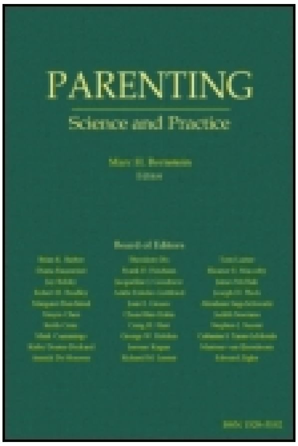

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Parenting Self-Efficacy is Associated with Cry Perception, Not Autonomic Responses, during a Cry Response Task

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SYNOPSIS

Objective. To experimentally test whether perceptions of cry stimuli and autonomic nervous system reactivity help to explain parenting self-efficacy (PSE). ***Design.*** First-time pregnant women ($N = 151$) completed a task during which they responded to infant cries. After each cry, they received performance feedback, which was manipulated to simulate an easy-to-soothe (80% success) and a difficult-to-soothe (20% success) infant. After responding to each infant, participants rated cry perception and PSE. Using continuous ambulatory recording, changes in heart rate, skin conductance level, pre-ejection period, and respiratory sinus arrhythmia were compared across conditions. ***Results.*** An increase in PSE followed the easy-to-soothe infant, whereas a decrease in PSE occurred after the difficult-to-soothe infant. These changes in PSE were not associated with autonomic reactivity during the task. Women with more negative perceptions of the cries had larger decreases in PSE during the task. Perceiving the difficult-to-soothe infant more negatively than the easy-to-soothe infant was related to larger decreases in PSE after the second series of cries. ***Conclusion.*** Negative cry perceptions were related to decreasing PSE. Negative perceptions of parenting duties may increase the saliency of parents' successes and failures. These findings are relevant to further testing mechanisms of change in PSE as well as the design of interventions to augment PSE.

INTRODUCTION

Although caring for a child is usually seen as fulfilling, for some parents it can also be stressful, for instance when babies are difficult to soothe (Del Vecchio, Walter, & O'Leary, 2009; Donovan, Leavitt, & Taylor, 2005). Failure to calm infants' distress may influence *parenting self-efficacy*, which is defined as "the expectation caregivers hold about their ability to parent successfully" (Jones & Prinz, 2005, p. 342). Parenting self-efficacy is associated with parental competence and child functioning (for a review, see Jones & Prinz, 2005) and often used as a target for prevention and intervention programs. However, parenting self-efficacy has mainly been studied in cross-sectional designs. As a result, questions are still open as to what extent parenting self-efficacy is malleable in response to challenges in caregiving and which cognitive and emotional systems are involved in changes in parenting self-efficacy. During an experiment in which participants tried to soothe an infant, experimentally manipulated success and failure experiences, perceptions of the cries and autonomic nervous system reactivity were examined in relation to change in parenting self-efficacy.

Early studies have demonstrated that self-efficacy is updated on the basis of personal mastery experiences (Bandura, Reese, & Adams, 1982; Bandura & Wood, 1989), although experimental tests of self-efficacy in parenting have not been reported. Randomized controlled trials aimed at improving parenting quality have led to increased parenting self-efficacy (Dekovic et al., 2010; Sanders, Stallman, & McHale, 2011; Tucker, Gross, Fogg, Delaney, & Lapporte, 1998), suggesting that parenting self-efficacy is sensitive to experience. However, because multiple factors are usually involved in interventions (i.e., mastery experiences and verbal feedback), questions remain about specific links between parenting successes and failures and parenting self-efficacy.

Bandura (1982) stated that self-efficacy is less based on actual performance than on perception of success, provided that the task is experienced as salient. For instance, parents trying to comfort a crying infant might value success or failure more when they perceive the crying as urgent and stressed than when they find the crying less intense. Bruning and McMahon (2009) confirmed that exposure to an inconsolable baby doll led to more negative affect and more negative remarks regarding parenting self-efficacy compared to exposure to a silent baby doll. Parents who rated their children's temperament as more negative had lower parenting self-efficacy (Cutrona & Troutman, 1986; Teti & Gelfand, 1991) and more decreases in parenting self-efficacy (Gross, Conrad, Fogg, & Wothke, 1994; Lipscomb et al., 2011) than parents who rated their children's temperament as more positive.

Physiological arousal may also impact self-efficacy (Bandura, 1977). Indirect evidence suggests linkages among physiological arousal, task performance, and self-efficacy in other domains than parenting (Bandura et al., 1982; Wiedenfeld et al., 1990). Caregiving cues, such as infant crying, lead to physiological signs of arousal (Boukydis & Burgess, 1982; Joosen et al., 2013; Out, Pieper, Bakermans-Kranenburg, & van Ijzendoorn, 2010; Zeskind, 1987). These individual differences in physiological reactivity to infant cries are associated with actual parenting behavior (Casanova, Domanic, McCanne, & Milner, 1994; Groh & Roisman, 2009; Irwin, 2003; Zeifman, 2003). A link between physiological arousal and parenting self-efficacy is therefore possible. Usually physiological responses were heart rate (HR) and skin conductance level (SCL). However, Porges (2003) suggested studying sympathetic and parasympathetic branches of the autonomic nervous system separately because of their functional differences. The parasympathetic nervous system, measurable through respiratory sinus arrhythmia (RSA), is activated when the environment is perceived as safe and facilitates social engagement, whereas the sympathetic nervous system, measurable through pre-ejection period (PEP), is activated when encountering threats to facilitate fight or flight responses. Joosen et al. (2013) showed that RSA decreased in sensitive mothers when confronted with infant cries, but research on the interplay between the sympathetic and parasympathetic branches of the autonomic nervous system in response to infant cries is scarce.

The current study examined success and failure experiences, physiological reactivity and cry perceptions as predictors of change in parenting self-efficacy during a simulated challenging caregiving situation. First-time pregnant women, for whom this task was salient, tried to soothe a crying infant during a computerized task. Soothability of the infant was experimentally manipulated to simulate an easy-to-soothe and a difficult-to-soothe infant. All participants were exposed to the same stimuli, which enabled between-subjects comparison of physiological reactivity and cry perceptions. Our first hypothesis was that parenting self-efficacy would increase with mostly successful trials and decrease with mostly unsuccessful trials. Based on previous studies, our second hypothesis was that participants would show higher HR and SCL, and lower PEP and RSA, while listening to infant cries. It was also expected that stronger increases in the autonomic reactivity indicators would be associated with stronger decreases in parenting self-efficacy. Our third hypothesis was that more negative cry perceptions would be associated with larger decreases in parenting self-efficacy. Participants with higher autonomic reactivity would have more negative cry perceptions and would decrease more in parenting self-efficacy.

METHOD

Participants

The sample included 151 first-time pregnant women (aged 18–40 years, $M = 30.52$, $SD = 4.05$) living in the vicinity of Amsterdam, The Netherlands. 77% of the women finished higher education (bachelor's or master's degree), as compared to 32% of the same age general Dutch female population (Bureau of Statistics Netherlands, 2011). Based on their parents' country of birth, women were predominantly Dutch (85%). Of the non-Dutch women, 50% had a Western background. Of all women, 50% cohabited with their partner, 47% were married, 2% were single, and 1% had a partner they were not living with.

Procedure

Women were recruited during the first trimester of pregnancy via midwifery practices in and around Amsterdam and websites. Initial informed consent was asked for questionnaires from the first trimester of pregnancy until a year after birth. Women who lived within travel distance of the research facility and did not receive a prenatal diagnosis for a congenital abnormality of the fetus were approached to participate in three additional assessments. Approximately 50% gave consent. Women were rewarded a gift certificate of €60 after the third additional assessment. Permission for this study was granted by the Medical Ethics Committee of the VU University Medical Center.

Assessments for this study were conducted during a home visit at approximately 22 weeks of gestation ($M = 22.7$ weeks, $SD = 0.98$). This moment was chosen because it closely followed the 20 weeks ultrasound offered to pregnant women in The Netherlands and because at this point the baby is regularly felt by the mother-to-be. It was assumed that seeing and feeling the baby would increase the saliency of the task. At the start of the visit, women were connected to an ambulatory monitoring device (VU University Ambulatory Monitoring System [VU-AMS]) continuously measuring autonomic nervous system response indicators (De Geus, Willemsen, Klaver, & Van Doornen, 1995; Willemsen, De Geus, Klaver, Van Doornen, & Carroll, 1996). The Cry Response Task was administered, a computerized task involving audio-recorded baby cries developed especially for the current study. The task was presented on a laptop computer while the participant was sitting at a table. The task was programmed in E-Prime 2.0, and signals were sent from E-Prime directly to the ambulatory monitoring device to mark task episodes.

The Cry Response Task started with a 6-min baseline, during which guitar music was played and pictures of landscapes appeared. After baseline, participants rated their parenting self-efficacy. Then, they were informed that they would hear different baby cries and that they could respond to each cry with four caregiving responses or do nothing. After each cry sound, women received feedback on their soothing success. Successful soothing was suggested by cry termination after 15 to 20 s (determined at random) and a display of a green smiley face. Unsuccessful soothing was suggested by cry termination after 30 s and a red sad smiley face. Feedback on responses was experimentally manipulated: All participants received 80% positive feedback during the first ten trials (baby 1). After baby 1, cry perception and parenting self-efficacy were measured. Women then responded to ten different trials (baby 2), but now received only 20% positive feedback. Baby 2 was followed by measures of cry perception and parenting self-efficacy. Participants were debriefed on these procedures.

Cry stimuli were derived from the spontaneous crying of a 3-month-old healthy infant over a period of 4 hours. Cries were recorded during bathing, before naptime, and before feeding. The average fundamental frequency of the cries was 397 Hz, and peak amplitude equaled on average 82 DbA. Each cry period contained on average 8.2 cry expirations. The two series of cries chosen as baby 1 and baby 2 did not differ in pitch, volume, and amount of cry expirations.

As a measure of ecological validity of the Cry Response Task, women showing larger decreases in parenting self-efficacy during the Cry Response Task also showed stronger linkages between negative reactivity and parenting self-efficacy after birth (Verhage, Oosterman, & Schuengel, 2013). This finding indicates that the experiment taps into processes that are also activated while parenting children in reality.

Before conducting the current study, a pilot study was done with an earlier version of the Cry Response Task (Oosterman & Schuengel, 2009). During this experiment, 55 parents of young children were asked to perform two tasks. The first task was to identify the cause of baby cry sounds. Afterwards, participants were given random feedback on their performance, which also functioned as a prime for the second task. The second task was to soothe the crying infant. Manipulated soothing success rates were 20%, 40%, 50%, or 80%. Results showed an interaction effect: Positively primed participants decreased more in parenting self-efficacy after low soothing success than negatively primed participants, $F(3,54) = 3.66$, $p = .02$, partial $\eta^2 = .19$. This priming effect led to the decision not to counterbalance soothing success in the current version of the Cry Response Task because counterbalancing might introduce carry-over effects from baby 1 to baby 2. Controlling for these effects would also lower statistical power of the analyses of relevant individual differences.

Measures

Parenting self-efficacy. Parenting self-efficacy was measured using a pictographic Visual Analogue Scale (VAS) during the Cry Response Task. VAS is a valid method of measuring self-efficacy (Turner, de Leemput, Draaisma, Oosterveld, & ten Cate, 2008). The VAS in the current study followed a validated pictographic design (Kalichman et al., 2005) to assess parenting self-efficacy by asking the question: “How well do you expect to respond to infant crying in daily situations?” Anchors on the scale were the color red and a picture of the “thumbs-down” hand gesture on the left side of the scale changing into the color green, and a picture of “thumbs-up” on the right side of the scale. E-Prime recorded the scores from 0 to 100. As an indication of construct validity, VAS baseline scores were significantly associated with scores on the Maternal Self-Efficacy in the Nurturing Role Questionnaire (SENR; Pedersen, Bryan, Huffman, & Del Carmen, 1989) completed on average at 22.1 ($SD = 1.05$) weeks of pregnancy ($r = .38$, $p < .001$). This correlation was similar to the correlations reported in Kalichman et al. (2005), which ranged from $r = .33$ to .39.

Cry perception. Cry perception was measured with four questions on a 7-point Likert Scale regarding how urgent, unpleasant, piercing, and stressed participants thought the cries sounded. These scales have been used previously in studies on cry perception and autonomic nervous system reactivity (Zeskind, Klein, & Marshall, 1992; Zeskind & Lester, 1978). Principal component analysis (PCA) indicated one underlying component explaining 57% and 73% of all variance, with factor loadings varying from .66 to .91. Therefore, the four scores for each baby were aggregated into overall cry perception scores per baby.

Autonomic nervous system reactivity. Autonomic nervous system reactivity was measured using the VU-AMS (De Geus et al., 1995; Willemsen et al., 1996). The device continuously recorded SCL, electrocardiogram (ECG), basal thorax impedance (Z_0), changes in impedance (dZ), and the first derivative of pulsatile changes in transthoracic impedance (dZ/dt).

To obtain separate measures of autonomic nervous system reactivity, HR, SCL, PEP, and RSA were extracted from recorded signals using the VU-AMS software program. The program automatically scored all beats in the ECG recording and the entire recording was manually checked for irregularities. For each episode (baseline, baby 1, and baby 2), an ensemble average of the Dz/dt waveform was presented. Three points were automatically scored on this Dz/dt waveform: (1) B-Point or upstroke, (2) $Dz/dt_{(max)}$ point, and (3) X-point. Each waveform was checked and corrected manually. The inspection of waveforms was done by the first and second author, who were trained in this procedure. Inter-rater reliability was $r = .86$ on 1,085 waveforms. In the respiration signal, the start point and end point of the inspiration and expiration phases were automatically detected by the software. SCL was measured continuously through passing a small voltage between two electrodes attached to the second and third finger on the nondominant hand.

SCL was defined as the average skin conductance level per episode in microsiemens. HR was defined as the average number of beats per minute per episode derived from the ECG signal. PEP was defined as the time between the onset of ventricular depolarization (Q wave onset) on the ECG signal and the B-point on the Dz/dt waveform (Willemsen et al., 1996). RSA was derived from the ECG and respiration signals in accordance with the peak-to-trough method by subtracting the shortest inter-beat interval (IBI) during HR acceleration in the inspiration phase from the longest IBI during heart rate deceleration in the expiration phase (De Geus et al., 1995; Grossman, Van Beek, & Wientjes, 1990).

Data Analyses

Preliminary analyses tested associations between demographic characteristics (age, education level, marital status, and nationality), parenting self-efficacy, indices of autonomic reactivity, and cry perception scores. Our first hypothesis regarding changes in parenting self-efficacy over the course of the Cry Response Task was tested with repeated-measures analysis of variance (ANOVA). To test our second hypothesis that there would be more autonomic reactivity during exposure to infant cries compared to baseline, changes in autonomic reactivity were assessed with a repeated-measures MANOVA [multivariate analysis of variance]. Hierarchical regression analyses tested whether changes in physiological reactivity were associated with changes in parenting self-efficacy. In accordance with our third hypothesis, hierarchical regression analyses tested whether more negative cry perception was associated with larger decreases in parenting self-efficacy. Finally, hierarchical regression analyses tested whether physiological reactivity was related to changes in cry perception. Because RSA was skewed in all episodes of the Cry Response Task, it was log transformed.

RESULTS

Descriptive data on parenting self-efficacy, physiological measurements, and negative cry perception for baseline, baby 1, and baby 2 are presented in Table 1. None of the demographic characteristics was significantly associated ($p > .10$) with both independent and dependent variables in the analyses to follow, and therefore were not included as covariates.

Success and Failure Experiences

Repeated-measures ANOVA was performed to test our hypothesis that parenting self-efficacy would increase with the easy-to-soothe infant and decrease with the difficult-to-soothe infant. The test revealed significant main effects, Wilks $\Lambda = .52$, $F(2,149) = 67.59$, $p < .001$, partial $\eta^2 = .48$. Post hoc tests showed that parenting self-efficacy increased after baby 1 (80% success in soothing; $F(1,150) = 4.39$, $p < .05$, partial $\eta^2 = .03$) and decreased after baby 2 (20% success; $F(1,150) = 132.58$, $p < .001$, partial $\eta^2 = .47$). The decrease in parenting self-efficacy from baseline to baby 2 was also significant, $F(1,150) = 79.49$, $p < .001$, partial $\eta^2 = .35$. Correlations between time points of parenting

TABLE 1
Descriptive Statistics of Parenting Self-Efficacy, Physiological Reactivity, and Negative Cry Perception during Baseline, Baby 1, and Baby 2

	Baseline		Baby 1		Baby 2	
Measure	*M*	*SD*	*M*	*SD*	*M*	*SD*
Parenting self-efficacy	69.11	13.6	70.94	12.14	59.42	15.82
Heart rate	76.88	8.58	77.50	8.72	77.28	8.43
Skin conductance level	4.68	2.30	5.26	2.55	4.93	2.36
Pre-ejection period	93.60	18.90	92.80	19.14	94.09	19.33
Respiratory sinus arrhythmia	4.21	.48	4.04	.45	4.05	.48
Cry perception	—	—	3.31	.91	5.21	.95

Note. For skin conductance level and heart rate, higher values indicate more physiological activity, whereas for pre-ejection period and respiratory sinus arrhythmia lower values indicate more physiological activity. Respiratory sinus arrhythmia was log transformed.

self-efficacy were between $r = .60$ and $r = .66$. An overview of correlations between all study variables can be found in the Appendix.

Physiological Reactivity

To make directionality of autonomic reactivity similar across measures, PEP and RSA were multiplied by -1. To assess our second hypothesis that there would be more autonomic nervous system reactivity in response to infant cries than during baseline, repeated-measures MANOVA with all autonomic measures revealed a significant main effect for time, $F(8,143) = 20.76$, $p < .001$. Univariate tests indicated that this was the case for all autonomic measures (range $p < .001$ to $p = .028$). Repeated-measures contrasts showed that reactivity on all measures increased from baseline to baby 1 (range $p < .001$ to $p = .017$). From baby 1 to baby 2, reactivity on lnRSA and HR remained stable (resp. $p = .58$ and $p = .16$), whereas reactivity decreased in PEP and SCL (both ps $<$ .001). Changes from baseline to baby 2 were only significant for lnRSA and SCL (both ps $< .001$).

To assess whether more autonomic reactivity would be associated with stronger decreases in parenting self-efficacy, hierarchical regression analyses with parenting self-efficacy and autonomic measures at baseline entered in the first step, autonomic measures entered in the second step, and parenting self-efficacy after baby 1 as outcome variable yielded no significant effects ($p > .60$). Results were similar for hierarchical regression analyses with parenting self-efficacy and autonomic reactivity after baby 1 entered in the first step, autonomic reactivity after baby 2 in the second step, and parenting self-efficacy after baby 2 as outcome variable ($p > .15$). Additionally, change in parenting self-efficacy of groups based on HR acceleration or deceleration were analyzed (for more information on this method, see Zeskind, 1987), but these analyses did not reveal significant effects ($p > .05$).

Cry Perception

Repeated-measures ANOVA showed a significant increase in negative cry perception during the task, Wilks $\Lambda = .16$, $F(1,150) = 783.71$, $p < .001$, partial $\eta^2 = .84$. To test our third hypothesis that more negative cry perceptions would be associated with decreasing parenting self-efficacy, hierarchical regression analysis with parenting self-efficacy at baseline entered in the first step, negative cry perception during baby 1 entered in the second step, and parenting self-efficacy after baby 1 as outcome indicated that cry perception significantly affected parenting self-efficacy after baby 1, $R^2 = .44$, $F(2,148) = 58.49$, $p < .001$. Higher negative cry perception was marginally associated with decreases in parenting self-efficacy, $b = -.11$, $t = -1.75$, $p = .082$, $R^2 = .012$. Hierarchical regression analysis with parenting self-efficacy after baby 1 entered in the first step, cry perception after baby 2 entered as the second step, and parenting self-efficacy after baby 2 as outcome revealed a significant effect, $R^2 = .45$, $F(2,148) = 60.22$, $p < .001$. Women with more negative cry perceptions had larger decreases in parenting self-efficacy, $b = -.20$, $t = -3.15$, $p < .01$, $R^2 = .037$.

To assess whether participants with increasingly negative cry perceptions showed larger decreases in parenting self-efficacy, hierarchical regression analyses with parenting self-efficacy and negative cry perception after baby 1 entered in the first step, negative cry perception after baby 2 entered in the second step, and parenting self-efficacy after baby 2 as the outcome variable revealed a significant effect, $R^2 = .46$, $F(3,147) = 41.12$, $p < .001$. Changes in negative cry perception were associated with changes in parenting self-efficacy, $b = -.26$, $t = -3.40$, $p < .001$. Change in cry perception explained 4.3% of the variance in change in parenting self-efficacy. Autonomic reactivity and cry perception were not significantly associated ($p > .10$).

DISCUSSION

Parenting self-efficacy could be manipulated using a simulated childrearing task. The sequential increase and decrease of parenting self-efficacy during the task indicated that pregnant women used their experiences of success and failure in adapting their parenting self-efficacy, as hypothesized based on previous studies (Bandura, 1982; Bandura et al., 1982; Gross, Rocissano, & Roncoli, 1989; Teti & Gelfand, 1991). The increase was only slight, while the decrease after failure was more prominent, which may be due to baseline level of parenting self-efficacy ($M = 69.11$) being not as discrepant from the success experiences during baby 1 (80%) as the rate of success during baby 2 (20%).

No support was found for the second hypothesis that autonomic responses to success or failure to soothe a crying infant would be linked to changes in parenting self-efficacy. Although dampening of autonomic nervous system reactivity due to pregnancy may play a role (for a review, see De Weerth & Buitelaar, 2005), participants did show physiological reactivity to the cry sounds compared to baseline. Given different patterns of autonomic reactivity to infant emotional cues (e.g., related to own childhood experiences with abuse; Casanova et al., 1994), future research might explore possible moderators of links between autonomic reactivity, parenting success and failures and parenting self-efficacy, as well as other perceptible physiological responses.

The association between negative cry perceptions and the larger decrease in parenting self-efficacy after unsuccessful soothing supports the idea that salience may moderate the effect of feedback on caregiving (Bandura, 1982, 1997). A trend in the same direction was found during successful soothing. This finding highlights individual differences in the association between cry perceptions and change in parenting self-efficacy. Results of the current study provide support for our third hypothesis by showing that women with a larger increase in negative perceptions between babies demonstrated a larger decrease in parenting self-efficacy than women whose perceptions of the signals changed less from the easy-to-soothe to the difficult-to-soothe infant. A meta-analysis showed that parental affective responses to parenting situations are robustly linked to parenting behaviors (Rueger, Katz, Risser, & Lovejoy, 2011): More negative affect of parents regarding their infants was associated with more hostile parenting, whereas more positive affect was associated with supportive parenting. Therefore, the association found between reactivity in cry perceptions and lower strength (i.e., heightened changeability) of parenting self-efficacy might stimulate further scrutiny of parenting self-efficacy *strength* and not only *level* as a potential indicator of overreactive parenting (Lipscomb et al., 2011). Overreactive parenting is likely to exacerbate difficulties in relationships between parents and infants with a negative reactive temperament.

Several limitations to the current study should be noted. First, the group of participants was very homogenous in education level, parental country of birth, and marital status. It would be interesting to investigate whether the experimental paradigm also manipulates parenting self-efficacy in more "at risk" populations. The second limitation can be found in the experimental set-up of the Cry Response Task. Although the experiment changed parenting self-efficacy and perceptions, not many other significant predictors of self-efficacy were found. It could be that the stark contrast between performance feedback in the two conditions led participants to pay less attention to their physiological responses. Furthermore, not counterbalancing the easy-to-soothe and the difficult-to-soothe infant during the experiment left open a possible caveat. Because participants were confronted first with the easy-to-soothe infant and then with the difficult-to-soothe infant, an alternative interpretation of the results could be that participants became fatigued or bored during exposure to the second, difficult-to-soothe infant. This interpretation is unlikely, because of the significant increase in parenting self-efficacy during exposure to the easy-to-soothe infant.

Although the results found in the current study are intriguing, it should be noted that this is an artificial experiment. To know whether real-life soothing success and failure is associated similarly to parenting self-efficacy and cry perception, these results should be replicated in situations that resemble real soothing situations more, for instance with baby doll experiments.

In future studies, it would be worthwhile to study the role of perceptions in relation to other sources of self-efficacy as described by Bandura (1977), such as vicarious experiences and verbal persuasion. Because perceptions played a role in the incorporation of success and failure experiences in changing the parenting self-efficacy, perceptions might be related as well to changes in parenting self-efficacy based on other sources.

IMPLICATIONS FOR PRACTICE, APPLICATION, AND POLICY

The current study showed that perceiving infant signals as more negative amplifies effects of caregiving successes and failures on parenting self-efficacy. Based on these findings, new parents should be thoroughly informed that failures in soothing are inherent in new parenthood. Parents should be advised to try to persevere in soothing behaviors, because their ultimate success will boost their parenting self-efficacy. Furthermore, both family and health care practitioners should pay close attention to the way mothers speak about their infants and their mothering capabilities. When declines in positive affect of mothers regarding their infants are noted, parenting support may be indicated to prevent a possible negative cascade in parenting. Further research into interrelations among sources of self-efficacy, perceptions of infants, and changes in parenting self-efficacy is needed to establish which people are at risk of turning to maladaptive caregiving behaviors when being confronted with childrearing challenges and to increase the knowledge base for prevention and intervention methods that may ultimately make parents more resilient when confronted with infants who are difficult to soothe.

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APPENDIX

Correlations among Parenting Self-Efficacy, Physiological Measurements, and Cry Perception

Variable	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1 PSE baseline	—																
2 PSE baby 1	.66*	—															
3 PSE baby 2	.60*	.64*	—														
4 PEP baseline	−.14	−.06	−.03	—													
5 PEP baby 1	−.12	−.05	−.03	.98**	—												
6 PEP baby 2	−.12	−.05	−.03	.96**	.98**	—											
7 RSA baseline	.05	.13	.14	.11	.13	.12	—										
8 RSA baby 1	.03	.11	.13	.11	.09	.07	.81**	—									
9 RSA baby 2	.04	.12	.15	.11	.11	.09	.80**	.89**									
10 HR baseline	.04	−.01	.05	−.17*	−.20*	−.19*	−.53**	−.46**	−.52**	—							
11 HR baby 1	.01	−.03	.04	−.15	−.17*	−.16*	−.45**	−.50**	−.50**	−.92**	—						
12 HR baby 2	.01	−.02	.03	−.20*	−.22*	−.19*	−.50**	−.52**	−.57**	.94**	.96**	—					
13 SCL baseline	.07	.12	.05	.05	.04	.04	.09	.08	.07	−.14	−.10	−.10	—				
14 SCL baby 1	.10	.15	.07	.01	−.01	−.01	.08	.08	.10	−.11	−.06	−.07	.95**	—			
15 SCL baby 2	.06	.15	.08	−.01	−.03	−.02	.08	.07	.08	−.13	−.08	−.08	.93**	.95**	—		
16 Cry perception baby 1	−.11	−.18*	−.16	−.02	−.02	−.02	−.10	−.09	−.04	.00	−.01	−.03	.07	.07	.07	—	
17 Cry perception baby 2	−.19*	−.18*	−.30**	.00	.01	.02	−.07	−.09	−.06	.03	.06	.05	.01	.04	.03	.60**	—

HR = heart rate; PEP = pre-ejection period; PSE = parenting self-efficacy; RSA = respiratory sinus arrhythmia; SCL = skin conductance level.
$^{*}p < .05$. $^{**}p < .01$.