

Title:

The role of maternal anxiety disorder subtype, parenting, and infant stable temperamental inhibition in child anxiety: a prospective longitudinal study.

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Abbreviated title:

Multiple risks for child anxiety: a prospective longitudinal study

Background:

Social Anxiety Disorder (SAD) aggregates in families. To elucidate intergenerational transmission of risk, we examined whether childhood SAD and symptoms of anxiety were prospectively predicted by stable infant temperamental inhibition, maternal SAD, maternal Generalized Anxiety Disorder (GAD), and maternal parenting behaviours.

Methods:

We conducted a longitudinal study beginning prenatally with follow-up at 4-, 10-, 14- and 58-months postnatally. Mothers were assessed for anxiety disorders prenatally and assigned to one of three groups: SAD (n=67), GAD (n=56), and non-anxious controls (n=94). We assessed infant temperamental inhibition at 4- and 14-months, maternal parenting behaviours at 10- and 58-months, and child anxiety disorders and symptoms at 58-months.

Results:

Child SAD at 58-months was predicted by prenatal maternal SAD (OR=23.76, 95%CI=1.15-60.37), but not by prenatal maternal GAD (OR = 7.44, 95% CI = 0.32-124.49), stable temperamental inhibition, or maternal behaviours. Child anxiety

symptoms at 58-months were predicted specifically by maternal SAD (but not GAD), and also by concurrent maternal intrusiveness. Stable temperamental inhibition moderated the association between 10-month maternal encouragement and 58-month child anxiety symptoms.

Conclusions:

We found evidence for specificity of risk for child SAD and anxiety symptoms from maternal SAD compared to maternal GAD. Childhood anxiety symptoms were also predicted by an interaction between a lack of maternal encouragement in infancy and stable temperamental inhibition, as well as concurrent maternal intrusiveness. The findings have clinical implications for targeted prevention of child anxiety.

Keywords

Anxiety; high risk studies, temperament; prevention.

Introduction

Social Anxiety Disorder (SAD) is among the most common and disabling of the anxiety disorders with a median age of onset of 13 years (Kessler et al., 2005). SAD commonly runs a chronic course (Wittchen & Fehm, 2003) and predicts

adverse psychiatric (Schutters et al., 2012), educational, and social outcomes (Siegel, La Greca, & Harrison, 2009; Van Ameringen, Mancini, & Farvolden, 2003).

It is important to understand the risk factors for SAD so that we can prevent it.

One known risk factor for SAD is the early temperamental style of heightened reactivity to, and a tendency to withdraw from, novelty. This is termed 'reactivity' in early infancy (Kagan & Snidman, 1991) and 'Behavioural Inhibition' (BI) from the beginning of the second year (Kagan, Reznick & Snidman, 1987). Reactivity at 4-months is associated with BI at 14-months (Fox, Snidman, Haas, Degnan, & Kagan, 2015) and BI has been found to be associated with raised odds of SAD in 6 to 15 year olds (odds ratio (OR) = 7.59; 95% CI=3.03–19.00) (Clauss & Blackford, 2012). Further, when BI is stable during development, compared to absent or unstable, the odds of SAD by early adolescence are significantly raised (OR = 3.79, 95% CI=1.18-21.12) (Chronis-Tuscano et al., 2009).

The importance of understanding the role of additional risk factors is highlighted by the finding that most temperamentally inhibited children do not develop SAD (Degnan & Fox, 2007) while some children without temperamental inhibition do so (e.g., Biederman et al., 2001; Clauss & Blackford, 2012). One

further risk factor that has received research attention is the presence of parental anxiety disorders. In a meta-analysis, Micco et al. (2009) found that, compared to offspring of parents without anxiety disorders, offspring of parents with anxiety disorders were at significantly increased risk of SAD. Evidence from both cross-sectional (Mancini, Van Ameringen, Szatmari, Fugere, & Boyle, 1996) and longitudinal (Biederman et al., 2006) studies suggests that there is intergenerational risk for SAD; however, it remains uncertain whether this elevated risk is specifically associated with parental SAD rather than a different subtype of parent anxiety disorder. To address this issue, it is necessary to categorize groups of parents by homogeneous subtypes of anxiety disorders and compare the prevalence of SAD in their offspring. Two subtypes of anxiety disorder seen in parents are SAD and Generalized Anxiety Disorder (GAD). Their core psychopathological features differ, in SAD it is a recurrent and intense anxious response to social situations where one may be evaluated by one's peers; in GAD it is frequent, recurrent and uncontrollable distressing worry about day-to-day issues (American Psychiatric Association, 2013). While they have distinct characteristics, SAD and GAD also share features; for example, both necessarily

feature negative affectivity (Goodwin, 2015) and are often chronic (Yonkers, Bruce, Dyck, & Keller, 2003).

A third set of potential risk factors included in theoretical accounts of the development of SAD is parenting practices that increase children's sense of threat in social situations and limit their opportunities to develop and exercise their sense of control of their social environment (Murray, Creswell, & Cooper, 2009). In particular, it appears that a low frequency of observed maternal encouragement, and a high frequency of expressed anxiety and intrusiveness in social situations are significant predictors of child social anxiety symptoms. For example, Murray et al., (2008) found that, compared to mothers without anxiety disorders, mothers with SAD expressed more anxiety and less encouragement in a social referencing task with their 10-month old infants, and these parental differences predicted increased infant social avoidant behaviours at 14-months, even after accounting for concurrent maternal behaviour. Notably, there was a significant interaction between maternal SAD and infant BI in predicting infant behaviour, and this was mediated by socially anxious mothers' anxious behaviours in the context of infant BI (but not infant non-BI). Specifically, BI infants of

mothers with SAD, but not of control mothers, showed a significant increase in avoidance behaviours in response to a stranger approach between 10- and 14-months. Interactive effects of child and parental factors were also found by Rubin, Burgess and Hastings (2002) who reported that (non-anxious) mothers' intrusive behaviours with their two-year olds moderated the association between toddler inhibition and child social anxiety symptoms at age four. Specifically, toddler temperamental inhibition predicted social anxiety symptoms at 4 years where mothers behaved intrusively, but not where mothers did not behave intrusively. Taken together these studies suggest that maternal expressed anxiety, intrusiveness and low encouragement are involved in the development of early social anxiety, particularly when infants have BI; however, no study has yet examined whether maternal behaviours in infancy (independent of, or in interaction with, stable temperamental inhibition and maternal SAD) predict child SAD.

To address this gap, this study set out to examine the risks posed for childhood SAD by stable temperamental inhibition, subtypes of maternal anxiety disorders, and maternal parenting behaviours, and whether the risks operate

additively or interactively. We were guided by earlier studies to consider methodological issues relating to the *context* in which maternal behaviours are assessed and theoretical issues relating to the *timing* of their assessment. Regarding context, Murray et al. (2012) found that in a *socially* stressful task, mothers with SAD, but not those with GAD, showed significantly more expressed anxiety than mothers without anxiety disorders. In contrast, in a *non-socially* stressful task, mothers with GAD, but not those with SAD, were less encouraging than mothers without anxiety disorders. These findings suggest that the predictive power of mothers' behaviours for children's anxiety may be amplified in contexts which are congruent with mothers' anxiety disorder subtype. Hence, here we examined mothers' behaviours, across both disorder subtypes, in contexts congruent and incongruent with their subtype of anxiety disorder.

Regarding the timing of observation of maternal behaviours, the onset of stranger fear in late infancy (Sroufe, 1977) highlights the theoretical issue of whether mothers' behaviours in social situations are more important at this time of normative developmental social wariness than when they occur later in development (Feinman, Roberts, Hsieh, Sawyer, & Swanson, 1992). In keeping

with this hypothesis, Aktar, Majdandzic, de Vente and Bögels (2014) found that 30-month child anxious behaviour was predicted by behaviours of parents with SAD in a social referencing task (in which the child refers to their parent for explicit communication of social information) when their child was 12-months old, but not by concurrent parent behaviour. Thus, in the present study, we also examined whether there were differential associations between maternal behaviours and child outcomes according to the timing of those behaviours, contrasting effects of parenting in infancy with that in early childhood. Finally, in order to clarify whether the risks posed by stable temperamental inhibition, maternal SAD, and maternal behaviours are pertinent to child SAD in particular, or whether they also predict child anxiety more generally, in addition to child SAD, we examined child anxiety symptoms more broadly.

In summary, we hypothesised that:

1. Prevalence of SAD and anxiety symptoms in children will be positively associated with:
 - a) The presence of stable temperamental inhibition in infancy
 - b) Maternal SAD, but not GAD

- c) Greater frequency of observed maternal expressed anxiety and intrusiveness, and less frequent encouragement. These associations will be stronger for mothers' behaviours in infancy than childhood, and amplified in contexts congruent with mothers' subtype of anxiety disorder.
- 2. Risk factors in 1 a), b) and c) will interact, such that maternal behaviours will moderate the associations in a) and b); and stable temperamental inhibition will moderate the associations in b).

Methods

Participants

We recruited our sample by screening 4000 women for SAD and GAD at their routine 20-week ante-natal screening appointments (using the Social Interaction and Anxiety Scale, the Social Phobia Scale for SAD, and the Penn State Worry Questionnaire (Meyer, Miller, Metzger, & Borkovec, 1990) for GAD). Trained researchers conducted psychiatric interviews using the Structured Clinical Interview for DSM-IV Axis 1 Disorders (Affective Disorders section; SCID-1; First, Spitzer, Gibbon, & Williams, 1995) with the 304 mothers whose scores on these

measures suggested probable presence of either disorder. Researchers discussed audio recordings of their interviews with a team of senior clinical researchers to confirm diagnoses. To recruit participants for the non-clinical control group, researchers interviewed 123 mothers with screening scores suggesting probable absence of SAD and GAD. At baseline, the groups were: SAD (without GAD): 67, GAD (without SAD): 56; Control: 94. (We also recruited mothers with SAD who had comorbid GAD ($n=28$); however, in view of our interest in specificity of effects of anxiety disorder subtypes, we have not included this group in the present study). (Full details of recruitment are reported in [removed for blind review]). We assessed mothers and their infants throughout the first two postnatal years and, for the present study, again at 58-months. Retention rates at 58-months from baseline groups were: SAD: 79.2%; GAD: 75%; and Control: 69.1%. While the current sample did not differ from those who were not followed-up in terms of SES ($\chi^2=0.00, 1, p=.96$) or child gender ($\chi^2=1.72, 1, p=.19$), they differed on maternal age at birth of the index child, with the current sample, on average, 2 years older than those who did not participate at this stage (mean=31.92 (SD=3.89) vs mean=29.86 (SD=4.98) years, respectively; $t=-3.06$,

$p < .05$). Dyads with complete outcome data in the 58-month assessment were SAD: 53; GAD:42; Control:65. Prevalence of mothers' baseline disorders at 10-weeks postpartum was 87.5% for SAD and 87.7% for GAD, and the concurrent presence of mothers' original diagnoses was 37.7% for SAD and 33.3% for GAD (removed for blind review); all mothers in the Control group continued to be free from SAD and GAD at both 10-weeks and 58-months. By the 58-month assessment, 11 mothers from the SAD group had developed GAD and, conversely, 9 mothers from the GAD group had developed SAD. (See supplementary Table 1 for information about prevalence of psychiatric disorders in the SAD and GAD groups). We examined whether mothers' concurrent scores on the screening measures (the Social Interaction and Anxiety Scale and Social Phobia Scale for SAD, and the Penn State Worry Questionnaire for GAD) warranted retaining mothers in their baseline groups. Table 1 shows that, indeed, mothers' concurrent scores on each measure differed significantly between each group, in the expected directions (all $ps < .001$). Notably, even when we compared mothers from the original diagnostic groups who did *not* meet concurrent diagnostic criteria to the Control group mothers, they scored significantly higher on

concurrent measures of social anxiety and worry. Furthermore, these latter index group participants differed significantly from each other on the Penn State Worry Questionnaire and the Social Interaction and Anxiety Scale in the expected directions (all $ps < .05$). We therefore retained mothers in their baseline groups. The three groups did not differ on demographic factors at baseline or 58-months. The [removed for blind review] ethics committee approved the study. Mothers provided written informed consent to participate.

Table 1 about here

Procedure

Mothers and their children completed the observational assessments in university laboratories. We assessed children's temperament at 4- and 14-months of age following the procedures set out by Kagan and colleagues (1987). We counter-balanced the order of the social- and non-social-stress tasks when assessing maternal behaviours, at 10- and at 58-months. We video recorded all assessments at 4-, 10-, 14- and 58-months using two wall-mounted cameras.

Mother-child interaction tasks

10-months

For the social stress task, a researcher told the mother that her infant would sit approximately five feet from her in a chair with restraints, and that a female researcher would join them in the room to talk first with the mother (two-minute observation period), and should then be introduced by the mother to the infant, whom the researcher would gradually approach, before picking up and talking to the infant while the mother and infant could see each other (two-minute engagement period).

The non-social stress task followed the same structure: observation, then engagement. Thus, infants were placed on a carpet approximately three feet from an unfamiliar remotely controlled toy animal (one-minute observation period).

Mothers were instructed to speak about the toy animal during the second minute, and to encourage their infant to approach the toy animal during the third minute (i.e., two-minute engagement period).

58-months

For the social stress task, a female researcher explained that the child was to spend five minutes drawing a picture of their family that they would then show and explain to an unfamiliar researcher, who would make a video recording of

this for three minutes. The researcher told mothers that they could support their child as they thought appropriate during the filming. After five minutes' drawing, a second researcher entered the room with a video camera on a tripod. She asked the pair to stand in front of the camera, and the mother to introduce her child and explain, for the recording, that her child would describe their picture, and then to sit on a settee nearby where she could interact with her child.

For the non-social stress task, a researcher brought a black box (.064m³) into the room. Each of the cube's four sides had an opening to a separate chamber, with covers to obscure the chambers' contents. The researcher told the pairs that each chamber held something 'that might be scary', and asked mothers a) to discuss with their child what might be in each chamber and b) to support their child in exploring each chamber. Objects were, in fact, rubber or furry toys.

Measures

Mothers' behaviours

Post-graduate researchers scored maternal behaviours for each of three constructs (encouragement, expressed anxiety and intrusiveness) on five-point

scales (1 = absent to 5 = pervasive), blind to mothers' anxiety group status, at each of 10- and 58-months (see Table 2 for descriptions of mothers' behaviours, and the online supplement for detailed coding schemes).

Table 2 about here

At each time point, for each construct, a psychology postgraduate researcher, blind to mothers' anxiety group status, second-rated a random sample of 25 videos. Mean intraclass correlations at 10-months were .75 for encouragement, .81 for expressed anxiety, and .86 for intrusiveness and .83, .82 and .84, respectively, at 58-months.

To examine whether patterns of associations between maternal behaviours and child anxiety were enhanced in maternal anxiety disorder subtype-congruent contexts, we examined the relationships using two approaches. First, in infancy and in childhood, we used a mean score from both social *and* non-social contexts for each of maternal encouragement, expressed anxiety and intrusiveness to predict child anxiety. Second, in infancy and in childhood, we used the score *only* from the context congruent with their subtype of anxiety disorder for maternal encouragement, expressed anxiety and intrusiveness to

predict child anxiety. That is, for mothers with SAD, scores for encouragement, expressed anxiety and intrusiveness were taken only from the socially stressful tasks, while for mothers with GAD, scores for were taken only from non-socially stressful tasks. For mothers in the control group, scores were taken from both contexts. (See supplementary Table 2 for correlations of mothers' behaviours between contexts in each domain.)

Child measures

Stable temperamental inhibition

Previously, at 4-months, we assessed, by observation, infants' negative emotional reactivity to unfamiliar stimuli using standard procedures (Kagan et al., 1987; Kagan, 1994). We measured reactivity at a university laboratory visit. We presented infants with a series of three novel visual stimuli (three mobiles, with one, three and seven dinosaurs attached, each mobile was shown three times), and coded their reactions on the dimension of negative affect in each of nine 20-second intervals. Negative affect was operationalized as presence of crying or

fretting in each 20 second interval, with a score of $>5/9$ coded as 'reactive' (as in Fox et al., 2015).

We assessed infants at a visit to a university laboratory at 14-months in three situations (1. an unfamiliar female approached the infant - three times, a different female each time; 2. a remote controlled toy animal moved on the floor and roared while the infant sat on the floor – three observations, each one-minute; 3. the infant played with novel toys – one three-minute observation). BI was operationalized by infants' latencies to approach novelties (e.g., toys) and fearful or distressed responses to novelties (e.g., an unknown female) in each of the seven frames. We coded BI as present or absent for each of the seven frames, and coded those with a score $>3/7$ as BI (Biederman et al., 2001; removed for blind review). Two trained postgraduate psychology researchers, blind to maternal group, scored videos. A third trained postgraduate researcher independently second-scored twenty videos, and kappa for these video ratings of BI (across the 1-7 scale) was 1.0. Twenty children (12.5% of the current sample) were classified as negatively reactive at 4-months as well as BI at 14-months, and so were classified as having 'stable temperamental inhibition'.

Anxiety Disorder Interview Schedule – Parent Version (ADIS-IV-P) (Silverman & Albano, 1996)

We used the ADIS-IV-P to assess whether children met criteria for anxiety disorders at 58-months. This is a semi-structured interview conducted with parents, and is reliable for pre-school children (Dodd, Hudson, Morris, & Wise, 2012). Graduate research psychologists were trained to administer the ADIS-IV-P, observed and given feedback on their assessments by [removed for blind review]. They made audio recordings of their interviews and, throughout the study, received frequent supervision from senior clinicians [removed for blind review] to confirm diagnoses. We double-rated a selection of 18 randomly selected recordings for reliability in assessment of childhood SAD, kappa = 1.0.

Child Behaviours Checklist (CBCL/1 ½ - 5)

Mothers completed the Internalizing subscale of the CBCL/1 ½ - 5 (Achenbach & Rescorla, 2000). We used the DSM-oriented Anxiety Problems scale as a continuous measure of child anxiety problems, which has been found to

correspond well with DSM diagnoses (Ebesutani, Bernstein, Nakamura, Chorpita, & Weisz, 2010).

Results

Statistical analyses

We used logistic regression for the diagnostic outcomes and fixed-effects multilevel regression to examine CBCL anxiety scores. Where complete separation of binary outcomes occurred, we used Firth's correction for logistic regression (Firth, 1993). We did not correct for type I errors (Perneger, 1998; Rothman, 1990) because we did not want to obscure the associations in our hypotheses (that is, by increasing the risk of type II errors) (Rothman, 2014). The distributions of maternal parenting behaviours at 10- and 58-months were skewed, so we used log transformed scores. We coded maternal group as a factor, and used dummy codes with Control group mothers as the reference group. We used multiple imputation to create 30 data sets comprising complete follow-up data (Sinharay, Stern, & Russell, 2001). All results reported are pooled values from these 30 sets.

Preliminary Analyses

To assess the degree to which mothers' parenting behaviours (encouragement, expressed anxiety and intrusiveness) were distinct, we examined correlations within and between mothers' behaviours at 10- and 58-months for significant associations. Expressed anxiety and encouragement were significantly, but only moderately, negatively correlated at 10- ($r = -.39, p < .001$) and 58-months ($r = -.24, p < .01$). Intrusiveness did not correlate significantly with either of the other behaviours at either time. Thus, without strong consistent correlations, we retained the original constructs.

Main effects

We first examined child SAD at 58-months as the outcome (see Table 3). The presence of child SAD was significantly predicted by maternal SAD ($OR = 23.76, 95\% CI = 1.15-60.37$), but not maternal GAD ($OR = 7.44, 95\% CI = 0.32-124.49$). Child SAD was not significantly associated with either stable temperamental inhibition or maternal behaviours (at 10- or 58-months, across, and only in,

maternal disorder subtype congruent contexts). (See supplementary Table 3 for diagnoses of other child anxiety disorders at 58-months).

Table 3 about here

When we considered offspring 58-month CBCL anxiety score as the outcome (see Table 4), controlling for stable temperamental inhibition, maternal intrusiveness, only in maternal disorder subtype congruent contexts at 58-months, ($\beta = .41$, $SE = 2.88$, $p < .05$; but not at all at 10-months) significantly predicted child anxiety score, as did maternal SAD ($\beta = .48$, $SE = 1.27$, $p < .01$), but not maternal GAD ($\beta = .04$, $SE = 1.26$, $p = .16$). Since residuals were significantly skewed ($W = 0.83$, $p < .0001$), we obtained BC_a from 5000 samples. These were consistent with our original estimates (for maternal intrusiveness, $b = 7.67$, BC_a 95% CI = 2.2-13.94; maternal SAD, $b = 4.30$, BC_a 95% CI = 1.80-6.82; and for maternal GAD, $b = 1.14$, BC_a 95% CI = -0.73-3.48).

Table 4 about here

Additive or interactive risks

We first examined child SAD as the outcome. We found no statistically significant interaction of risk factors, that is, interactions between: subtype of

maternal anxiety disorder and stable temperamental inhibition; subtype of maternal anxiety disorder and each maternal parenting behaviour (at 10- and 58-months, across contexts, and only in disorder congruent contexts); and stable temperamental inhibition and each maternal parenting behaviour ($p > .2$).

When we examined CBCL anxiety as the outcome, we found no significant interactions between subtype of maternal anxiety disorder and stable temperamental inhibition, nor between subtype of maternal anxiety disorder and each maternal parenting behaviour (at 10- and 58-months, across contexts, and only in disorder congruent contexts) ($p > .49$). However, when we considered maternal parenting behaviours, stable temperamental inhibition significantly moderated the relationship between 10-month maternal encouragement and 58-month CBCL anxiety score ($\beta = -2.64$, $SE = 13.85$, $p < .05$). As shown in Figure 1, in contrast to children without stable temperamental inhibition, the CBCL anxiety scores of children with stable temperamental inhibition were predicted by maternal parenting behaviour, with less maternal encouragement associated with a higher CBCL anxiety score. Relationships between concurrent maternal

behaviours and child anxiety outcomes were not significantly moderated by other risk factors ($p > .21$).

Figure 1 about here

Discussion

This was the first study to examine the independent and combined effects of stable infant temperamental inhibition, maternal Social Anxiety Disorder (SAD), and particular maternal parenting behaviours as risks for pre-school child SAD and anxiety symptoms. We have extended understanding by showing specificity of risk transmission: maternal SAD, but not GAD, prospectively predicted childhood SAD. We found no evidence to support our hypotheses that the early risks of stable infant temperamental inhibition and particular maternal behaviours would be associated with child SAD. However, consistent with our hypotheses, we did find evidence that risk factors operate both independently and interactively; that is, in addition to the independent effect of maternal SAD, maternal parenting behaviour in infancy interacted with infant stable temperament to predict child anxiety symptoms.

Our finding that child SAD was prospectively predicted by maternal SAD, but not maternal GAD, is consistent with evidence from earlier studies of the risks posed by parent SAD to offspring (e.g., Biederman et al., 2006; Mancini et al., 1996). Crucially, our results strengthen the evidence for specificity of risk because we compared the risk posed by carefully characterized groups of mothers with a history of particular subtype of anxiety disorders.

At least two interesting implications arise from the result that maternal SAD, but not GAD, prospectively predicted child anxiety symptoms. The first relates to the absence of risk at 58-months associated with maternal GAD. A recent meta-analysis showed that, compared to offspring of parents without anxiety disorders, offspring of parents with GAD *are* at increased risk of having an anxiety disorder (relative risk = 2.54, 95% CI = 1.86-3.45) (Lawrence, Murayama, & Creswell, 2019). Here, by contrast, we found that maternal GAD was significantly associated with neither offspring SAD nor anxiety symptoms. Given that GAD has a relatively late median age of onset of 31 years (Kessler et al., 2005), perhaps the risks posed by parent GAD are not manifest until later in development, even when expressed as elevated symptoms of anxiety, if not full-blown anxiety

disorder. The increased prevalence of SAD as children move into late childhood and adolescence might provide more opportunity to detect the risk of offspring SAD posed by maternal GAD than the risk of offspring GAD. The second implication relates to the risks posed by maternal SAD. While maternal SAD in infancy posed a specific risk of child SAD, its risk extended beyond child SAD to broader child symptoms of anxiety. (It is notable that, while child anxiety symptoms were measured using maternal report, maternal anxiety is an unlikely source of bias given the association with maternal SAD but not GAD). Thus, it appears that, in infancy, maternal SAD in particular poses significant risks for both social and broader anxiety symptoms.

We found no evidence that stable temperamental inhibition, considered independently, was significantly associated with child SAD at 58-months. Notably, however, while we did not find evidence of a main effect of stable temperamental inhibition, we did find that it was associated with child anxiety symptoms where mothers showed low amounts of encouragement in infancy. Our study is, to our knowledge, the first to find an interaction of *stable* infant temperamental inhibition and parenting behaviours, in the context of parent anxiety disorders, in

the prospective prediction of *childhood* anxiety symptoms. These findings differ from those of previous studies that have found significant longitudinal associations between Behavioural Inhibition (BI) and SAD (Clauss & Blackford, 2012; Hudson & Dodd, 2012; Hudson, Dodd, & Bovopoulos, 2011), or no evidence of an interaction between BI and parental responses (Aktar et al., 2014). This could be accounted for by differences in the age of assessments for both risk factors and child outcomes between studies. For example, Hudson et al. (2011; 2012) assessed BI at four years of age, when, arguably, measurements of BI may overlap with measures of social anxiety symptoms themselves. Furthermore, in the Clauss and Blackford (2012) meta-analysis, assessments for SAD occurred between 6 and 15 years of age (that is, older than the samples here and in Aktar et al., 2014). The increased prevalence of SAD as children move into late childhood and adolescence may provide more opportunity to detect potential risks posed by stable infant temperamental inhibition (Hudson, Murayama, Meteyard, Morris, & Dodd, 2018).

We found evidence that the association between maternal behaviours and child anxiety symptoms was amplified when assessed in contexts congruent with

mothers' subtype of anxiety disorder (specifically for mothers' concurrent intrusiveness), but not their behaviours in infancy. There are at least three potential explanations for this. First, the context of maternal behaviours may be less important in infancy than early childhood; second, the tasks used may have been less likely to elicit intrusiveness within laboratory-based assessments in infancy than in later childhood, limiting our ability to detect an effect and; third, maternal parenting behaviours might have developed in response to child anxiety. Notably, our results complement Degnan, Henderson, Fox, and Rubin (2008) who recruited their sample on the basis of infant negative reactivity at four-months, but did not report maternal anxiety. Degnan and colleagues found that mothers' oversolicitous behaviour in a free-play context with their four-year old children moderated the association between concurrent child social reticence and social withdrawal at seven-years' old; more specifically, high maternal oversolicitousness was associated with stability of child social anxiety, but low maternal oversolicitousness was associated with attenuated child social anxiety. Our results point to the importance of the context of observation of *anxious* mothers' intrusive behaviours in understanding children's anxiety – mothers'

intrusiveness at 58-months was associated with children's concurrent anxiety *only* in contexts congruent with the subtype of their anxiety disorder.

Study limitations

The strengths of our study include homogeneous anxiety disorder subtype groups, longitudinal observation of infant temperament, direct observations of parenting behaviours, and diagnostic assessment of mothers and children. We must, though, alert the reader to important limitations. First, we assessed temperament only in infancy which limits the comparability of our results to other longitudinal studies (e.g., Chronis-Tuscano et al., 2009; Hudson et al., 2012). Second, we only examined mothers, and not fathers, as family risk factors for child anxiety. Aktar et al. (2014) have demonstrated that children's anxiety is differentially associated with mothers' and fathers' parenting behaviours. Future studies would benefit from the inclusion of more than one parent, where applicable, to examine independent and combined risk / protective factors. Third, we used different social and non-social tasks to assess mothers' behaviours in infancy and childhood (although this was necessary so that the tasks were

developmentally appropriate at each time point). Fourth, our sample was relatively affluent, comprising mostly two-parent, Caucasian families. Thus, the generalizability of our findings to other populations is unknown. Fifth, we have no treatment data for our sample. While our groups remained distinct at 58-months in their endorsement of disorder specific symptoms, treatment data might have helped explain any changes in symptom severity from baseline to 58-months. Sixth, while we recruited homogeneous anxiety disorder subtype groups, by 58-months some mothers in each group had developed the subtype of anxiety disorder characteristic of the respective other anxiety group. Seventh, we assessed child anxiety disorders only once, so we cannot comment on whether different patterns of associations would have obtained when children were older. Finally, we did not account for genetic factors in the transmission of anxiety (Eley et al., 2015) and, while the groups followed-up in this study did not differ from each other demographically, we had a lower rate of retention in the control group than the anxiety groups.

Conclusion

We found evidence for specificity of risk transmission: maternal SAD, but not GAD, prospectively predicted both childhood SAD and anxiety symptoms. Neither stable infant temperamental inhibition nor particular maternal parenting behaviours were significantly associated with child SAD. However, childhood anxiety symptoms were prospectively predicted by an interaction between a lack of maternal encouragement behaviour in infancy and stable temperamental inhibition; as well as by concurrent maternal intrusiveness in contexts congruent with mothers' subtype of anxiety disorder.

These results have clinical implications for the targeted prevention of SAD and broader anxiety symptoms in early childhood. In particular, in infancy, maternal SAD and, for infants with stable temperamental inhibition, maternal encouragement behaviours could be therapeutically targeted; and in childhood, maternal intrusive behaviours in contexts congruent with maternal disorder subtype, could prove a suitable target for early prevention efforts.

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