Maternal anxiety disorders predict excessive infant crying: a prospective longitudinal study

Johanna Petzoldt, Hans-Ulrich Wittchen, Julia Wittich, Franziska Einsle, Michael Höfler, Julia Martini

ABSTRACT

Purpose To prospectively examine relations between maternal DSM-IV-TR anxiety and depressive disorders and excessive infant crying.

Methods Based on the prospective longitudinal Maternal Anxiety in Relation to Infant Development Study, n=306 expectant mothers were enrolled during early pregnancy and repeatedly interviewed until 16 months post partum. Lifetime and prospective information on maternal anxiety and depressive disorders was assessed via standardised diagnostic interviews (Composite International Diagnostic Interview for Women). Excessive crying (crying for ≥3 h per day on ≥3 days per week for ≥3 weeks) was assessed via Baby-DIPS. During the first 16 months after delivery, n=286 mother-infant dyads were available and included in the analyses.

Results Excessive crying was reported by n=29 mothers (10.1%). Infants of mothers with anxiety disorders prior to pregnancy were at higher risk for excessive crying than infants of mothers without any anxiety disorder prior to pregnancy (OR=2.54, 95% CI 1.11 to 5.78, p=0.027). Risk was even increased when considering additionally incident anxiety disorders until delivery (OR=3.02, 95% CI 1.25 to 7.32, p=0.014) and until 16 months post partum (OR=2.87, 95% CI 1.13 to 7.28, p=0.027). Associations remained stable when adjusting for sociodemographic and perinatal covariates. Maternal depressive disorders prior to pregnancy were not significantly associated with excessive crying in this sample.

Implications Maternal lifetime and incident anxiety disorders revealed to be a robust predictor for excessive crying. Thus, early identification and monitoring of women with anxiety disorders is important to identify mother-infant dyads at risk for excessive crying.

BACKGROUND

Excessive infant crying occurs with a prevalence of 3–40% and is one of the most frequent reasons for parents to consult a paediatrician. Unfortunately, most mothers search for professional help after infant crying behaviour has already escalated. Thus, correlates of excessive crying are typically investigated in clinical samples and rarely examined in prospective longitudinal studies.

Due to the close relation between infant and mother as primary caregiver, excessive crying seems to emerge in a dynamic interplay that can exacerbate to a vicious circle and maternal psychopathology has been investigated as one potential vulnerability or risk factor. While the relation between maternal depression and excessive crying has gained a lot of attention, maternal anxiety has been widely neglected. The few available studies suggest that maternal trait anxiety/psychological distress and manifest anxiety disorders during pregnancy are associated with excessive crying, or emotional problems later in childhood. Yet, evidence based on prospective longitudinal examinations of the relation between maternal anxiety and depressive disorders (as well as their combination) is still lacking.

To summarise, previous studies used predominantly dimensional self-report questionnaires, often neglected prepregnancy status of the mother and mainly focused on depression whereas anxiety was typically not examined in detail. With respect to this gap of knowledge, the present study aims to investigate prospective longitudinal associations between lifetime and peripartum maternal DSM-IV-TR anxiety and depressive disorders and excessive crying based on two research questions:

What is already known on this topic?

- Excessive infant crying is common in infancy, but aetiological conditions are poorly understood and mainly studied retrospectively in clinical samples during the post partum period.
- The relation of excessive infant crying to maternal depressive disorders is well examined; the relation to maternal anxiety disorders has been widely neglected.
- Excessive infant crying is one of the most frequent reasons for paediatric consultation, but parents typically search for help after crying behaviour has already escalated.

What this study adds?

- Infants of mothers with anxiety disorders (but not with depressive disorders) prior to pregnancy are at higher risk for excessive infant crying.
- The association even increases, when considering incident anxiety disorders during pregnancy and the post partum period.
- The relation between maternal anxiety disorders and excessive infant crying cannot be explained by sociodemographic and perinatal confounders.
1. Are maternal anxiety and/or depressive disorders (and their severity) prior to pregnancy associated with an increased risk for excessive crying?

2. Does incident maternal anxiety or depressive disorder during pregnancy and post partum predict an increased or attenuated risk for excessive crying?

Since maternal anxiety and depressive disorders may be interrelated, we consider anxiety and depressive disorders alone and in combination as well as independently from their comorbid presentation. As former studies showed associations of sociodemographic features (eg, lower maternal age and educational level) and perinatal factors (eg, primiparity, caesarean section, breastfeeding) with excessive crying, these potential confounders will be considered as covariates.

**METHODS**

**Procedure**

In the prospective longitudinal Maternal Anxiety in Relation to Infant Development Study, n=306 women were investigated from early pregnancy until 4 months post partum at approximately 2-month intervals (T1:10–12 weeks of gestation; T2:22–24 weeks of gestation; T3:35–37 weeks of gestation; T4:10 days post partum; T5:2 months post partum; T6:4 months post partum) and additionally 1 year later (T7:16 months post partum). Participants were assessed via standardised interviews, questionnaires and observations.

All participants provided written informed consent after the study aims and procedures were fully explained. The study has been approved by the Ethics Committee of the Medical Faculty of the TU Dresden (No: EK 94042007). Further information on the procedure is published elsewhere.

**Participants**

A total of n=533 pregnant women were recruited in gynaecological outpatient settings (January 2009–June 2010) in the area of Dresden (Germany) and screened for inclusion and exclusion criteria. Fifty women met exclusion criteria (gestational age>12 weeks: n=8, younger than 18 years or older than 40 years: n=8, spontaneous abortions/(induced) terminations of pregnancy/still-births or infant impairment: n=2, invasive fertility treatment: n=9, severe physical disease/microsomia/skeletal malformation: n=6, substance abuse or heroin substitution during the past 6 months: n=0, severe psychiatric illness: n=2, expectation to leave the area of Dresden: n=6, insufficient mastery of German language: n=7). Additionally, n=9 women did not participate due to spontaneous abortion before T1, n=10 due to lacking consent of partner, n=154 due to lacking time and n=4 due to unknown reasons.

Overall, n=306 women were eligible for the Maternal Anxiety in Relation to Infant Development Study. Until 2 months post partum n=286 mothers could be retained (retention rate: 93.5%). Due to spontaneous abortion and termination of pregnancy (after detection of fetal malformation during gynaecological screening) the participation of n=8 women ended after T1. Until T5, n=2 women moved away from Dresden, n=3 women could not be reached anymore by phone, postal or personal contact and n=7 women reported lack of time or interest.

Baseline sample (n=306) and retained sample (n=286) are comparable regarding their sociodemographic features: In this sample, mean maternal age was 28.1 years (SD=4.4) and 69.2% of the mothers reported high education (at least 10th grade; n=198). The majority of mothers was unmarried (n=180, 62.9%) and primiparous (n=168, 58.7%). Most infants were born via vaginal delivery (n=271, 94.8%), at term (≥37 completed weeks of gestation; n=275, 96.2%) and with an average birth weight of 3441.8 grams (SD=457.4). Infant sex ratio was almost equal (n=147 boys, n=139 girls).

**Maternal diagnostic information**

Maternal DSM-IV-TR anxiety and depressive disorders were assessed with the Composite International Diagnostic Interview for Women, a modified version of the WHO-Composite International Diagnostic Interview that comprises very good psychometric properties.

To receive valid prospective information participants were carefully instructed to report the particular symptoms for each assessment period irrespective of the information they gave in interviews before. Most mothers were repeatedly assessed by the same investigator to encourage further study participation. Thus, interviewers were aware of previously reported symptoms, but not informed about the resulting diagnoses.

Lifet ime diagnostic information: Based on lifetime diagnostic information all participants were assigned to one of the following initial diagnostic groups:

<table>
<thead>
<tr>
<th>Lifetime until conception (Initial diagnostic groups)</th>
<th>Lifetime until delivery (T3)</th>
<th>Lifetime until 16 months (T7)</th>
</tr>
</thead>
<tbody>
<tr>
<td>n%</td>
<td>n%</td>
<td>n%</td>
</tr>
<tr>
<td>No AD (Reference)</td>
<td>100</td>
<td>35.0</td>
</tr>
<tr>
<td>Pure D</td>
<td>46</td>
<td>16.1</td>
</tr>
<tr>
<td>Pure A</td>
<td>79</td>
<td>27.6</td>
</tr>
<tr>
<td>Comorbid AD</td>
<td>61</td>
<td>21.3</td>
</tr>
<tr>
<td>No anxiety disorder (no AD, pure D) (Reference)</td>
<td>146</td>
<td>51.0</td>
</tr>
<tr>
<td>Any anxiety disorder (pure A, comorbid AD)</td>
<td>140</td>
<td>49.0</td>
</tr>
<tr>
<td>No depressive disorder (no AD, pure A) (Reference)</td>
<td>179</td>
<td>62.6</td>
</tr>
<tr>
<td>Any depressive disorder (pure D, comorbid AD)</td>
<td>107</td>
<td>37.4</td>
</tr>
</tbody>
</table>

(No AD) no anxiety nor depressive disorder prior to pregnancy, (Pure D) pure depressive disorder(s) prior to pregnancy, (Pure A) pure anxiety disorder(s) prior to pregnancy, (Comorbid AD) comorbid anxiety and depressive disorders prior to pregnancy, (n) number, (%) percentage. Please note that all participants of the initial diagnostic groups were reallocated if they reported incident anxiety and/or depressive disorders. For example, a woman with an incident anxiety disorder during pregnancy who was initially classified as pure AD prior to pregnancy was then classified as pure A until delivery.

Table 2  Description and crude logistic regression of maternal diagnostic status prior to pregnancy (lifetime until conception) and excessive infant crying (n=286)

<table>
<thead>
<tr>
<th>Lifetime until conception: Diagnostic groups</th>
<th>Excessive crying (n=286)</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No (n=257)</td>
<td>Yes (n=29)</td>
<td>OR</td>
<td>95% CI</td>
<td>p Value</td>
<td></td>
</tr>
<tr>
<td></td>
<td>n</td>
<td>%</td>
<td>n</td>
<td>%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No AD (Reference) (n=100)</td>
<td>92</td>
<td>92.0</td>
<td>8</td>
<td>8.0</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>Pure D (n=46)</td>
<td>45</td>
<td>97.8</td>
<td>1</td>
<td>2.2</td>
<td>0.26</td>
<td>0.03</td>
</tr>
<tr>
<td>Pure A (n=79)</td>
<td>67</td>
<td>84.8</td>
<td>12</td>
<td>15.2</td>
<td>2.06</td>
<td>0.80</td>
</tr>
<tr>
<td>Comorbid AD (n=61)</td>
<td>53</td>
<td>86.9</td>
<td>8</td>
<td>13.1</td>
<td>1.74</td>
<td>0.62</td>
</tr>
<tr>
<td>No anxiety disorder (no AD, pure D) (Reference) (n=146)</td>
<td>137</td>
<td>93.8</td>
<td>9</td>
<td>6.2</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>Any anxiety disorder (pure A, comorbid AD) (n=140)</td>
<td>120</td>
<td>85.7</td>
<td>20</td>
<td>14.3</td>
<td>2.54</td>
<td>1.11</td>
</tr>
<tr>
<td>No depressive disorder (no AD, pure A) (Reference) (n=179)</td>
<td>159</td>
<td>88.8</td>
<td>20</td>
<td>11.2</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>Any depressive disorder (pure D, comorbid AD) (n=107)</td>
<td>98</td>
<td>91.6</td>
<td>9</td>
<td>8.4</td>
<td>0.73</td>
<td>0.32</td>
</tr>
</tbody>
</table>

- **no AD**: no anxiety nor depressive disorder prior to pregnancy
- **pure D**: pure depressive disorder(s) prior to pregnancy
- **pure A**: pure anxiety disorder(s) prior to pregnancy
- **comorbid AD**: comorbid anxiety and depressive disorders prior to pregnancy

To consider anxiety and depressive disorders independently from their comorbid presentation, women with any anxiety disorder prior to pregnancy (pure A, comorbid AD) were compared with women without anxiety disorders prior to pregnancy (no AD, pure D) and women with any depressive disorder prior to pregnancy (pure D, comorbid AD) were compared with women without depressive disorders prior to pregnancy (no AD, pure A).

To investigate whether the severity of the disorder was associated with excessive crying, the dimensional anxiety liability index (AL) and depression liability index (DL) were applied. Each subject was assigned a score that considered type and severity of the symptoms reported: AL considers ten diagnostic features (eg, number of depressive episodes and symptoms, interference with daily life) reflecting the severity of anxiety and depressive symptomatology present at baseline or before.

Incident diagnostic information: To consider incident anxiety and depressive disorders, participants of the initial diagnostic groups were reallocated to the appropriate group, whenever they reported incident anxiety and/or depressive disorders during pregnancy (incorporates prior lifetime diagnostic status and incident diagnoses until delivery) and post partum (incorporates prior lifetime diagnostic status and incident diagnoses up to 16 months post partum) (see Table 1). For example, a woman with an incident anxiety disorder during pregnancy who was initially allocated to no AD prior to pregnancy was then assigned to pure A until delivery. Overall, n=30 incident anxiety and n=12 incident depressive disorders were reported until T7. Rates of maternal depressive disorders were consistently lower than rates of maternal anxiety disorders over the course of the study.

**Excessive crying**

Excessive crying was assessed via maternal information obtained at T5, T6 (questionnaire format) and T7 (interview format; Baby-DIPS). The Baby-DIPS is a structured diagnostic interview that measures behavioral problems in infants and toddlers between 0–3 years with moderate to excellent inter-rater agreement.

Excessive crying was determined as crying for ≥3 h per day on ≥3 days per week for ≥3 weeks, bold characters display statistically significant associations on the 5% level.

**Confounders**

Sociodemographic and perinatal factors that were considered as potential confounders were based on maternal reports (maternal age, marital status, education, occupation and parity) and medical records that were filled out by gynaecologists or midwives (infant prematurity, type of delivery, birth weight and sex).

**Statistical analyses**

STATA (V12.1) was used to compute descriptive statistics and prospective associations. Logistic regression models were fitted to calculate ORs for crude associations and associations adjusted for potential confounders. Two-sided statistical significance was evaluated at the 5% level.

**RESULTS**

Excessive crying was reported by n=29 mothers (10.1%) at least once after delivery (T5, T6 or T7); n=18 (6.3%) reported...
adjusting for maternal DL (ORadj=1.18, 95% CI 1.02 to 1.35, between maternal AL and excessive crying increased when 6.15, p=0.020). Similarly, the statistically signi

Petzoldt J, et al

As shown in table 2 infants of mothers with pure A and pregnancy and excessive crying all three assessment points.

excessive crying at one, n=10 (3.5%) at two and n=1 (0.3%) at all three assessment points.

Maternal anxiety and depressive disorders prior to pregnancy and excessive crying
As shown in table 2 infants of mothers with pure A and comorbid AD had remarkably higher rates of excessive crying (15.2% and 13.1%) as compared with women with no AD (8.0%), but the crude ORs between maternal initial diagnostic status and excessive crying were not statistically signi.

any anxiety disorder prior to pregnancy were at higher risk for excessive crying as compared with mothers without any anxiety disorder until delivery. OR=2.87, 95% CI 1.13 to 7.28, p=0.027). Any incident depressive disorder until delivery no statistically significant association was found. After delivery, the OR in comorbid AD was highest, although not statistically significant (OR=2.50, 95% CI 0.91 to 6.84, p=0.076). Infants of mothers with any anxiety disorder until 16 months post partum were at significantly higher risk for excessive crying as compared with infants of mothers without any anxiety disorder until 16 months post partum (OR=2.87, 95% CI 1.13 to 7.28, p=0.027). Any incident depressive disorder until 16 months post partum was not associated with excessive crying. The OR of any anxiety disorder until delivery increased when adjusting for any maternal depressive disorder until delivery (ORadj=3.26, 95% CI 1.33 to 7.96, p=0.014). For any depressive disorder until delivery no statistically significant association was found.

Table 3 Description and crude logistic regression of maternal diagnostic status lifetime until delivery and until 16 months post partum and excessive infant crying (n=286)

<table>
<thead>
<tr>
<th>Excessive crying (n=286)</th>
<th>No (n=257)</th>
<th>Yes (n=29)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>%</td>
</tr>
<tr>
<td>Lifetime until delivery: Diagnostic groups</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No AD (Reference) (n=91)</td>
<td>85</td>
<td>93.4</td>
</tr>
<tr>
<td>Pure D (n=42)</td>
<td>41</td>
<td>97.6</td>
</tr>
<tr>
<td>Pure A (n=84)</td>
<td>70</td>
<td>83.3</td>
</tr>
<tr>
<td>Comorbid AD (n=69)</td>
<td>61</td>
<td>88.4</td>
</tr>
<tr>
<td>No anxiety disorder (no AD, pure D) (Reference) (n=133)</td>
<td>126</td>
<td>94.7</td>
</tr>
<tr>
<td>Any anxiety disorder (pure A, comorbid AD) (n=153)</td>
<td>131</td>
<td>85.6</td>
</tr>
<tr>
<td>No depressive disorder (no AD, pure A) (Reference) (n=175)</td>
<td>155</td>
<td>88.6</td>
</tr>
<tr>
<td>Any depressive disorder (pure D, comorbid AD) (n=111)</td>
<td>102</td>
<td>91.9</td>
</tr>
<tr>
<td>Lifetime until 16 months post partum: Diagnostic groups</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No AD (Reference) (n=83)</td>
<td>77</td>
<td>92.8</td>
</tr>
<tr>
<td>Pure D (omitted)* (n=33)</td>
<td>33</td>
<td>100.0</td>
</tr>
<tr>
<td>Pure A (n=84)</td>
<td>75</td>
<td>89.3</td>
</tr>
<tr>
<td>Comorbid AD (n=86)</td>
<td>72</td>
<td>83.7</td>
</tr>
<tr>
<td>No anxiety disorder (no AD, pure D) (Reference) (n=116)</td>
<td>110</td>
<td>94.8</td>
</tr>
<tr>
<td>Any anxiety disorder (pure A, comorbid AD) (n=170)</td>
<td>147</td>
<td>86.5</td>
</tr>
<tr>
<td>No depressive disorder (no AD, pure A) (Reference) (n=167)</td>
<td>152</td>
<td>91.0</td>
</tr>
<tr>
<td>Any depressive disorder (pure D, comorbid AD) (n=119)</td>
<td>105</td>
<td>88.2</td>
</tr>
</tbody>
</table>

*Analysis was omitted due to a lack of participants with pure D until 16 months post partum in the group with excessive crying.

Incident maternal anxiety and depressive disorders during peripartum and excessive crying
Considering incident disorders (table 3) during pregnancy revealed that infants of mothers with pure A until delivery were at higher risk for excessive crying than infants of mothers with no AD until delivery (OR=2.83, 95% CI 1.03 to 7.76, p=0.043). Similarly, infants of mothers with any anxiety disorder until delivery were at increased risk for excessive crying as compared with mothers without any anxiety disorder until delivery (OR=3.02, 95% CI 1.25 to 7.32, p=0.014). For any depressive disorder until delivery no statistically significant association was found.

As shown in table 4, only maternal age (OR=0.86 per year of age, 95% CI 0.78 to 0.95, p=0.004) and lower education

Sociodemographic and perinatal factors and excessive infant crying
As shown in table 4, only maternal age (OR=0.86 per year of age, 95% CI 0.78 to 0.95, p=0.004) and lower education
(OR = 2.31, 95% CI 1.06 to 5.02, p = 0.035) were significant predictors of excessive crying. Adjusting for each potential confounder did neither increase nor attenuate the relations between maternal anxiety disorders and excessive crying (see Table 5).

**DISCUSSION**

In this prospective longitudinal examination of maternal anxiety and depressive disorders and excessive crying we found:

1. In the categorical and the dimensional analyses, maternal anxiety prior to pregnancy was associated with an increased risk for excessive crying; even when adjusting for maternal depression.
2. The association of maternal anxiety disorders and excessive crying was increased when considering incident anxiety disorders during peripartum.
3. No statistically significant associations were found for maternal depression and excessive crying.

These findings were confirmed even when controlling for sociodemographic and perinatal confounders, although maternal age and educational level were significantly associated with the outcome. We found the strongest associations for the mere occurrence of maternal anxiety disorders independent of severity that is in line with Weinberg and colleagues.18

In contrast to the predominantly clinical view, that maternal depression is a major risk factor for excessive crying,6 11 14 our results point to a greater importance of maternal anxiety disorders. When considering lifetime maternal anxiety disorders and the degree of maternal anxiety liability expressed prior to pregnancy we consistently found that maternal anxiety was a strong predictor of excessive crying up to 16 months after delivery.

We assume that this divergence of findings is due to several factors: First, former research6 11 14 focused on the association between maternal post partum depression and excessive crying. Second, former studies failed to examine the role of maternal anxiety disorders in greater detail, and third, they did not take into account mothers’ diagnostic status prior to pregnancy.

Why we find statistically significant associations for anxiety, but not for depression, remains unclear. It could be argued that the consistently lower rates of maternal depressive disorders reduced statistical power, so that potential associations were not observable in this sample. On the other hand, one might speculate, whether this points to the role of different parenting styles in mothers with anxiety versus depressive disorders. While maternal depression might lead to withdrawal that potentially discourage infant crying, maternal anxiety might lead to intrusiveness that possibly intensifies infant crying. However, since respective empirical findings are incoherent and unsatisfying,33 these mechanisms remain speculative and need further research attention.

**Strengths and limitations**

Major strengths are the prospective longitudinal design with multiple assessments, the application of well-defined categorical diagnoses (DSM-IV-TR) of maternal anxiety and depressive disorders prior to and during peripartum, the additional consideration of comorbidity and dimensional measures as well as the

<table>
<thead>
<tr>
<th>Table 4</th>
<th>Sociodemographic and perinatal factors and excessive infant crying (n=286)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Excessive crying (n=286)</td>
</tr>
<tr>
<td>Marital status prior to pregnancy</td>
<td></td>
</tr>
<tr>
<td>Married</td>
<td></td>
</tr>
<tr>
<td>Not married</td>
<td></td>
</tr>
<tr>
<td>Level of maternal education</td>
<td></td>
</tr>
<tr>
<td>High education (&gt;10th grade)</td>
<td></td>
</tr>
<tr>
<td>Low education (10th grade)</td>
<td></td>
</tr>
<tr>
<td>Maternal occupation</td>
<td></td>
</tr>
<tr>
<td>Employed</td>
<td></td>
</tr>
<tr>
<td>Not employed</td>
<td></td>
</tr>
<tr>
<td>Parity</td>
<td></td>
</tr>
<tr>
<td>Multiparous</td>
<td></td>
</tr>
<tr>
<td>Primiparous</td>
<td></td>
</tr>
<tr>
<td>Prematurity</td>
<td></td>
</tr>
<tr>
<td>&gt;37 weeks gestational age</td>
<td></td>
</tr>
<tr>
<td>&lt;37 weeks gestational age</td>
<td></td>
</tr>
<tr>
<td>Type of delivery</td>
<td></td>
</tr>
<tr>
<td>Vaginal delivery</td>
<td></td>
</tr>
<tr>
<td>Caesarian section</td>
<td></td>
</tr>
<tr>
<td>Sex of infant</td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Mean</th>
<th>SD</th>
<th>Mean</th>
<th>SD</th>
<th>OR</th>
<th>95% CI</th>
<th>p Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maternal age</td>
<td>28.4</td>
<td>4.3</td>
<td>25.9</td>
<td>4.8</td>
<td>0.86</td>
<td>0.78</td>
</tr>
<tr>
<td>Birth weight</td>
<td>3450.9</td>
<td>461.2</td>
<td>3614.4</td>
<td>421.3</td>
<td>1.00</td>
<td>1.00</td>
</tr>
</tbody>
</table>

(n) number, (%) percentage, excessive infant crying was defined as crying for ≥3 h per day ≥3 days per week for ≥3 weeks, bold characters display statistically significant associations on the 5% level.
widely used definition of excessive crying.  

Since we used an epidemiological sampling design and did not sample mothers in clinical-psychiatric settings, our results might be better generalisable to pregnant mothers living in the community. However, generalisability might be restricted by the initial response rate and our use of inclusion and exclusion criteria (eg, mothers younger than 18 years or older than 40 years or with insufficient mastery of German language were excluded).

As a potential limitation, one may argue that the assessment of excessive crying via maternal report was confounded by current maternal anxious or depressive state. As already discussed by others,7,8 this could lead to diagnostic error, for example anxious mothers might tend towards catastrophic misinterpretations.  

Therefore anxious mothers may overvalue the amount of crying leading to overestimation of associations. Nevertheless, the prospective longitudinal approach provides the current gold standard to investigate prospective relations between maternal and infant factors. And still, maternal reports are the most common and feasible diagnostic approach to obtain detailed information about infant behaviour.8 35

CONCLUSION
Our results show a robust association from maternal prepregnancy and incident anxiety disorders during the peripartum period to excessive crying. Thus, a history of maternal anxiety disorders seems to be highly relevant for the development of excessive crying and should therefore be regarded as a risk factor. If this could be confirmed, early identification and monitoring of women with anxiety disorders prior to and during pregnancy might be helpful to identify mother-infant dyads at risk for excessive crying. This highlights the potential need for routine screening for maternal psychopathology in perinatal care.36–38 Then, prevention programmes like parenting training could be offered particularly to women with a history of anxiety disorders to help them improve their knowledge and skills for future crying situations before they escalate. If infant crying behaviour has already become excessive, specific interventions are indicated for mother and infant (eg, developmental counselling, treatment in mother-infant units), to break the vicious circle of excessive crying.

Acknowledgements Principle investigators of the Maternal Anxiety in Relation to Infant Development Study are: Dr Julia Martini and Prof Dr Hans-Ulrich Wittchen.

Core staff members of the project are: Yvonne Hansche, Dr Michael Höfler, Julia Niehoff, Johanna Petzoldt, Jens Siegert, Gesine Wieder, Susanne Winkel and Julia Wittchen. Advisors/consultants to the project are: Prof Dr Katja Beesdo-Baum, Prof Dr Franziska Emslie and Dr Susanne Knappe.

Contributors IP: Substantial contributions to the conception or design of the work (A); or the acquisition (B), analysis (C), or interpretation (D) of data for the work. Drafting the work (E). Final approval of the version to be published (G). Agreement to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved (H). HUW, FE: Substantial contributions to the conception or design of the work (A); or interpretation (D) of data for the work or revising it critically for important intellectual content (F). Final approval of the version to be published (G). Agreement to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved (H). JW, JM: Substantial contributions to the conception or design of the work (A); or the acquisition (B), or interpretation (D) of data for the work. or revising it critically for important intellectual content (F). Final approval of the version to be published (G). Agreement to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved (H).

Funding This work is funded by the Institute of Clinical Psychology and Psychotherapy, Technische Universität Dresden and supported in part by the Lundbeck Institute Skodsborg, Denmark. Parts of the field work were additionally supported by the friends and sponsors (Gesellschaft der Freunde und Förderer) of the Technische Universität Dresden.

Competing interests None.

Ethics approval Ethics Committee of the Medical Faculty of the Technische Universität Dresden.

Provenance and peer review Not commissioned; externally peer reviewed.

REFERENCES


32 Staata Statistical Software (Release 12.1) [program]. College Station, TX, 2012.


Maternal anxiety disorders predict excessive infant crying: a prospective longitudinal study

Johanna Petzoldt, Hans-Ulrich Wittchen, Julia Wittich, Franziska Einsle, Michael Höfler and Julia Martini

Arch Dis Child 2014 99: 800-806 originally published online June 27, 2014
doi: 10.1136/archdischild-2013-305562

Updated information and services can be found at:
http://adc.bmj.com/content/99/9/800

These include:

References
This article cites 30 articles, 6 of which you can access for free at:
http://adc.bmj.com/content/99/9/800#BIBL

Email alerting service
Receive free email alerts when new articles cite this article. Sign up in the box at the top right corner of the online article.

Topic Collections
Articles on similar topics can be found in the following collections

Editor’s choice (146)
Child and adolescent psychiatry (paediatrics) (683)
Anxiety disorders (including OCD and PTSD) (28)
Pregnancy (528)
Reproductive medicine (945)
Mood disorders (including depression) (39)
Developmental paediatrics (128)
Epidemiologic studies (1818)

Notes
To request permissions go to:
http://group.bmj.com/group/rights-licensing/permissions

To order reprints go to:
http://journals.bmj.com/cgi/reprintform

To subscribe to BMJ go to:
http://group.bmj.com/subscribe/