Association between life stress during pregnancy and infant crying in the first six months postpartum: A prospective longitudinal study

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Abstract

Objective: To examine prospectively the relationship between prenatal life stress and infant crying/fussing during the first 6 months of postnatal life, taking into account an array of confounders suggested in the literature.

Design: Prospective longitudinal study of a convenient sample, with data points in pregnancy and at about 6 weeks, 3, and 6 months postpartum.

Methods: The study included 86 pregnant women who completed a standardized, validated and widely used questionnaire on negative life changes experienced in the preceding 12 months. Women were grouped by median split on the impact score of negative life changes. Demographic, obstetric and lifestyle variables were obtained from pre- and postnatal interviews and from medical records in order to be taken into account as possible confounders. At all three postnatal data points, mothers kept a validated 5-day 24-h behavior diary to assess durations of infant crying/fussing.

Results: Infants of mothers with high scores of negative life changes exhibited more crying/fussing than infants born to mothers with low negative change scores, throughout the first half year postpartum, but particularly at ages 3 and 6 months. These results do not seem to be spurious due to the confounders considered in this report or to recording bias.

Conclusion: Prenatal life stress is associated with infant crying/fussing in the first half year after delivery. To prevent or reduce infant crying and to foster a well-adapted parent–infant relationship, professionals attending expectant mothers should consider their emotional condition. If required, support should be provided already in pregnancy.

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1. Introduction

During the first months of postnatal life, most infants are prone to increased crying and/or fussing, particularly in the late afternoon and evening hours [1]. The increase in crying/fussing amounts exhibits a typical age dependent pattern, first described by Brazelton [2] and replicated by many others (e.g., [1,3–6]): crying/fussing begins to augment in the first two weeks postpartum, peaks at about 6 weeks, on average, and subsides by the age of about 3 months. The crying/fussing peak has been explained by normal maturational and neuro-developmental processes during the early postnatal period [3,6–9].

Evidence in favor of this view is converging [10–12]. However, onset, peak and ending, as well as the amounts of crying/fussing at specific ages, display a high interindividual variability. For instance, crying/fussing in individual infants has been reported to peak between 3 and 12 weeks of age [6]. Similarly, daily crying/fussing durations at ages 6, 13, 26, and 52 weeks have been found to vary extremely from a minimum of 0 to 280, 210, 145, and 115 min, respectively [13]. At the age of 0 to 3 months, extreme expressions of crying/fussing, as defined according to the now commonly used criteria of Wessel et al. [14] (crying/fussing of more than 180 min/day, on more than three days in any one week), are estimated to range from 5% to 29% of infants in Western European countries [15]. The same diurnal rhythm and age dependent pattern in crying/fussing have been reported for these excessively crying infants [16]. But again, excessive crying continues beyond the age of three months in some 40% of all cases [17,18]. This large variability in crying/fussing cannot be solely accounted for by maturational processes.

On the part of the infant, difficult temperament [19,20], pediatric conditions [21], birth weight and other physical factors related to birth [22,23] have been assumed as putative sources for variations in crying/fussing amounts. On the part of the parents, effects of maternal sensitivity factors related to birth [22,23] have been assumed as significant risk factors for the development of excessive infant crying within the first six months. All of these factors were determined retrospectively shortly after delivery, however. In the study by Sundergaard et al. [22], a more than threefold increased risk of excessive crying, cumulatively assessed up to the age of 8 weeks, was observed in infants born to mothers with high amounts of general distress in pregnancy. In contrast to these reports, Miller, Barr, and Eaton [32] did not find any associations between both emotional distress and anxiety, ascertained at 34 weeks of gestation, and measures of infant crying/fussing at the age of 6 weeks.

All of these 4 studies have used a longitudinal design with data on maternal distress obtained either in pregnancy or before the peak age of infant crying. This ensures that maternal reports of distress are not biased by the cry problem. However, these studies are limited by a number of methodological shortcomings. First, measures of distress during pregnancy have been ascertained using non-validated questionnaires or telephone interviews in 3 of these studies [22,23,31]. A second flaw, also related to validity, is that 2 of the studies used subjective estimates of the amounts of infant crying as indicators of the target constructs [23,31]. Both limitations raise the question of what really has been measured in pregnancy and in the postpartum period; furthermore, relying on subjective estimates of infant behavior impedes comparison with studies which use validated behavior diaries and the criteria of Wessel et al. [14] to define cases. Third, although the study of Hugdall et al. [23] has a longitudinal design, measures of distress and psychosomatic complaints were obtained retrospectively, after delivery, which might have had an impact on ratings. Fourth, though Miller, Barr, and Eaton [32] used validated and common instruments to assess distress in pregnancy and infant crying/fussing durations, the study started in late pregnancy; the results of several studies imply, however, that stress in the first half of gestation has a more pronounced impact on infant behavior, as susceptibility to the effects of stress decreases in the course of pregnancy [33,34]; thus, Miller et al. [32] may have started data collection too late to detect associations between emotional distress in pregnancy and infant crying/fussing.

Apart from these methodological constraints, none of the previous studies has examined the issue of whether prenatal stress is related to the persistence of infant crying/fussing in the course of the first six months of postnatal life. Therefore, we investigated prospectively the association between stress and infant crying/fussing at ages 6 weeks, 3, and 6 months, parallel to the age dependent crying curve. We utilized validated and common instruments to assess measures of prenatal stress and infant crying/fussing. Impact of life stress, reported by the mother during early–mid gestation, was assessed because it is more specific and quantifiable than general emotional distress. We hypothesized that infants of mothers stressed during early–mid gestation exhibited continuously higher amounts of crying/fussing throughout the first half year postpartum. If confirmed, this information could be useful to develop effective interventions to prevent excessive infant crying/fussing.

2. Methods

2.1. Study design and overview

This is the first report of a larger longitudinal research project on the influences of prenatal stress of the mother on...
infant development during the first six months postpartum. The study employed a prospective longitudinal design with several data points in pregnancy and in the early postpartum period. Adjusting for gestational age, the postnatal data points were scheduled to cover the peak age and course of infant crying. Here, we report on data collected during the first contact in pregnancy and at about 6 weeks, 3, and 6 months postpartum.

The study is a joint research project undertaken by the Universities of Munich and Trier, Germany. Subject recruitment and data collection took place in Trier, one of Germany’s oldest university towns with a population of about 100,000 inhabitants. Subjects were recruited by newspaper advertisements and by collaborating obstetricians.

A total of 94 women met inclusion criteria and, after a brief explanation of the protocol of the research project, initially provided informed consent to participate in the study. The inclusion criteria were age 16 years or older and fluency in German. Exclusion criteria were 1) severe biomedical complications (acute or chronic physical diseases, such as gestational diabetes, metabolic diseases, hypertension, gestosis), 2) multifetal pregnancies, 3) signs of fetal malformation, and 4) psychiatric diseases of the expectant mother. It is noteworthy that this selection strategy resulted in a convenient community sample that had a relatively low risk of pregnancy or birth complications and was committed to continue with an intensive longitudinal study protocol.

Adherence to the exclusion criteria was observed by the women’s attending obstetricians. One woman was excluded because she was expecting twins. Of the remaining 93 women, 7 denied further participation after an initial semi-structured interview to obtain sociodemographic and lifestyle characteristics. Thus, information on life stress during pregnancy was available for 86 women.

2.2. Subjects

Most of the participants were German (n=81 or 94.2%), only 5 women were of other nationalities (either French, Anglo-American, Brazilian, Japanese, or Columbian). The semi-structured interview was conducted during the first contact at 18.3 ± 6.8 (M ± SD) weeks of gestation. At first contact, women were 31.4 ± 5.3 years of age. Most (74.4%) of the women were married, 23.3% were unmarried, and 2.3% were divorced or were living in separation. The majority (93.0%) was living with their partners, 4.7% were living without their partners, and 2.3% were living with their parents. The rate of primiparous women in the sample was 41.9%. Accordingly, 43.0% of the women already had given birth to one child, 10.5% had two, and 4.6% had three or more previous children by the time of the interview. As indicated by level of education and monthly income per household, family background of the participants was middle and working class. 60.5% of the mothers and 60.2% of the fathers had a high school or college education, the remaining mothers and fathers had a basic education or vocational qualification. A minority (6.0%) of the sample had a net income per household of less than €750; €750 to less than €2250 were available for 36.1% of the subjects; 43.4% of the sample had €2250 to less than €3750; and at least €3750 were available for 14.5% of the subjects. With regard to nicotine consumption, 9 women (10.5%) admitted smoking during pregnancy, with 4 (4.7%) of them smoking 10 cigarettes or more per day. Occasional alcohol intake in pregnancy was reported by 11 women (12.8%).

Participating and non-participating subjects did not differ significantly in any of these sociodemographic and lifestyle variables. It should be noted that, although tests for group differences are restricted by lack of statistical power on account of the small number of non-participating subjects, means and frequencies were comparable and remarkably similar.

All women were paid €200 for their time and efforts in participating in the project. The study protocol was approved by the Ethical Committee of the University of Trier and is consistent with the revised Helsinki Declaration of 1975.

2.3. Procedures

2.3.1. Life stress

At first contact in pregnancy, the impact of negative life events during the preceding 12 months was assessed by means of the Life Experiences Survey (LES, [35]). This widely used, validated and sufficiently reliable instrument lists 47 life changes that require adjustment. The LES includes events of the following life domains: 1) family roles; 2) financial situation; 3) interpersonal relationships; 4) working conditions; 5) lifestyle; 6) physical integrity; and 7) minor law conflicts. Subjects were requested to indicate the occurrence of events and to rate their impact on bipolar 7-point scales. Summing up the impact ratings of those events experienced as negative by the subjects yields a negative change score.

The negative life change scores in our sample ranged from 0 to 27 with a mean of 7.5 ± 7.2, slightly higher than that reported for the normative sample (5.6 ± 6.4; [35]) which consisted of female college students. The proportion of women with scores of more than 1 SD above the mean of the normative sample was 24.4%, markedly higher than that expected from the distribution of the normative data. This probably reflects the fact that the studied group was somewhat older than the normative sample, for the incidence of life events increases with age.

We grouped the participants in our sample according to their negative change scores. Subjects (n=47) with negative change scores equal to or above the median (5.0) constituted group LES(+), subjects (n=39) scoring below the median composed group LES(−). Table 1 compares the two groups as to the incidence of negative life events in the above mentioned domains. The group differences were all significant and most pronounced with respect to negative changes in working conditions, lifestyle and financial situation.

2.3.2. Variables related to birth, feeding practices and subjective view of infant behavior

Information on demographic, obstetric and physical factors was extracted from medical records routinely kept by the attending obstetricians (Table 2). At each postnatal data point, semi-structured interviews were conducted to obtain information on feeding practices (bottle-feeding vs. breast-feeding with or without additional bottle-feed-
2.3.3. Infant fussing and crying

A German adaptation of Hunziker and Barr’s [4] standardized 24-h behavior diary was employed to obtain amounts of infant sleeping, content wakefulness, feeding, fussing, crying, and unsoothable crying (cry bouts that are difficult or impossible to soothe) at about 6 weeks, 3, and 6 months postpartum. The behaviors were defined on the diary as exclusive and comprehensive. Mothers were asked to record infant behavior continuously for 5 consecutive days using predefined symbols to mark the onset and ending of each behavior. The symbols were to be shaded in time-rulers which had an accuracy of 5 min and represented four 6-h periods: morning (6 am to noon), afternoon (noon to 6 pm), evening (6 pm to midnight), and night (midnight to 6 am).

Hunziker and Barr’s [4] behavior diary is widely used in the international cry literature and has been validated against audio-recordings with satisfactory results [36–38]. In order to increase reliability, we only considered diaries for analyses if mothers returned complete behavior records covering a period of at least 3 out of 5 days. At 6 weeks, 3, and 6 months postpartum this requirement was met by 64, 63, and 63 diaries, respectively. With listwise deletion, complete behavior records for all three postnatal data points were available for 54 infants. The negative life change scores of women for whom complete behavior data sets were available did not differ significantly from those of women with incomplete diaries ($t_{(84)} = -1.40; p = .165$). In this report fussing, crying and unsoothable crying were the main outcome variables.

At each data point, amounts of fussing, crying, unsoothable crying and total crying/fussing were calculated as the average from completely recorded days. Means were derived for the four 6-h periods and for the entire 24-h day, respectively. At 6 weeks postpartum, infants were grouped according to modified criteria of Wessel et al. [14]: excessive criers in group Wessel(+) consisted of infants who had daily amounts of crying or fussing of more than 180 min, on average; group Wessel(−) comprised infants who did not meet this criterion.

2.3.4. Confounders

In the literature, a number of demographic, obstetric and lifestyle variables have been investigated as potential risk factors for excessive infant crying. They include cigarette smoking and alcohol consumption in pregnancy, maternal age, parity, socioeconomic status, sex, gestational age, method of delivery, birth weight, and feeding practices [1,3,18,22,23,27,31,39–41]. Although results have been conflicting in the literature, the listed variables were assessed in this project in order to be taken into account as potential confounders in statistical analyses.

2.4. Statistical analyses

To explore the effects of negative life changes and of the potential confounders on crying/fussing, we used $\chi^2$-tests.
Statistics, Fischer’s exact tests, non-parametric procedures, Pearson’s product-moment correlations, Student’s t-tests, 1-way ANOVAs, and 3-way repeated measure ANOVAs according to data quality. Values given are percentages, means, and standard deviations (SD), or standard errors (SE) where indicated. SPSS version 12.0.1 for Windows was used for statistical computations. A p value < .05 was considered significant for all analyses.

3. Results

At enrolment, groups LES(+) and LES(−) did not differ significantly in any of the assessed sociodemographic and lifestyle characteristics. Medical records on neonatal variables were provided for 83 newborns. As shown in Table 2, neonates of groups LES(+) and LES(−) were comparable in the considered demographic, obstetric and physical variables related to birth. Apgar scores assessed 5 and 10 min after delivery refer to good to optimal physiological condition of the neonates.

Table 3 gives the mean durations of infant behaviors in the first half year postpartum. Age effects were apparent for all aspects of infant behavior with total duration of content wakefulness increasing, and durations of sleeping, fussing, crying, unsoothable crying and crying/fussing decreasing with age. Notable is the relatively high amount of infant crying/fussing at the age of about 6 weeks. The mean duration of crying/fussing was more than 145 min./24 h, which is markedly higher than that reported for non-referred English or Danish infants of that age [1,3].

At about 6 weeks postpartum, 29.7% of the infants in our sample fulfilled slightly modified criteria of Wessel et al. [14]. On average, these infants cried and fusses for a total of 240.8 ± 84.0 min a day (range: 187.0–565.0). Signs of unsoothable crying at the age of about six weeks were recorded for 35.9% of the infants (unsoothable cries). These infants cried unsoothably for a duration of 29.3 ± 37.0 min per day, on average, with a range of 5.0 to 158.3 min in 24 h. The overlap between excessive and unsoothable infant crying at the age of about 6 weeks was not perfect: only 52.6% of Wessel(+) infants were also unsoothable cries; conversely, as many as 28.9% of Wessel(−) infants were reported to exhibit unsoothable crying.

The alleged effects of cigarette smoking and alcohol consumption in pregnancy, maternal age, parity, parental education, net income per household, sex, gestational age, method of delivery, birth weight, and feeding practices on crying/fussing at each data point have been tested. Only random and inconsistent relationships between these variables and infant behaviors were apparent. Furthermore, groups LES(+) and LES(−) did not differ systematically in any of the potential confounders. For these reasons, we refrained from including the listed variables in further statistical analyses.

In order to analyze differences between infants of groups LES(+) and LES(−) in the amounts and diurnal patterns of crying/fussing during the first half year postpartum, we performed a 3-way repeated measure ANOVA with LES as between subjects factor and Age as well as Time of day as within subjects factors. Fig. 1 depicts the interaction of LES and Age. As shown, infants (n=27) of mothers with high negative change scores in pregnancy (LES(+)) cried and fussed for longer durations than infants (n=27) of group LES(−) at all postnatal data points, but particularly so at ages 3 and 6 months. The mean (± SE) of amounts of crying/fussing in 24 h, averaged over the 3 data points, for LES(+) infants was 132.2 ± 9.9 min, as opposed to 102.2 ± 9.9 min in group LES(−). This main effect for LES was significant (F(1; 52) = 6.61; p < .05). There was also a significant main effect for Age (F(2; 104) = 18.63; p < .001), with a linear decrease in the amounts of crying/fussing over the first half year postpartum (F(1; 52) = 30.73; p < .001). The degree of this decline in daily crying/fussing durations was similar for groups LES(+) and LES(−), as indicated by the insignificant interaction of LES and Age (F(2; 104) = 1.17; p = .316).

The repeated measure ANOVA also yielded a significant main effect for Time of day (F(12; 156) = 87.66; p < .001): across all postnatal data points, there was a marked and significant (F(1; 52) = 124.75; p < .001) curvilinear trend with a peak in the afternoon and evening hours (Fig. 2, panels a to c). The interaction effect LES by Time of day was insignificant (F(12; 156) = 0.93; p = .414), thus infants of groups LES(+) and LES(−) showed the same diurnal crying/fussing peak. Interestingly, the ANOVA revealed a significant interaction effect of Age and Time of day (F(6; 312) = 6.43; p < .001): with age, the diurnal crying/fussing peak, gradually decreasing in level, shifted from the evening (6 pm to midnight) to the afternoon (noon to 6 pm) hours (Fig. 2). Finally, the 3-way interaction effect LES by Age by Time of day was not significant (F(6; 312) = 1.52; p = .191).

ANOVA with the same between and within subject factors, using amounts of fussing and crying as dependent variables, showed comparable results with regard to the main effects of Age and Time of day, linear or curvilinear trends, and all interaction effects. However, the difference in daily amounts of crying/fussing between infants of groups LES(+) and LES(−) was not accounted for by differences in fussing durations (F(1; 52) = 2.11; p = .152).

<table>
<thead>
<tr>
<th>Table 3</th>
<th>Mean (± SD) durations of infant behaviors in the first half year postpartum</th>
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<tbody>
<tr>
<td></td>
<td>6 weeks (n=64)</td>
</tr>
<tr>
<td>Sleeping (min./24 h)</td>
<td>849.7 ± 116.6</td>
</tr>
<tr>
<td>Content wakefulness (min./24 h)</td>
<td>244.2 ± 99.2</td>
</tr>
<tr>
<td>Fussing (min./24 h)</td>
<td>102.3 ± 56.2</td>
</tr>
<tr>
<td>Crying (min./24 h)</td>
<td>43.3 ± 49.9</td>
</tr>
<tr>
<td>Unsoothable crying (min./24 h)</td>
<td>10.5 ± 26.0</td>
</tr>
<tr>
<td>Crying/fussing (min./24 h)</td>
<td>145.6 ± 84.4</td>
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</tbody>
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which made up 70.3%, 73.4%, and 77.7% of total crying/fussing at about 6 weeks, 3, and 6 months postpartum, respectively, but was mainly due to differences in crying durations ($F_{(1; 52)} = 5.68; p < .05$).

In order to investigate if there is a dose dependent effect of prenatal life stress, experienced by the mother, on the amounts of infant crying/fussing in the first half year postpartum, we performed an additional analysis, using the same within subjects factors as described above, but stratifying subjects into three groups (lower, middle, and upper terciles) according to their negative change scores. Results show that daily amounts of crying/fussing were comparable in subjects of the lower (107.0 ± 11.9 min) and middle (108.6 ± 11.9 min) terciles, but highest in subjects of the upper tercile (139.5 ± 13.0 min). Due to small sample sizes, however, these group differences failed to be significant ($F_{(2; 51)} = 2.11; p = .131$).

In the semi-structured interviews 6 weeks, 3, and 6 months postpartum, the mothers gave their subjective estimates of infant crying/fussing durations and reported their distress caused by crying/fussing. In order to explore if the durations of infant crying/fussing recorded in the diaries are a reflection of the current emotional distress of the mothers from the persistence of the impact of negative life stress into the postpartum period, we tested for group differences in the subjective evaluations of infant behavior. The subjective views were assumed to be more prone to bias than the behavior records. At 6 weeks postpartum, the peak age of infant crying, no significant differences between mothers in groups LES(+) and LES(−) were detected with respect to times of positive interactions with their babies (92.9% vs. 100.0%), elevated levels of crying/fussing in their babies as compared to babies of other mothers (10.0% vs. 6.1%), complaints of unsoothable infant crying (8.3% vs. 13.3%), and crying/fussing of more than 3 h per day (10.5% vs. 5.7%). The rate of distress caused by crying/fussing was only 17.1% for mothers in group LES(+) and was comparable to the rate of 13.9% for mothers in group LES(−). Equally, we did not find any significant differences in the reports obtained in the 3 and 6 months interviews. Thus, no reporting bias in mothers with high scores of negative life stress in pregnancy was evident in the interviews, which increases the credibility of the diary data.
4. Discussion

This is the first prospective study to address the issue of whether prenatal life stress is related to the persistence of infant crying/fussing in the course of the first six months postpartum. We found that infants of mothers scoring higher on impact of negative life changes in early—mid gestation cried/fussed more than infants of mothers with lower negative change scores, throughout the first half year postpartum. These differences in crying/fussing durations were most pronounced at ages 3 and 6 months. Life stress seems to contribute particularly to the persistence of crying/fussing beyond the first 3 months of postnatal life, when increased crying/fussing is expected to terminate in many infants [1–6].

We used validated and common instruments to assess measures of prenatal stress and infant crying/fussing in order to reduce shortcomings of previous investigations and to ensure comparison with forthcoming studies. An array of possible confounders for excessive infant crying/fussing, suggested in the literature, was obtained and considered in statistical analyses. These confounders exerted only random and inconsistent effects on the outcome variables. Moreover, they did not differ systematically between groups LES(+) and LES(−). Therefore, we feel confident that our results do not constitute a spurious artifact due to the third variables considered in this report. There might have been a recording bias caused by the persistence of the impact of negative life stress in pregnancy into the postpartum period. However, groups LES(+) and LES(−) did not differ in subjective views of infant behavior and distress caused by crying/fussing, as assessed by interviews at 6 weeks, 3, and 6 months postpartum. Because subjective views appear to be more prone to distortions due to current emotional distress than behavior diaries, it is unlikely that our results are based on recording bias. Nonetheless, this study is limited by the relatively large number of missing or incomplete (behavior recorded for <3 out of 5 days) diaries. For the 6 weeks, 3, and 6 months data points, 25.6% to 26.7% of the records were not available or eligible for analyses. This rate is higher than that reported in previous studies [32]. However, we used a stricter criterion to define eligible diaries in order to increase reliability. This implied that complete behavior records for all 3 postnatal data points, requested for the repeated measure ANOVAs, were usable for only 62.8% of all infants in the sample. This attrition rate most likely is due to the intensive longitudinal study protocol the subjects had to undergo. Although drop-outs tended to have higher negative life change scores than women who returned complete diaries, this difference was not significant. The findings with regard to infant crying/fussing, therefore, are unlikely to be affected by the drop-outs or are conservative estimates of the differences between groups LES(+) and LES(−), at the most.

The data reported here support the assumption that life stress of the expectant mother is associated with infant crying/fussing. This is in keeping with results from most previous studies on this issue [22,23,31], but in contrast to the observation of Miller [32]. There are animal and human studies suggesting a sensitive period in early pregnancy in which stress might have a more detrimental effect on the developing fetus than in other periods of gestation [33,34]. According to these studies, this sensitive period is in the first half of gestation. In the present study as well as in two of the studies [22,31] that did find an association between prenatal stress and infant crying/fussing, stress was assessed in the first or second trimester of pregnancy. In contrast, Miller et al. [32], assessed the level of emotional distress in late gestation, i.e., after the suggested temporal window of increased sensitivity to the effects of prenatal stress. This might be responsible for the conflicting results in their report. Clearly, however, more research on possible sensitive periods in early gestation, inflicting increased vulnerability to stress, is urgently needed.

At least two alternative mechanisms, underlying the relationship between maternal stress in pregnancy and infant crying/fussing, are conceivable. First, prenatal stress of the mother might have an impact on fetal brain development and thus on infant behavior regulation. Investigations on rodents have shown excessively high or low levels of stress hormones (glucocorticoids or others) to be detrimental to the development of brain structures like the hippocampus [42,43]. The hippocampal complex is involved in the regulation of functions that are the biological basis for individual temperament characteristics. Temperament-like features (fetal movement), in their turn, have been shown to predict infant crying [44]. Thus, there may be a physiological effect of prenatal stress on infant temperament and behavior. The second mechanism implies a social or interactive basis for infant crying. Prenatal stress of the mother might persist into the postpartum period and compromise maternal behavior in mother—infant interaction. According to a systemic psychobiological model proposed by Papoušek [45], the infant’s self-regulatory competencies develop within the context of the parents’ intuitive co-regulatory support. This parental support compensates for the infant’s initial maturation constraints in regulating affective arousal, self-soothing, and transition to sleep. An array of factors, including postnatal emotional distress, might interfere with the intuitive parental competence, resulting in dysfunctional mother—infant interactions. In this view, excessive infant crying may be the result of dysfunctional mother—infant interactions. The proposed dynamic model provides for both mechanisms to combine their effects. Difficult infant temperament with persistently elevated levels of crying and fussing, which might ensue from prenatal stress hormone exposure, is among the stressful factors compromising the mother’s resources and affecting her competence. Hence, a process of negative mother—infant reciprocities might arise from both infant and maternal characteristics. Deeper insight into the mechanisms that underlie the observed association between life stress during pregnancy and infant crying in the first six months postpartum will be explored in forthcoming reports about our research project (Wurmser et al., in prep.; Wurmser et al., in prep.).

Based on our results and under consideration of the literature, we conclude that life stress of the expectant mother is associated with infant crying/fussing in the first half year postpartum. In order to prevent or reduce infant crying and to foster the development of well-adapted parent—infant relationships, professionals dealing with expectant mothers should pay more attention to their emotional condition and provide support, if required.
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