive to others' emotions are likely to be socially insensitive.

The purpose of the present study was to examine the relations of physiological indices of empathy (i.e., heart rate and skin conductance) to children's regulation, emotionality, and adjustment and whether maternal expressivity moderates these relations. Investigators commonly use heart rate and skin conductance arousal as indices of empathy because people typically show some autonomic arousal when exposed to others' emotions, even if only through static slides or very short film clips (Blair, 1999; Buck, 1975; Craig & Lowery, 1969; Levenson & Ruef, 1992; Zahn-Waxler,

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This study is part of a larger longitudinal study. A number of articles have been published on the first three assessments following the initial article (Eisenberg, Fabes, Guthrie, et al., 1996).

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Cole, Welsh, & Fox, 1995).[1] However, the meaning of physiological arousal in response to empathy-inducing stimuli would be expected to vary with the intensity of the stimulus. Relatively intense or evocative stimuli are expected to evoke sympathy or personal distress, especially if stimuli clearly depict negative emotions and provide detail about another person's situation and/or emotion (e.g., as in a videotape that includes vivid visual and verbal information). Therefore, high physiological arousal in response to relatively intense or evocative stimuli likely indicates empathic overarousal or personal distress. In contrast, physiological arousal to mild stimuli such as a static picture of a smiling or crying person with no explanation of their situation likely indicates empathy because few individuals would be expected to experience either empathic overarousal (i.e., personal distress) or much sympathy to such mild stimuli.

If physiological responsiveness to mildly evocative stimuli indicates empathy, it is reasonable to predict that children who tend to be unresponsive to such mild stimuli are likely to be poorly regulated, low in social competence, and at risk for externalizing problems. Consistent with the notion that empathy forestalls aggression, children and adolescents who demonstrate stable and serious patterns of delinquency are described as exhibiting shallow affect and low empathy (Frick, 1998; Lynam, 1997). Of particular relevance, Cole et al. (1996) found that preschoolers who were facially unresponsive to short (15-s) empathy-inducing clips (e.g., a child who was lost in a shopping mall) were relatively high in externalizing problems and more depressed and anxious at a follow-up; they also showed little autonomic nervous system change (i.e., heart rate and skin conductance) when viewing the film clips. Similarly, those with psychopathic traits appear to be less physiologically responsive to emotion-eliciting stimuli (most often evaluated with slides) and to cues of others' distress than are those without such traits (Blair, 1999; Blair, Jones, Clark, & Smith, 1997; Levenston, Patrick, Bradley, & Lang, 2000) and have difficulty recognizing others' negative emotions (Blair, Colledge, Murray, & Mitchell, 2001).

It is slightly more difficult to predict how children's physiological responsiveness to empathy-eliciting stimuli might relate to their dispositional negative emotionality. Elementary school children's sympathy often has been associated with low levels of adult-reported negative emotionality (e.g., Eisenberg, Fabes, & Murphy, et al., 1996). This makes sense given that adults' (especially teachers') reports of children's dispositional negative emotion often reflect children's anger and frustration, which is more easily observed than sadness and anxiety (Eisenberg et al., 1993). Thus, we expected children who are physiologically responsive to mild empathy-eliciting stimuli to be perceived by adults as low on negative emotional intensity. In addition, we expected children prone to intense positive emotions to be physiologically responsive to empathy-inducing stimuli (Eisenberg et al., 1994), especially when they depicted positive emotions.

In brief, for conceptual and empirical reasons, we expected physiological responsiveness (most likely indicated by skin conductance and heart rate acceleration, but perhaps deceleration) to mild empathy-eliciting stimuli to be associated with positive social adjustment, regulation, and low levels of negative emotionality. However, we also expected these associations to differ depending on the valence of the emotion likely to be elicited, as well as the child's familial experience. With regard to the former issue, there is some evidence that empathy with positive emotions (e.g., happiness) may not be equivalent to empathy with negative emotions (e.g., sadness). Feshbach (1982) found that schoolchildren's empathy with positive emotions was positively related to boys' (but not girls') aggression, whereas empathy with negative emotions was negatively related to such aggression in boys and girls; Feshbach suggested that the aggressive boys empathized with positive emotions to elevate their own mood (i.e., for self-serving reasons). In another study, Zhou et al. (2002) found that empathy, as assessed with self-reports and facial reactions, was more consistently related to adjustment when it occurred in response to stimuli involving negative emotions. Moreover, men's empathy with positive emotions has been associated with cognitive role-taking skills, whereas their empathy with negative emotions has been associated with sympathy (Davis, Hull, Young, & Warren, 1987). Thus, it is likely that the meaning of physiological arousal differs when it is evoked by positive and negative emotional stimuli. Because empathy with others' negative states is important for moral and social functioning (Eisenberg & Miller, 1987; Hoffman, 2000), we expect empathy with negative emotions to be more consistently related to socioemotional functioning than empathy with positive emotions.

In addition, parental expressiveness likely relates to children's empathy-related physiological responding and/or moderates its relations to children's regulation, emotionality, and social functioning. *Expressiveness* is defined as "a persistent pattern or style in exhibiting nonverbal and verbal expressions that often but not always appear to be emotion-related" (Halberstadt, Cassidy, Stifter, Parke, & Fox, 1995, p. 93). Parental expressiveness reflects parents' tendencies to express emotions in the presence of (but not necessarily directed toward) their children. Positive expressivity refers to positive emotional expressions such as praising someone, and/or expressing admiration or gratitude for a favor. Negative expressivity may be dominant (i.e., involve the display of assertive emotions such as anger and hostility) or submissive (i.e., involve less assertive emotional displays such as sulking, expressing sorrow, and/or crying).

There are numerous conceptual reasons why parental expressivity might be directly or indirectly associated with children's empathy-related responding. Parental positive expressivity may foster children's feelings of security, con-

[1] Although heart rate deceleration may accompany sympathy because of an intense focus on information stemming from the other person (Eisenberg & Fabes, 1990), it would not necessarily be expected when people experience mild empathy. In general, the interpretation of heart rate acceleration and decline with regard to emotional arousal is less clear than for skin conductance.

trol, and trust in the environment, which would minimize self-concern and heighten the probability of the child considering and responding to others' feelings (e.g., Staub, 1979). In contrast, children exposed to high levels of negative emotion are likely to be emotionally insecure (Davies & Cummings, 1994) and consequently focused on their own needs rather than those of others. Consistent with these arguments, positive family/parental expressiveness has been linked to children's adjustment and social competence; however, findings for negative expressivity are mixed (Halberstadt, Crisp, & Eaton, 1999).

Exposure to parental expressivity also provides opportunities for experiencing and learning about others' emotion. In addition, children in expressive families would be expected to learn that it is acceptable to experience and express emotions, including the vicarious emotions evoked by others' happiness or negative emotions (e.g., empathy). However, although exposure to low or moderate levels of parental negative emotion may foster an understanding of others' emotions and the ability or willingness to experience them, high levels of parental negative emotion may undermine the development of empathy by disrupting children's learning about others' emotions and conflict management skills (Dunn & Brown, 1994; Hoffman, 2000).

There is a growing body of research suggesting that self-reported, adult-reported, and facial empathy-related responding are positively related to parental positive expressivity and perhaps parental warmth (e.g., Zhou et al., 2002), especially for females (Eisenberg, Fabes, Schaller, Carlo, & Miller, 1991; Spinrad et al., 1999), although this has not always been found (e.g., Eisenberg et al., 1992; Eisenberg, Liew, & Pidada, 2001). Conversely, some evidence suggests that parental negative expressivity (dominant and submissive) is negatively related to empathy-related responding (Eisenberg et al., 1992; Eisenberg, Liew, & Pidada, 2001). However, parental submissive negative emotion sometimes has been positively related to adults' empathy-related responding (Eisenberg, Fabes, Schaller, Miller, et al., 1991) as well as to young girls' (but not boys') facial concerned attention (Eisenberg et al., 1992).

Relations of parental expressivity to physiological measures of empathy have rarely been examined. In one study, adults' skin conductance reactions to an evocative empathy-inducing film were unrelated to reports of parents' expressivity (in the family of origin); in contrast, heart rate deceleration was associated with positive family expressivity, albeit primarily for male participants (Eisenberg, Fabes, Schaller, Miller, et al., 1991). Thus, evidence of a direct relation between parental expressivity and physiological indices of empathy-related responding is sparse and, to our knowledge, has not been examined when assessing empathy with mild stimuli.

We hypothesized that parental expressivity also can moderate the association between physiological responsiveness to empathy-eliciting stimuli and children's dispositional regulation and socioemotional functioning because the meaning of empathy-related physiological responding may be qualitatively different for children exposed to high versus lower levels of emotion in the home. For example, children who are exposed to high levels of parental negative emotion, in comparison to those exposed to lower levels, may be more reactive to others' negative emotion, deem them more threatening, and respond with either greater distress or distancing (and emotion suppression). Findings on parental conflict are consistent with the perspective that exposure to negative emotion in the home can be very upsetting to children and undermine their adjustment (e.g., Davies & Cummings, 1994). Moreover, children from positively expressive families may not only be more receptive to others' positive emotions but also be less likely to empathize with others' positive emotion merely to elevate their own mood (because they have less need to do so). Thus, we predicted that the strength or direction of associations between physiological responsiveness to empathy-eliciting stimuli and regulation, emotionality, or social functioning might differ for children in highly expressive and less expressive families. Specifically, we expected children's physiological responsiveness to mildly negative stimuli to be positively associated with regulatory abilities, low negative emotionality, and positive adjustment in cases in which parental negative expressivity is low or moderate, but not high. Similarly, we tentatively predicted that physiological responsiveness to others' positive states would be positively related to regulation, low emotionality, and positive adjustment primarily in families that were high rather than low in positive expressivity.

Finally, gender differences have sometimes been found in the relations between physiological arousal and sympathy (Eisenberg et al., 1996; Guthrie et al., 1997), empathy with positive emotions and externalizing behavior (Feshbach, 1982), and family expressivity and empathy-related responding (e.g., Eisenberg et al., 1992; Eisenberg, Fabes, Schaller, Carlo, & Miller, 1991). Thus, despite little evidence to confirm a sex difference in empathy-related physiological responding (Eisenberg et al., 1990), we examined the relations of physiological responding to measures of regulation and socioemotional competence separately for boys and girls.

Method

Participants

The initial sample consisted of 199 children (97 girls, 102 boys) in kindergarten through third grade who were participants in a longitudinal study (see also Eisenberg, Fabes, Guthrie, & Reiser, 2000; Eisenberg, Losoya, et al., 2001; Zhou et al., 2002). In the current study, the sample consisted of children who participated in the second assessment conducted 2 years after the initial assessment. Of these 166 children, the 154 children who participated in physiological assessments were included in the analyses (mean age = 9 years, 5 months; *SD* = 1 year 2 months; range = 7 years 4 months to 12 years 5 months), including 78 girls and 76 boys (mean ages = 9 years 4 months, *SD* = 1 year 2 months; and 9 years 5 months, *SD* = 1 year, 2 months, respectively).

The participants in the current study were mostly from Euro-American middle-class families (78%) residing in a large metropolitan area; 13% of the children were reported to be Hispanic (non-Black), 4% were Native American, 2% were Asian American, 1% was African American, and 2% were of mixed origin. The

mean years of parental education were 15.0 (SD = 2.2 years; range = 11 to 20 years) for mothers, and 15.1 (SD = 2.7 years; range = 8 to 20 years) for fathers. Family income ranged from \$4,000 to \$175,000 (M = \$49,000, SD = \$27,900; Mdn = \$50,000).[2]

Procedures

Parents (146 mothers) came to the laboratory with their children (8 fathers provided the questionnaire data with the exception of reports of parental emotional expressivity). Children participated in some tasks while their parents completed questionnaires that assessed children's emotionality, regulation/control, and externalizing problem behavior, as well as their own expressivity. Teachers completed similar questionnaires (and one concerning social competence) after children came to the laboratory, near the end of each school semester.

At the laboratory, an experimenter (who was the same sex as the child) placed two heart rate electrodes on the child's lower lateral ribs and a ground electrode on the child's stomach, as well two skin conductance electrodes on the child's nondominant (usually the left) hand. The electrodes were connected to Colbourne equipment, as well as to a computer and physiograph in an adjacent room. The parent stayed with the child during the electrode hook-up procedures and then went to a separate room to complete questionnaires.

Next, the child completed questionnaires for approximately 20 min and then viewed a series of 12 slides (using a procedure similar to Buck, 1975). There were four slides in each of three valence categories: (a) pleasant (e.g., children at a birthday party, children swimming in a pool, a smiling girl standing in front of a tree, and a grandfather smiling with a baby in his arms), (b) unpleasant (e.g., child crying in a war scene, man with a crying girl, a woman with her head in her hands, and a frightened looking child), and (c) neutral (abstract art with photographic effects). Some of the slides had been used previously by Buck (1975), but some new ones were selected to replace slides that were too graphic for young children. The order in which the series of slides was presented to the children was counterbalanced. Consistent with the content of the slides, children exhibited more facial negative emotion in response to the negative than the positive or neutral slides and more positive facial reactions to the positive slides than the neutral ones. Moreover, children's facial and self-reported reactions to the slides correlated with their social competence and adjustment (Zhou et al., 2002).

The child viewed the slides with the experimenter; both sat facing a small slide screen. The slide projector automatically showed a blank slide followed by a stimulus slide. The blank screen was shown for 10 s, and each stimulus slide was shown for 15 s. Throughout the slide presentation, the experimenter did not make eye contact or interact with the child. The child's physiological responses were recorded during the slide presentation.

After removing the electrodes, the child participated in a puzzle task that assessed the child's attentional persistence and ability to inhibit cheating (regulation). The experimenter told the child to assemble a puzzle in a large box without looking at it and that the child would receive an attractive prize if he or she finished within 5 min. A cloth covered the front of the box, and the child slipped his or her arms through sleeves to get into the box and work on the puzzle. Although the child was told to work without looking, the child could cheat by lifting up the cloth to look at the puzzle. While the child was working on the puzzle, a timer was visible. The child's on-task and cheating behaviors were recorded with a hidden camera.

Measures

Physiological, observational, and questionnaire measures were obtained.

Heart Rate (HR) Responses

Children's HR responses were collected on-line into a computer every 10 ms. Mean HR was calculated every 0.5 s. HR artifacts (e.g., responses that were clearly related to children's movement or coughing) were edited with computer software.

The *slopes* for HR responses (e.g., linear changes in an individual's HR) were calculated during the positive and negative slides using the first 8 s of each slide. Slopes were calculated by computing (for each participant) the correlation between mean HR during the consecutive half-second periods and the time period of the HR (numbered from 1 to k, with k being the number of half-second periods). In addition, mean baseline HR just prior to the HR used to compute the slopes was calculated from the last four half-second periods prior to viewing the evocative slide (during the blank slide). HR slopes that are positive represent HR acceleration; negative slopes reflect deceleration. HR slopes were averaged across slides, separately for positive and negative slides, as were the scores for baseline HR. Henceforth we refer to the HR slope as *HR responses.* HR responses during the abstract slides were not used.

Skin Conductance (SC) Responses

The amplitude and number of SC phasic responses were calculated when children viewed the positive and negative slides and during the baseline period before each slide. The baseline period was the mean of a child's responding during the 3rd through 10th seconds of viewing the blank slide presented just prior to each slide. SC during the evocative slides was the average of the first 8 s of viewing a given slide.

SC responses were detected when phasic responses during this period increased more than .05 micro-ohms. SC artifacts that were marked on a polygraph output at the time of data collection (due to yawning, coughing, or large body movements) were edited out with computer software. SC responses that were both larger than 3.00 micro-ohms and 2.5 SDs larger than the mean response for that child were considered to be artifact and were edited out. A

[2] We compared the demographic and socioemotional measures that were available at the initial assessment (i.e., all except inhibitory control) for the 166 children who participated in the second assessment and the 33 children who did not participate (even by mail). There were no differences between the groups on maternal or paternal education, family income, family structure, or race/ethnicity. Children who did not participate after the initial assessment were rated by their parents as higher on attentional shifting, $F(1, 188) = 7.81$, $p < .01$, but marginally lower on teacher-rated attention focusing, $F(1, 196) = 3.53$, $p < .07$. Findings were similar when the 154 children with physiological data were compared with those without physiological data (including those who attrited), except that the differences for race/ethnicity, $\chi^2(5, N = 199) = 13.36$, $p < .02$, parent-reported attention shifting, $F(1, 188) = 5.73$, $p < .02$, and teacher-reported attention focusing, $F(1, 196) = 4.09$, $p < .05$, were all significant. In addition, children who did not participate in the physiological assessment at the follow-up were rated by their parents as lower on ego control, $F(1, 188) = 4.02$, $p < .05$.

computer software program converted the number of SC responses into the rate of phasic responses per minute and also computed the mean amplitude across the individual's phasic responses. SC responding was averaged across the four negative slides or the four positive slides as well as across the four baseline periods for positive or negative emotions. Mean amplitude and mean number of SC responses were significantly correlated with one another for the baseline positive period, the positive slide, the baseline negative period, and the negative slides, $rs(154) = .64, .58, .53$, and $.64$ ($ps < .01$), respectively. Thus, the mean amplitude and number of SC responses were standardized and averaged to create composite measures of *baseline SC* and for *SC responses for positive and negative slides.*

Regulation/Control

Regulation or control (i.e., ego control) measures included parents' and teachers' reports of temperamental effortful attention (e.g., shifting and focusing) and behavioral (e.g., inhibitory control) regulation, ego control, and an observational measure of regulation (the puzzle box).

Attentional control. Parents and teachers rated children's attentional shifting and focusing on a 7-point scale using items from the Child Behavior Questionnaire (Rothbart, Ahadi, Hershey, & Fisher, 2001). Some items were slightly modified for teachers because the CBQ was originally designed for parents. Parents and teachers rated 11 items for attention shifting (e.g., "can easily shift from one activity to another"; $\alpha s = .77$ and .87 for parents and teachers, respectively) and 12 items for attentional focusing (e.g., "has difficulty leaving a project he/she has begun"; $\alpha s = .82$ and .89 for parents and teachers, respectively).

Inhibitory control. Parents and teachers rated children on inhibitory control with 13 items (e.g., "can wait before entering into new activities if he/she is asked to") using the CBQ subscale ($\alpha s = .81$ and .89 for parents' and teachers' ratings, respectively).

Ego control. Parents and teachers rated children's undercontrol versus overcontrol on a 9-point scale ranging from 1 (*most undescriptive*) to 9 (*most descriptive*) for 19 items from the Block and Block Q-sort (Block & Block, 1980; Caspi et al., 1992; see Guthrie et al., 1997, for details). Most items pertained to behavioral control ("is inhibited and constricted.") Alpha values for parents and teachers were .75 and .85, respectively.

Puzzle box task. Children's observed regulation was indexed by the time (in seconds) that children persisted without cheating on the puzzle box when alone (interrater reliability based on 76 children was .93). Because some children stopped working on the puzzle before the allotted 5 min had passed, proportion of time working was computed by dividing the number of seconds working by the total amount of time. In addition to children's persistence on the puzzle box, cheating was timed (interrater reliability, Pearson $r, = .93$) and proportion of time cheating was computed by dividing the time cheating by total time with the puzzle. A composite score for observed regulation during the puzzle task was constructed by subtracting the standardized scores for cheating from the standardized scores of observed persistence. This measure generally correlates with adult-report measures of regulation (e.g., Eisenberg et al., 2000).

Data reduction for regulation/control. A principal-components factor analysis with a varimax rotation was conducted separately for parents' and teachers' ratings of measures of control/regulation. For both parents and teachers, factor analysis yielded a single factor (accounting for 63% and 73% of the factor variance, respectively), with loadings ranging from .65 to .95. Therefore, the four scales were standardized and averaged for both parents and teachers. To further reduce the number of measures of children's regulation/control, we conducted a principal-components factor analysis with a varimax rotation on adult-reported and observed (e.g., puzzle task) regulation. This analysis yielded one factor: parent-rated regulation/control (.85), teacher-rated regulation/control (.86), and observed regulation (.53), accounting for 58% of the factor variance. Thus, to reduce the number of variables and increase reliability of the measure (Rushton, Brainerd, & Pressley, 1983), scores for adults' reports and observed regulation were standardized and averaged to assess regulation.

Emotional Intensity

On a scale ranging from 1 (*never*) to 7 (*always*), parents and teachers rated children's general emotional intensity (e.g., "my child [this child] responds very emotionally to things around him/her"; 7 items), positive emotional intensity (e.g., "when my child [this child] is happy, it is like he/she is bursting with joy"; 6 items), and negative emotional intensity (e.g., "when my child [this child] gets nervous or distressed, he/she gets very nervous/upset"; 5 items); items were adapted from Larsen and Diener's (1987) Affect Intensity Scale (Eisenberg et al., 2000). Alphas for parents' and teachers' reports were .74 and .90 for general emotional intensity, .84 and .92 for positive emotional intensity, and .78 and .86 for negative emotional intensity, respectively. For both parents' and teachers' reports, general and negative emotional intensity were positively correlated, $rs(149, 147) = .55$ and $.76$ $ps < .01$, respectively, so these scales were standardized and averaged within reporter. Further, parents' and teachers' composites for negative/general emotional intensity were positively correlated, as were their composites for positive emotional intensity, $rs(153, 148) = .22$ and $.30$, $ps < .01$. Thus, parents' and teachers' composites were standardized and averaged to create separate composites for adult-reported negative emotional intensity and positive emotional intensity.

Social Functioning and Adjustment

Children's externalizing problem behavior was assessed with the Child Problem Behavior Checklist (CBC; Lochman & Conduct Problems Prevention Research Group, 1995). Parents and teachers completed 23 items (e.g., "argues," "lies," "aggressive to adults," "physically harms other children") on a 4-point scale ranging from 1 (*really false*) to 4 (*really true*) $\alpha s = .91$ and .97. Teachers' reports were positively skewed, and the inverse transformed scores were used in analyses.

In addition, on a 4-point scale ranging from 1 (*really false*) to 4 (*really true*) teachers rated 7 items concerning children's socially appropriate behaviors (e.g., "my/this child is usually well behaved"; 4 items) and popularity (e.g., "my/this child has a lot of friends"; $\alpha = .90$; 3 items) (Eisenberg et al., 1993).

To further reduce the number of variables on children's social functioning, we conducted a principal-components factor analysis with a varimax rotation on adults' reports, and yielded one factor (accounting for 65% of the factor variance): parent-reported externalizing problem behavior (.71), teacher-reported externalizing problem behavior (.85), and teacher-reported social competence ($-.85$). The standardized scores for teacher-reported externalizing problem behavior and reversed social competence were averaged to construct a composite, and this teacher-report composite was then averaged with the standardized score for parent-reported externalizing behavior to derive a composite for *adult-reported maladjustment.*

Maternal Emotional Expressivity

Mothers completed a 34-item version of Halberstadt et al.'s (1995) Self Expressiveness in the Family Questionnaire (fathers who were primary caregiving parents were not included). On a 9-point scale ranging from 1 (*rarely expresses feeling*) to 9 (*frequently expresses feeling*), mothers rated how frequently they express emotions with family members that are positive (e.g., "expressing excitement over future plans," "expressing gratitude for a favor"; 14 items, $\alpha = .88$), negative-dominant (e.g., "quarreling with a family member"; 10 items, $\alpha = .71$) and negative-submissive (e.g., "crying after an unpleasant disagreement"; 10 items, $\alpha = .81$). Scores for positive expressivity were not related to negative dominance, $r(146) = .11$, *ns*, but were positively related to negative submissive expressivity, $r(146) = .40$, $p < .01$. Negative-dominant and negative-submissive subscales were positively related, $r(146) = .49$, $p < .001$. Because the latter correlation was relatively high and these scales frequently have been combined in other research (Halberstadt et al., 1995), the negative-dominant and negative-submissive subscales were standardized and averaged to compute a composite for *mothers' negative expressivity* in the family.[3]

Results

Descriptive Statistics

Means and standard deviations for the major variables are presented in Table 1. Nontransformed means prior to standardization are presented.

Relations of Child Age and Gender to Major Variables

Relations of age with major variables were examined. Baseline responding for HR or SC was controlled (e.g., partialed) in all analyses with physiological measures. Age of child was positively related to regulation and negatively related to maternal positive expressivity, rs(154, 146) = .19 and $-.22$, ps $< .02$ and .01, respectively; no other correlations with age were significant.

We conducted analyses of covariance to examine whether there were gender differences in children's physiological responses when the effects of the relevant baseline were partialed out. There were no differences between boys' and girls' HR or SC during positive and negative slides. However, there were gender differences in baseline HR and baseline SC responses, Fs(2, 151) = 3.95 and 4.98, ps $< .03$ and .01, for HR and SC, respectively (see Table 1 for means). Girls had higher baseline HR before the positive and for the negative slides and higher SC responses during the negative slides than did boys, Fs(1, 152) = 5.92, 7.93, and 6.36, ps $< .02$, .01, and .02, respectively. In addition, as has been reported elsewhere (i.e., Zhou et al., 2002), girls scored higher on regulation and lower on maladjustment than did boys.

Relations Between HR and SC Responding

Girls', but not boys', HR during positive slides was significantly correlated with HR during negative slides, partial $r(74) = .37$, $p < .01$. SC responses during positive and negative slides were significantly related for both girls and boys, rs(74, 72) = .42 and .65, respectively, ps $< .01$. However, HR and SC were not correlated with each other for boys or for girls.

Partial Correlations Between HR or SC Responding and Measures of Regulation/Control, Emotionality, and Maladjustment

We computed partial correlations to examine relations between children's HR or SC and their socioemotional functioning (i.e., the composites of children's regulation/control, negative or positive emotional intensity, and maladjustment) while controlling for the relevant baseline physiological responding. Results for correlations with and without controlling for age effects were highly similar so only the latter are presented. Because the number of significant correlations for girls did not exceed chance levels, these are not discussed.

In regard to responses during the slides with negative content, boys' relative HR acceleration (vs. deceleration) and SC responses were significantly, positively related to regulation/control (see Table 2). (In both cases, the behavioral measure of regulation/control was a relatively strong correlate of physiological responding, so the findings were not based solely on adults' reports.) Boys' HR responses during negative slides was also negatively related to negative emotional intensity (findings for SC were similar but only marginally significant) as well as maladjustment (the latter correlation differed significantly for boys and girls).

In contrast, boys' HR during positive slides was not related to any of the socioemotional outcomes. However, similar to the findings for boys' HR during negative slides, boys' SC responses during positive slides were positively related to regulation and negatively related to positive and negative emotional intensity.

Relations of Physiological Reactivity With Mothers' Emotional Expressivity

Girls' SC responses during negative emotional stimuli were negatively related to mothers' positive expressivity (whereas HR was marginally positive related to both types of expressivity). No significant correlations were found for boys.

Regression analyses were used to examine whether mothers' positive or negative expressivity moderated the relations of physiological arousal with socioemotional function-

[3] Six positive expressivity items in the SEFQ that were not recommended for a short positive expressivity scale by Halberstadt et al. (1995) were dropped to save administration time. In addition, the item "sulking over unfair treatment by a family member," which was coded as submissive negative emotion in Halberstadt (1986) but as dominant negative emotion in Halberstadt et al. (1995) was left as submissive negative emotion. Findings for submissive and dominant maternal expressivity generally were similar in direction and/or were both nonsignificant.

Table 1
Means and Standard Deviations for Major Variables

Variable	Total	Girls	Boys
	M (*SD*)	*M* (*SD*)	*M* (*SD*)
HR slope			
Negative slides	−0.09 (0.47)	−0.07 (0.48)	−0.12 (0.47)
Positive slides	0.04 (0.46)	0.03 (0.46)	0.05 (0.47)
HR slope baseline			
Negative slides	85.70 (10.54)	88.01 (10.08)	83.33 (10.54)
Positive slides	86.63 (10.64)	88.66 (9.95)	84.55 (10.98)
Mean HR during slides			
Positive slides	86.61 (10.18)	88.41 (9.58)	84.77 (10.50)
Negative slides	84.80 (10.09)	86.90 (9.67)	82.65 (10.13)
Skin responses			
Negative slides[a]	0.00 (0.91)	−0.10 (0.92)	0.10 (0.88)
Delta	0.19 (0.31)	0.21 (0.36)	0.17 (0.25)
Number	0.63 (0.71)	0.62 (0.73)	0.65 (0.70)
Positive slides[a]	0.00 (0.89)	0.04 (1.06)	−0.04 (0.68)
Delta	0.17 (0.26)	0.17 (0.28)	0.16 (0.23)
Number	0.62 (0.69)	0.59 (0.70)	0.66 (0.69)
Skin responses baseline			
Negative slides[a]	0.00 (0.88)	0.17 (0.95)	−0.18 (0.76)
Delta	0.16 (0.35)	0.20 (0.43)	0.11 (0.21)
Number	0.52 (0.69)	0.56 (0.68)	0.47 (0.69)
Positive slides[a]	0.00 (0.90)	−0.05 (0.91)	0.05 (0.90)
Delta	0.12 (0.24)	0.12 (0.26)	0.12 (0.20)
Number	0.48 (0.69)	0.42 (0.64)	0.53 (0.73)
Regulation			
Parent reports[a]	0.00 (0.80)	0.11 (0.76)	−0.11 (0.83)
Attentional shifting	4.30 (0.79)	4.41 (0.77)	4.19 (0.81)
Attentional focusing	4.83 (0.92)	4.92 (0.90)	4.74 (0.94)
Inhibitory control	5.16 (0.84)	5.33 (0.77)	4.98 (0.88)
Ego control	4.77 (0.98)	4.77 (0.98)	4.78 (0.98)
Teacher reports[a]	0.00 (0.84)	0.29 (0.72)	−0.29 (0.85)
Attentional shifting	4.66 (0.98)	4.99 (0.79)	4.32 (1.04)
Attentional focusing	4.67 (1.12)	4.89 (1.08)	4.45 (1.12)
Inhibitory control	5.08 (1.18)	5.51 (0.92)	4.64 (1.25)
Ego control	5.22 (1.13)	5.51 (0.99)	4.92 (1.19)
Puzzle task[a]	0.00 (1.91)	0.13 (1.93)	−0.14 (1.89)
Persistence	0.73 (0.28)	0.75 (0.28)	0.71 (0.28)
Cheating	0.20 (0.23)	0.18 (0.23)	0.21 (0.23)
Negative/general emotionality			
Parent reports[a]	0.00 (0.88)	0.19 (0.84)	−0.20 (0.88)
Negative emotional intensity	4.19 (1.00)	4.27 (1.00)	4.11 (0.98)
General emotional intensity	4.43 (0.84)	4.66 (0.78)	4.19 (0.83)
Teacher reports	0.00 (0.94)	−0.20 (0.82)	0.20 (1.01)
Negative emotional intensity	3.59 (1.28)	3.29 (1.10)	3.90 (1.38)
General emotional intensity	3.75 (1.21)	3.60 (1.10)	3.91 (1.30)
Positive emotionality			
Parent reports	4.97 (1.02)	5.21 (0.93)	4.72 (1.06)
Teacher reports	4.13 (1.26)	4.16 (1.25)	4.10 (1.27)
Social competence			
Parent reports	NA	NA	NA
Teacher reports	3.17 (0.72)	3.33 (0.63)	3.01 (0.76)
Problem behavior			
Parent reports	2.12 (0.45)	2.08 (0.42)	2.17 (0.47)
Teacher reports	1.75 (0.69)	1.50 (0.53)	2.00 (0.74)
Mothers' expressiveness			
Positive	7.41 (0.96)	7.37 (0.97)	7.45 (0.96)
Negative	4.85 (0.98)	4.82 (0.96)	4.89 (1.01)
Negative-submissive	5.64 (1.17)	5.66 (1.07)	5.61 (1.27)
Negative-dominant	4.07 (1.11)	3.98 (1.13)	4.16 (1.08)

Note. NA = not available. HR = heart rate. Scores for individual variables are presented before any standardizing or transforming of the data (see text). For teachers' reports, *n*s = 74 for girls and 74 for boys. For parents' reports, *n*s = 78 for girls and 76 for boys. For mothers' reports on expressiveness, *n*s = 74 for girls and 72 for boys. Slopes were used in analyses; mean HR during slides is provided simply for descriptive purposes.
[a]Means and standard deviations for the composite score after standardizing.

Table 2
Relations of Children's Heart Rate (HR) and Skin Conductance (SC) With Regulation, Emotionality, Social Behavior, and Maternal Emotional Expressivity

	HR				SC			
	Negative slides		Positive slides		Negative slides		Positive slides	
Measure	Girls	Boys	Girls	Boys	Girls	Boys	Girls	Boys
Regulation	−.15	.39***	−.17	−.09	.16	.24*	.14	.30**
Negative/general emotionality	.04	−.23*	.21†	.18	.06	−.20†	.02	−.28*
Positive emotionality	.05	.02	.01	−.05	−.20†	−.23†	−.14	−.24*
Maladjustment	−.01[a]	−.36***	.09	.14	.05	−.10	.25[a]*	−.17
Mothers' positive expressivity	.20†	−.04	−.04	−.05	−.25*	−.13	−.02	−.09
Mothers' negative expressivity	.20†	.04	−.10	−.09	−.14	.04	−.16	.00

Note. Partial correlations are presented (controlling for baseline physiological responses). For all measures excluding mothers' expressivity, *n*s = 154, 78, and 76 for the total sample, girls, and boys, respectively. For mothers' expressivity, *n*s = 146, 74, and 72 for the total sample, girls, and boys, respectively.
[a] This correlation differed significantly ($p < .05$) between girls and boys.
†$p < .10$. *$p < .05$. **$p < .01$. ***$p < .001$.

ing. To reduce the number of analyses, and because parental expressivity was expected to have the greater relation to children's emotions of the same valence, in these analyses the valence of mothers' emotional expressivity matched the valence of emotion-eliciting slides as well as the valence of children's emotional intensity (e.g., negative expressivity was examined as a moderator of the relation of children's negative emotional intensity with their physiological responding during negative slides). All regression analyses were conducted separately for boys and girls and controlled for baseline physiological responding. Age was not included as a control variable because the results did not differ substantially when it was controlled.

To test the hypothesized interaction effects, four multiplicative (or interaction) terms were created by multiplying children's HR or SC responding with their mothers' negative or positive expressivity. Separate multiple regression analyses were then conducted with each of the multiplicative terms to predict children's regulation, positive or negative/general emotional intensity (whichever matched the emotional valence of the predictor variables), and maladjustment (resulting in 12 separate multiple regression analyses for each sex, including six for each valence of slides). For all regression analyses, baseline physiological responding was entered in the first step, physiological responses during emotional stimuli and mothers' emotional expressivity were entered in the second step, and the multiplicative term was entered in the final step. To map the moderation by mothers' negative expressivity for boys or girls, the slope and intercept of physiological arousal and regulation, emotional intensity, or maladjustment were estimated at the mean, one standard deviation above the mean, and one standard deviation below the mean of mothers' negative expressivity (Aiken & West, 1991).

Negative expressivity as a moderator. Results for the six regression analyses with mothers' negative expressivity as moderator for boys included three significant interactions. Mothers' negative expressivity moderated the relation between HR during negative slides and maladjustment; R^2 change for the final step = .05, $F(1, 67) = 4.00$, $p < .05$, unstandardized beta for the interaction = .81. Boys' HR during the negative slides was negatively related to maladjustment when mothers reported expressing low and moderate levels of negative emotions, slopes = −2.23 and −1.51, *p*s < .01 (see Figure 1). The relation between boys' HR and adjustment was not significant when mothers were high in negative expressivity, slope = −.78.

Mothers' negative expressivity also moderated the relation between SC responses during negative slides and both regulation and maladjustment; R^2 change for the interactions = .06 and .05, *F*s(1, 67) = 4.77 and 4.20, *p*s < .032 and .044, unstandardized betas for the interaction terms = −.40 and .32, for regulation and maladjustment, specifically. Boys' SC responding during negative slides was significantly positively related to regulation for mothers who reported expressing low and moderate, but not high, levels of negative emotion (slopes = .64, .29, and −.06, $p < .01$, $p < .10$, and $p = .39$, respectively; see Figure 2). In addition, boys' SC responses during negative stimuli were negatively related to maladjustment for mothers who reported expressing low, but not moderate or high, levels of negative emotions, slopes = −.36, −.08, and .21, $p < .05$, $p = .28$, and $p = .16$, respectively; see Figure 3). According to additional regressions including three-way interaction terms analyzing whether sex significantly moderated any of the interaction effects, the two findings for SC X negative parental expressivity differed significantly for boys and girls: R^2 change for the three-way interactions when predicting regulation and maladjustment = .028 and .044, respectively, *F*s for R^2 change(1, 137) = 4.55 and 7.18, *p*s < .04 and .01, unstandardized betas = −.53 and .54, respectively.

For girls, one of the six regression analyses including mothers' negative expressivity as the moderator was signif-

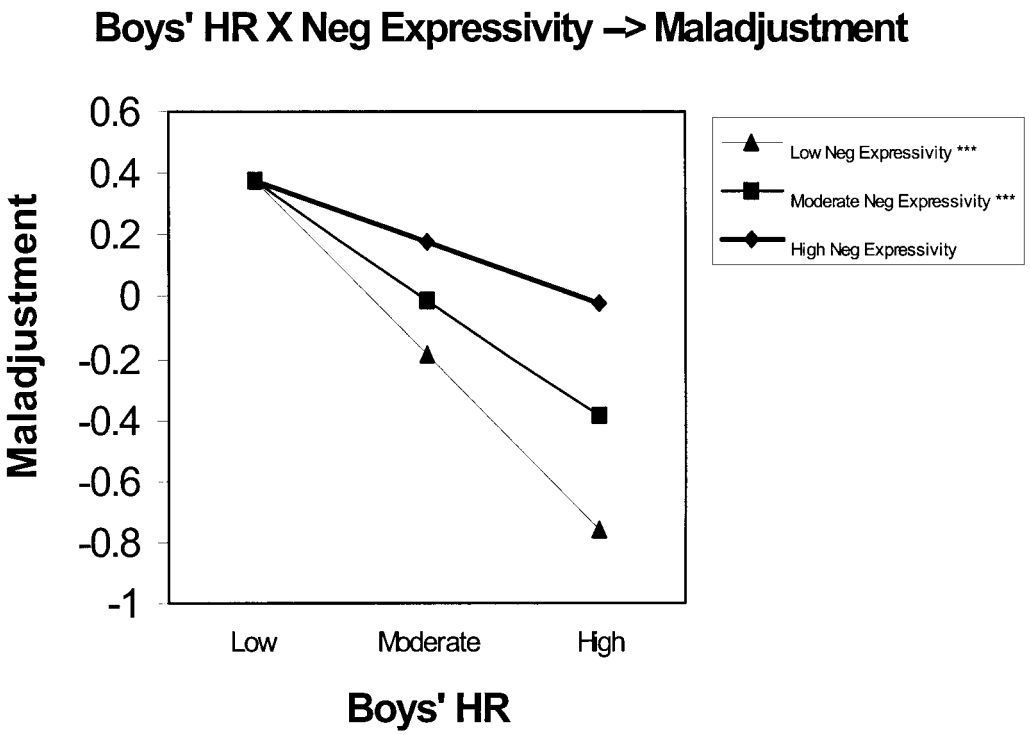

Figure 1. Parental negative expressivity as a moderator of the relation between boys' heart rate (HR) and maladjustment (composite of standardized measures): Negative slides. Neg = negative. ***$p < .001$.

icant. Mothers' negative expressivity significantly moderated the relation between HR responses during negative stimuli and girls' regulation; for the final step in regression analysis, R^2 change = .05, $F(1, 69) = 3.99$, $p < .05$, unstandardized beta = −1.07 for the interaction. As shown in Figure 4, HR during the negative slides was negatively related to regulation for girls with mothers who reported expressing moderate and high levels of negative emotions in the home (slopes = −.86 and −1.76, *p*s < .10 and .05, respectively). In contrast, girls' HR and regulation were not significantly related if mothers were low in negative expressivity (slope = .05). This interaction was not significant for boys but did not differ significantly by sex.

Positive expressivity as moderator. Mothers' positive expressivity did not significantly moderate the relation between boys' physiological arousal during positive slides and socioemotional functioning. For girls, mothers' positive expressivity moderated the relation between SC responses during positive emotional stimuli and positive emotional intensity; for the final step in regression analysis, R^2 change = .10, $F(1, 69) = 8.79$, $p < .01$, unstandardized beta for the interaction = .27. SC was negatively related to positive emotional intensity for girls with mothers who reported expressing low levels (slope = −.40, $p < .01$) but not medium or high levels of positive emotion (slopes = −.13 and .13, *ns*, respectively). In general, the mean level of positive emotional intensity was somewhat higher for girls with more positively expressive parents (especially at high levels of SC). Given that this was the only significant moderational finding for the positive slides (out of 12), it is quite possibly a chance finding.

Discussion

In general, the findings indicated that there were significant relations between boys' physiological arousal to mildly evocative slides and their regulation/control (including observed regulation), emotionality, and adjustment. Boys who exhibited higher SC responses to the mild slides and who exhibited greater HR acceleration (or, for some, less deceleration) were better regulated, less emotionally intense, and better adjusted than their less responsive peers. Thus, unlike the findings in studies involving relatively evocative empathy-inducing stimuli, that is, studies in which HR acceleration and SC responding were associated with low levels of prosocial behaviors (Eisenberg & Fabes, 1990; Zahn-Waxler et al., 1995) and seemed to reflect personal distress (Eisenberg et al., 1988), HR acceleration (or lesser deceleration) and SC responding in the present study generally were associated with boys' positive socioemotional functioning.

Children's HR acceleration (or lesser deceleration) and SC responses to mildly evocative slides likely reflected their emotional responsiveness to those stimuli. Individuals who are sensitive and responsive to mildly evocative stimuli would be expected to be sensitive and responsive in social

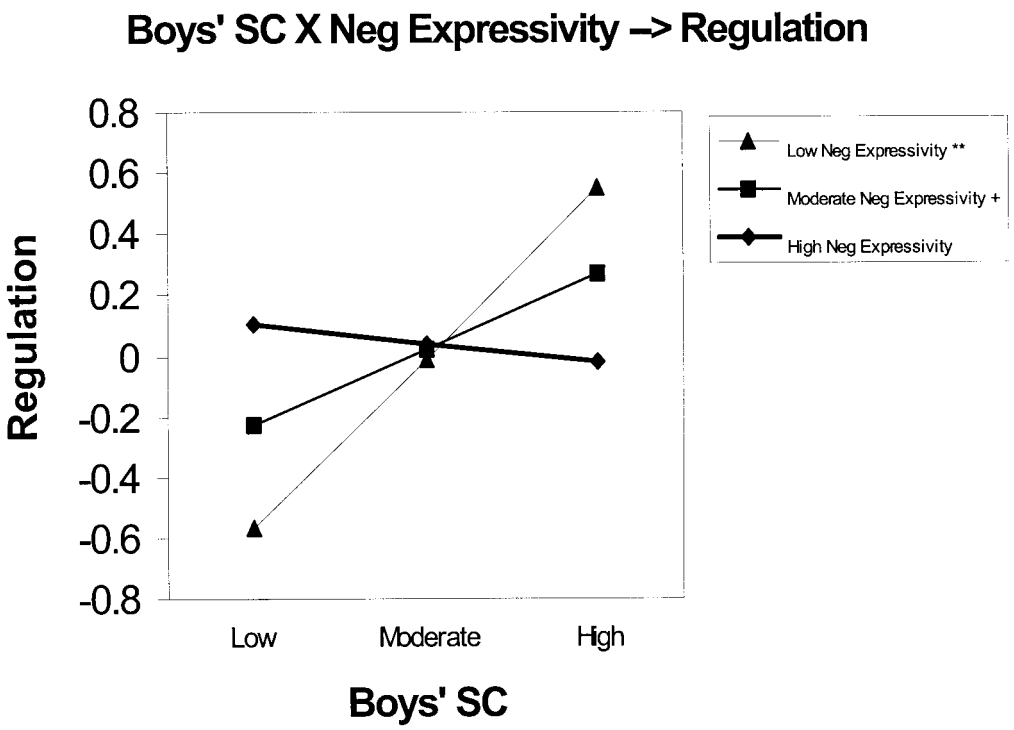

Figure 2. Parental negative expressivity as a moderator of the relation between boys' skin conductance (SC) and regulation (composite of standardized measures): Negative slides. Neg = negative. $^{**}p < .01$. $+p < .10$.

situations involving subtle social cues. Indeed, as previously noted, lack of response to mild empathy-inducing stimuli has been linked to children's psychopathic tendencies (e.g., Blair, 1999). However, it is also possible that the positive relation between HR and positive socioemotional functioning was due to lesser orienting toward the emotional stimuli in well-adjusted children. Among the sample, 59% of boys and 60% of girls had a negative (decelerating) mean HR slope during the negative slides. Cole et al. (1996) found that well-modulated children showed somewhat (albeit nonsignificantly) less HR deceleration to short emotion-related film clips than did the highly expressive children (who were prone to externalizing problem behaviors) and somewhat more HR deceleration than inexpressive children (who were prone to externalizing and internalizing problems); the inexpressive children exhibited significantly less deceleration than the expressive children. It appears that numerous better-adjusted boys in this study actually exhibited mild deceleration in response to the mildly evocative stimuli (HR was slightly negative during the negative slides), whereas less adjusted, unregulated boys exhibited somewhat more deceleration on average. Thus, it may be that there is an optimal degree of attentional deployment to mild stimuli that is associated with positive functioning in boys. However, it is also possible that the pattern of findings for HR was due primarily to an association between HR acceleration and regulation/adjustment and that deceleration was important only in that it indicated a lack of emotional arousal in response to the slides.

It is difficult to know why the direct relations between physiological reactivity and socioemotional functioning were found only for boys. Perhaps HR and SC responding to empathy-inducing stimuli differ for the sexes. Feshbach (1982) found that the meaning of empathy depended on the valence and intensity of the empathy-inducing stimuli for boys, but not especially for girls. In addition, the association between physiological reactivity to empathy-inducing stimuli and adjustment may differ for boys and girls. Zahn-Waxler et al. (1995) found that SC responding to a sadness mood induction was associated with risk for disruptive behavior disorders for girls, but not boys. In the present study, boys and girls did not differ significantly on mean level or variability in HR or SC responding during the slides. However, girls' HR and SC baselines (with the exception of SC baseline during positive slides) were significantly higher than boys' HR and SC baselines (see Table 1). It is plausible that, due to their higher HR or SC baselines, girls in this sample might need exposure to more evocative stimuli than the mild slides used in the study to elicit HR or SC increases and/or that the change observed was not equivalent psychologically for boys and girls. Alternatively, because of a greater social expectation for girls to be prosocial and socially skilled (Power & Shanks, 1989; also see Block, 1983), it is possible that girls' adjustment, regulation, and expressed emotionality relate to the internalization of norms for their gender more than to empathy (perhaps especially in situations that do not involve a real person in need). The finding that boys' facial expressions

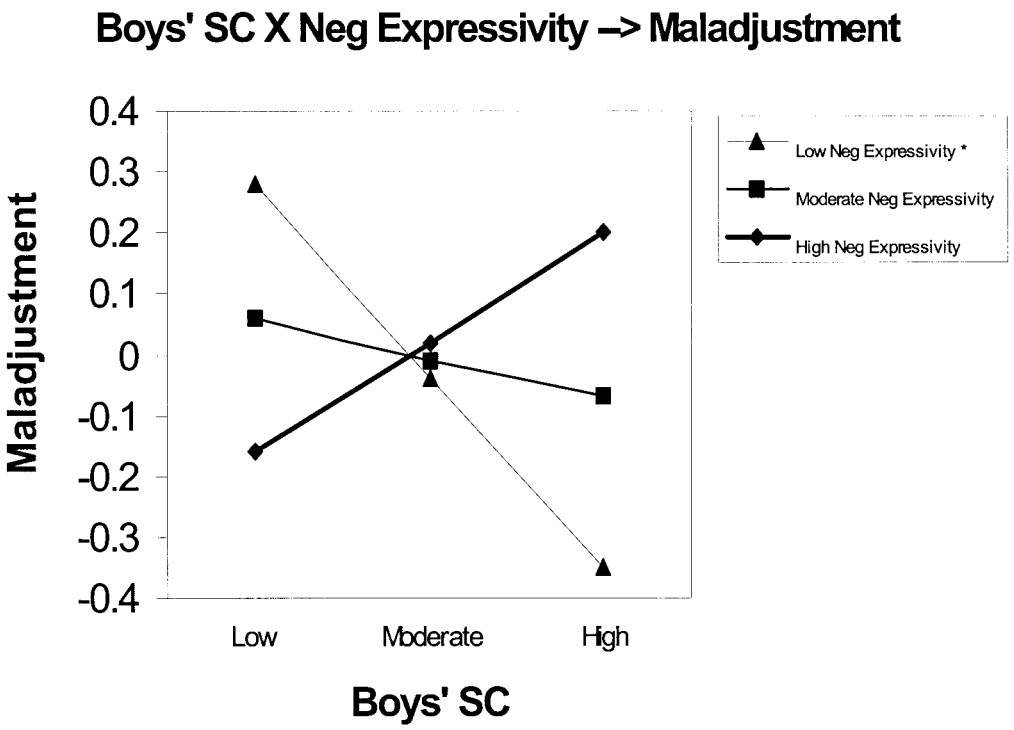

Figure 3. Parental negative expressivity as a moderator of the relation between boys' skin conductance (SC) and maladjustment (composite of standardized measures): Negative slides. Neg = negative. *$p < .05$.

relate more consistently to their prosocial behavior than do girls' (Eisenberg & Fabes, 1990) is consistent with this idea.

Although there appeared to be little consistent direct relation between parents' emotional expressivity and children's physiological arousal, parents' negative expressivity moderated the relation between children's physiological reactivity when viewing mildly negative stimuli and socioemotional functioning. Especially for boys, regulation and adjustment were positively associated with physiological responding to the negative slides when parents expressed relatively low (or sometimes moderate), but not high, levels of negative emotions. Physiological arousal in response to mildly evocative slides was not associated with positive adjustment for boys with a parent who expressed high levels of negative emotions. For these boys, emotional reactivity may have reflected a mix of reactions, including empathy, personal distress, and a general vulnerability to negative emotion, with the consequence that there was no discernable relation between physiological reactivity and regulation or adjustment. In contrast, for boys with parents who were not high in negative expressivity, their physiological responses to the negative slides likely reflected a healthy, nonaversive responsiveness to others' negative states.

The moderating role of parents' emotional expressivity in the association between boys' physiological reactivity to mildly evocative stimuli and their regulation and adjustment suggests that parents' emotional expressivity may influence children's interpretations of, and/or reactions to, emotionally evocative social stimuli. (Findings for girls were few and likely not reliable.) In homes with low or moderate levels of negative emotions, we speculate that boys' physiological reactivity to mildly evocative stimuli was associated with regulation and adjustment because negative emotions were not perceived as highly threatening and were not overly arousing. Moreover, boys exposed to mild maternal negative expressivity might be especially receptive to experiencing others' negative emotion because of the supportive family environment.

There were fewer findings for children's reactions to positive than negative slides. Perhaps, as noted earlier, empathy with positive slides can be self-serving (i.e., can be used to lift one's own mood; Feshbach, 1982); moreover, empathy with positive emotions is less conceptually linked to social competence and adjustment. The relative lack of moderational effects for the positive stimuli was not due to our examining maternal positive expressivity as the moderator; no significant interactions were obtained when maternal negative expressivity was used as the moderator in the regressions. In addition, there may be less moderation between maternal expressivity and children's physiological responding to viewing others in positive situations because parents probably are less concerned with socializing their children to respond to others' positive (in comparison to negative) emotions. Disciplinary situations generally are focused on incidents when children have made others feel badly, not positively.

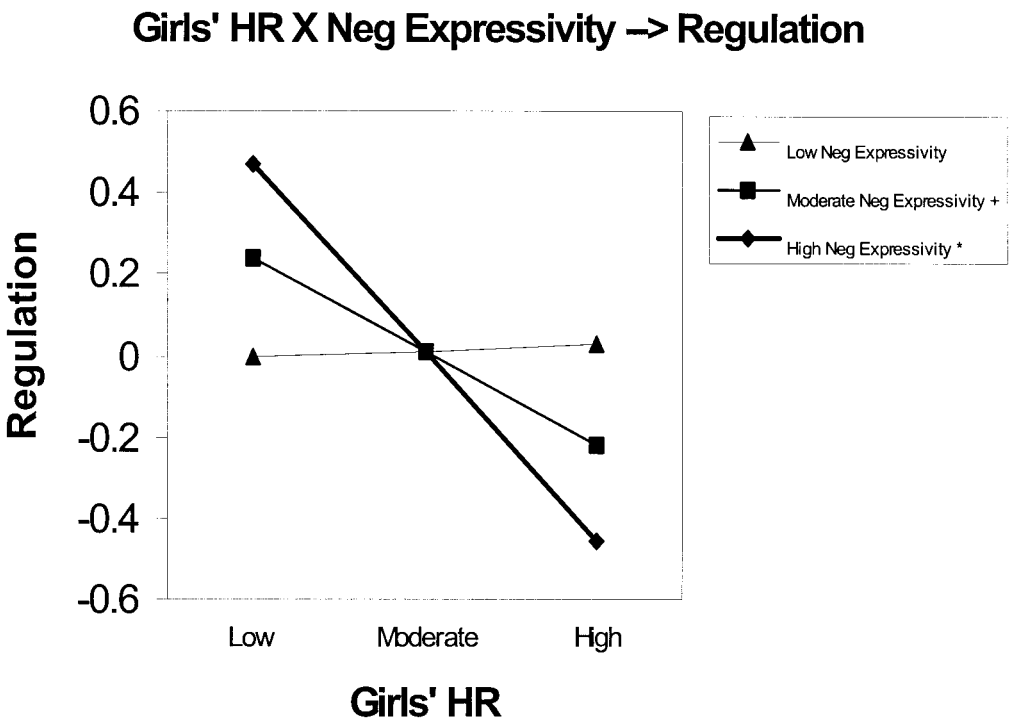

Figure 4. Parental negative expressivity as a moderator of the relation between girls' heart rate (HR) and regulation (composite of standardized measures): Negative slides. Neg = negative. $^{*}p < .05$. $^{+}p < .10$.

As in similar research (e.g., Zahn-Waxler et al., 1995), HR and SC responses were examined separately in relation to mothers' emotional expressivity and children's socioemotional functioning because HR and SC responses were not related to one another. As suggested by Lacey (1967) and Gross (1998), generalized arousal might not be useful when examining relations to emotion-related responding because a specific physiological response system might show a change in one direction, whereas another physiological response system might show either no change, or a change in another direction (i.e., directional fractionation). Nonetheless, with mildly evocative stimuli, HR and SC responses were both positively related to boys' positive socioemotional functioning, providing some convergence of findings. Moreover, although additional analyses showed few significant correlations between children's physiological responding and their facial or self-reported reactions to the slides, facial and self-reported reactions to the slides were also positively related to the children's social competence and adjustment (Zhou et al., 2002). Thus, various measures of empathy-related responding to the mild slides were similarly related to socioemotional outcomes (especially for boys for HR and SC).

In summary, the general pattern of results is consistent with the notion that empathic responding while viewing mildly evocative stimuli is associated with boys' socioemotional adjustment, especially for those with mothers who express low or perhaps moderate levels of negative emotion in the home. Whereas boys who are well regulated and adjusted seem to be empathic toward relatively subtle cues of others' negative emotions, they may be more likely to ignore or be vigilant of others' negative emotion if they are exposed to high levels of negative emotion at home. However, because the clear majority of the children were from middle-income and Euro-American families, it is unclear whether the pattern of findings would generalize to other socioeconomic or ethnic groups and cultures.

Implications for Application and Public Policy

The finding that parental emotional expressivity moderated the relation between children's physiological arousal and socioemotional functioning or adjustment has implications for application and intervention. If the strength or direction of the relation between physiological arousal and adjustment differs depending on the types and/or levels of emotions to which children are exposed in the home (El-Sheikh, 1994), intervention programs can be designed to enhance or promote children's regulatory abilities and positive adjustment. For example, parents who are experiencing high levels of marital conflict might learn constructive, nonhostile, and nonthreatening ways to deal with this conflict. In fact, studies indicate that family conflict is not always directly associated with children's maladjustment. Rather, children's maladjustment might be more directly linked to the ways in which parents resolve or handle interpersonal disputes and conflicts (Davies & Cummings, 1994). Our results lend initial support to the notion that

children's exposure to parents' expression of negative emotion affects the nature of their vicarious emotional responding. Therefore, it is important for caregivers to learn ways to temper the levels of negative emotions they express as well as to resolve conflicts in constructive, nonhostile ways.

References

Aiken, L. S., & West, S. G. (1991). *Multiple regression: Testing and interpreting interactions.* Newbury Park, CA: Sage Publications.

Batson, C. D. (1991). *The altruism question: Toward a social-psychological answer.* Hillsdale, NJ: Erlbaum.

Blair, R. J. R. (1999). Responsiveness to distress cues in the child with psychopathic tendencies. *Personality and Individual Differences, 27,* 135–145.

Blair, R. J. R., Colledge, E., Murray, L., & Mitchell, D. G. V. (2001). A selective impairment in the processing of sad and fearful expressions in children with psychopathic tendencies. *Journal of Abnormal Child Psychology, 29,* 491–498.

Blair, R. J. R., Jones, L., Clark, F., & Smith, M. (1997). The psychopathic individual: A lack of responsiveness to distress cues? *Psychophysiology, 34,* 192–198.

Block, J. H. (1983). Differential premises arising from differential socialization of the sexes: Some conjectures. *Child Development, 54,* 1335–1354.

Block, J. H., & Block, J. (1980). The role of ego-control and ego-resiliency in the organization of behavior. In W. A. Collins (Ed.), *Development of cognition, affect, and social relations: The Minnesota Symposia on Child Psychology* (Vol. 13, pp. 39–101). Hillsdale, NJ: Erlbaum.

Buck, R. (1975). Nonverbal communication of affect in children. *Journal of Personality and Social Psychology, 31,* 644–653.

Caspi, A., Block, J., Block, J. H., Klopp, B., Lynam, D., Moffitt, T. E., & Stouthamer-Loeber, M. (1992). A "common-language" version of the California Child Q-set for personality assessment. *Psychological Assessment, 4,* 512–523.

Cole, P. M., Zahn-Waxler, C., Fox, N. A., Usher, B. A., & Welsh, J. D. (1996). Individual differences in emotion regulation and behavior problems in preschool children. *Journal of Abnormal Psychology, 105,* 518–529.

Craig, K. D., & Lowery, H. J. (1969). Heart-rate components of conditioned vicarious autonomic responses. *Journal of Personality and Social Psychology, 11,* 381–387.

Davies, P. T., & Cummings, E. M. (1994). Marital conflict and child adjustment: An emotional security hypothesis. *Psychological Bulletin, 116,* 387–411.

Davis, M. H., Hull, J. G., Young, R. D., & Warren, G. G. (1987). Emotional reactions to dramatic film stimuli: The influence of cognitive and emotional empathy. *Journal of Personality Psychology and Social Psychology, 52,* 126–133.

Dunn, J., & Brown, J. (1994). Affect expression in the family, children's understanding of emotions, and their interactions with others. *Merrill-Palmer Quarterly, 40,* 120–137.

Eisenberg, N., & Fabes, R. A. (1990). Empathy: Conceptualization, assessment, and relation to prosocial behavior. *Motivation and Emotion, 14,* 131–149.

Eisenberg, N., Fabes, R. A., Bernzweig, J., Karbon, M., Poulin, R., & Hanish, L. (1993). The relations of emotionality and regulation to preschoolers' social skills and sociometric status. *Child Development, 64,* 1418–1438.

Eisenberg, N., Fabes, R. A., Bustamante, D., Mathy, R. M., Miller, P., & Lindholm, E. (1988). Differentiation of vicariously-induced emotional reactions in children. *Developmental Psychology, 24,* 237–246.

Eisenberg, N., Fabes, R. A., Carlo, G., Troyer, D., Speer, A. L., Karbon, M., & Switzer, G. (1992). The relations of maternal practices and characteristics to children's vicarious emotional responsiveness. *Child Development, 63,* 583–602.

Eisenberg, N., Fabes, R. A., Guthrie, I. K., Murphy, B. C., Maszk, P., Holmgren, R., & Suh, K. (1996). The relations of regulation and emotionality to problem behavior in elementary school children. *Development and Psychopathology, 8,* 141–162.

Eisenberg, N., Fabes, R. A., Guthrie, I. K., & Reiser, M. (2000). Dispositional emotionality and regulation: Their role in predicting quality of social functioning. *Journal of Personality and Social Psychology, 78,* 136–157.

Eisenberg, N., Fabes, R. A., Murphy, B., Karbon, M., Maszk, P., Smith, M., O'Boyle, C., & Suh, K. (1994). The relations of emotionality and regulation to dispositional and situational empathy-related responding. *Journal of Personality and Social Psychology, 66,* 776–797.

Eisenberg, N., Fabes, R. A., Murphy, B., Karbon, M., Smith, M., & Maszk, P. (1996). The relations of children's dispositional empathy-related responding to their emotionality, regulation, and social functioning. *Developmental Psychology, 32,* 195–209.

Eisenberg, N., Fabes, R. A., Schaller, M., Carlo, G., & Miller, P. A. (1991). The relations of parental characteristics and practices to children's vicarious emotional responding. *Child Development, 62,* 1393–1408.

Eisenberg, N., Fabes, R. A., Schaller, M., Miller, P. A., Carlo, G., Poulin, R., Shea, C., & Shell, R. (1991). Personality and socialization correlates of vicarious emotional responding. *Journal of Personality and Social Psychology, 61,* 459–470.

Eisenberg, N., Liew, J., & Pidada, S. (2001). The relations of parental emotional expressivity with the quality of Indonesian children's social functioning. *Emotion, 1,* 107–115.

Eisenberg, N., Losoya, S., Fabes, R. A., Guthrie, I. K., Reiser, M., Murphy, B. C., Sherpard, S., Poulin, R., & Padgett, S. J. (2001). Parental socialization of children's dysregulated expression of emotion and externalizing problems. *Journal of Family Psychology, 15,* 183–205.

Eisenberg, N., & Miller, P. A. (1987). The relation of empathy to prosocial and related behaviors. *Psychological Bulletin, 101,* 91–119.

El-Sheikh, M. (1994). Children's emotional and physiological responses to interadult angry behavior: The role of history in interpersonal hostility. *Journal of Abnormal Child Psychology, 22,* 661–678.

Feshbach, N. D. (1982). Sex differences in empathy and social behavior in children. In N. Eisenberg (Ed.), *The development of prosocial behavior* (pp. 315–338). New York: Academic Press.

Feshbach, N. D., & Feshbach, S. (1982). Empathy training and the regulation of aggression: Potentialities and limitations. *Academic Psychology Bulletin, 4,* 399–413.

Frick, P. J. (1998). *Conduct disorders and severe antisocial behavior.* New York: Plenum.

Gross, J. J. (1998). Sharpening the focus: Emotion regulation, arousal, and social competence. *Psychological Inquiry, 9,* 287–289.

Guthrie, I. K., Eisenberg, N., Fabes, R. A., Murphy, B. C., Holmgren, R., Mazsk, P., & Suh, K. (1997). The relations of regulation and emotionality to children's situational empathy-related responding. *Motivation and Emotion, 21,* 87–107.

Halberstadt, A. G. (1986). Family socialization of emotional expression and nonverbal communication styles and skills. *Journal of Personality and Social Psychology, 51,* 827–836.

Halberstadt, A., Cassidy, J., Stifter, C., Parke, R., & Fox, N. (1995). Self-expressiveness with the family context: Psychometric support for a new measure. *Psychological Assessment, 7,* 93–103.

Halberstadt, A. G., Crisp, V. W., & Eaton, K. L. (1999). Family expressiveness: A retrospective and new directions for research. In P. Philippot, R. S. Feldman, & E. Coats (Eds.), *The social context of nonverbal behavior* (pp. 109–155). New York: Cambridge University Press.

Hoffman, M. L. (2000). *Empathy and moral development: Implications for caring and justice.* New York: Cambridge University Press.

Lacey, J. I. (1967). Somatic response patterning and stress: Some revisions of activation theory. In M. H. Appley & R. Trumbull (Eds.), *Psychological stress: Issues in research* (pp. 14–37). Englewood Cliffs, NJ: Prentice Hall.

Larsen, R. I., & Diener, E. (1987). Affect intensity as an individual difference characteristic: A review. *Journal of Research on Personality, 21,* 1–39.

Levenson, R. W., & Ruef, A. M. (1992). Empathy: A physiological substrate. *Journal of Personality and Social Psychology, 63,* 234–246.

Levenston, G. K., Patrick, C. J., Bradley, M. M., & Lang, P. J. (2000). The psychopath as observer: Emotion and attention in picture processing. *Journal of Abnormal Psychology, 109,* 373–385.

Lochman, J. E., & Conduct Problems Prevention Research Group. (1995). Screening of child behavior problems for prevention programs at school entry. *Journal of Consulting and Clinical Psychology, 63,* 549–559.

Lynam, D. R. (1997). Pursuing the psychopath: Capturing the fledgling psychopath in a nomological net. *Journal of Abnormal Psychology, 106,* 425–438.

Mehrabian, A., & Epstein, N. (1972). A measure of emotional empathy. *Journal of Personality, 40,* 525–543.

Miller, P. A., & Eisenberg, N. (1988). The relation of empathy to aggressive and externalizing/antisocial behavior. *Psychological Bulletin, 103,* 324–344.

Power, T. G., & Shanks, J. A. (1989). Parents as socializers: Maternal and paternal views. *Journal of Youth and Adolescence, 18,* 203–220.

Rothbart, M. K., Ahadi, S. A., Hershey, K. L., & Fisher, P. (2001). Investigations of temperament at three to seven years: The Children's Behavior Questionnaire. *Child Development, 72,* 1394–1408.

Rushton, J. P., Brainerd, C. M., & Pressley, M. (1983). Behavioral development and construct validity: The principle of aggregation. *Psychological Bulletin, 94,* 18–38.

Spinrad, T. L., Losoya, S. H., Eisenberg, N., Fabes, R. A., Shepard, S. A., Cumberland, A., Guthrie, I. K., & Murphy, B. C. (1999). The relations of parental affect and encouragement to children's moral emotions and behavior. *Journal of Moral Education, 28,* 327–337.

Staub, E. (1979). *Positive social behavior and morality: Vol. 1. Social and personal influences.* New York: Academic Press.

Zahn-Waxler, C., Cole, P. M., Welsh, J. D., & Fox, N. A. (1995). Psychophysiological correlations of empathy and prosocial behaviors in preschool children with behavior problems. *Development and Psychopathology, 7,* 27–48.

Zhou, Q., Eisenberg, N., Losoya, S., Fabes, R. A., Reiser, M., Guthrie, I. K., Murphy, B., Cumberland, A., & Shepard, S. A. (2002). The relations of parental warmth and positive expressiveness to children's empathy-related responding and social functioning: A longitudinal study. *Child Development, 73,* 893–915.

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