

Research Article

Maternal Anxiety During and After Pregnancy: Effects on Child Internalizing Behaviour

Sue K Adams^{1*}, Jennifer F Daly¹ and Kathleen N Morgan²

¹Department of Human Development and Family Studies, University of Rhode Island, USA

²Department of Psychology, Wheaton College (MA), USA

***Corresponding author:** Sue K Adams, Department of Human Development and Family Studies, University of Rhode Island, Transition Center 208, 2 Lower College Road, Kingston, RI 02881USA, Tel: 401 874 5958; Fax: 401 874 4020; Email: suekadams@mail.uri.edu

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Abstract

Background: Anxiety during pregnancy can have significant effects on both a developing fetus and long-term developmental outcomes. In animal and human models, prenatal anxiety has been associated with characteristics of inhibited temperament in infants, which may be a precursor to later anxiety disorders. This pilot study examined if maternal report of anxiety during pregnancy differentially explained preschool-aged children's internalizing behaviour over and above a mother's trait anxiety. In addition, using multi-reporter methodology, the study examined if maternal anxiety during pregnancy predicted multiple reporters' ratings of child internalizing behaviour.

Method: Participants in this pilot study included preschool-aged children, their mothers, and teachers. Retrospective maternal anxiety during pregnancy, current maternal anxiety and multi-reporter ratings of children's internalizing behaviour were assessed.

Results: In a sample of 46 mothers, their preschool children, and the children's teachers, hierarchical multiple regression analyses indicated that after controlling for a mother's current level of anxiety, maternal anxiety during pregnancy significantly predicted children's internalizing behaviour as reported by their mothers, but not as reported by teachers or other observers.

Conclusion: The prenatal environment may have a significant effect on child internalizing over time. Findings also suggest that mothers may be the most reliable reporters of child behaviour because of an overarching knowledge of the child's behaviour across contexts.

Introduction

Pregnancy is often perceived as an exciting milestone in a woman's life. For many women, however, it is also a time wrought with concerns about their child's and family's health and well-being [1,2]. In fact, expectant mothers appear to be especially vulnerable to anxiety [3,4]. Occurrences of clinical-level anxiety in this population are found to be high when compared to rate estimates of anxiety in non-pregnant fertile women [4], with as many as 54% of pregnant women reporting elevated levels of anxiety in at least one of three prenatal assessments [3].

Anxiety during pregnancy is associated with a number of prenatal and perinatal complications, the putative mechanism for which is excessive cortisol secretion in the mother and disruption of the developing hypothalamic-pituitary-adrenal axis in the fetus [5]. The resulting consequences can include an increased risk for lower birth weights [6] more frequent premature delivery [7,8], and less optimal performance on the Brazelton Neonatal Behaviour Assessment Scale [9]. In addition, prenatal anxiety can alter the developmental trajectory of infants and children, resulting in children that are more irritable or difficult to soothe [10,11]. Children of mothers who were gestationally stressed have also been shown to exhibit behaviourally inhibited temperaments [12] that increase their risk for anxiety disorders later in life [13,14]. Given the high prevalence of anxiety disorders during pregnancy, exploring the short- and long-term effects of prenatal anxiety on the developing fetus is judicious.

The role of the prenatal and postnatal environments on development

Studies of prenatal anxiety and perinatal fetal outcomes in nonhuman animal models have the advantage of a level of control that is not easily duplicated in human studies. In these studies, researchers have identified a causal relation between prenatal stress and behavioural effects in nonhuman primate and rodent infants including behavioural inhibition when placed in social situations [15], impaired motor skills [16], reduced exploratory behaviour [17], and reduced social play [18]. Clarke and Schneider [19] examined the effects of prenatal stress on the postnatal stress responses of juvenile rhesus monkeys and found that prenatally-stressed subjects exhibited less normal social behaviour (i.e., proximity, contact) and more abnormal social behaviour (i.e., mutual clinging) than controls, suggesting that exposure to stress in utero may have a long-term effect on offspring behavioural reactivity, producing offspring with an intensified response to stress.

Correlational studies in human populations have yielded similar results. For instance, Coplan, O'Neil, and Arbeau [12] investigated whether maternal trait and state anxiety during pregnancy would differentially predict temperament in human infants. Researchers found that antenatal state anxiety measured during the third trimester of pregnancy predicted less positive infant affect and a lower attention span at three months of age. High levels of cortisol in pregnant women at 30-32 weeks gestation has also been shown to be

significantly related to greater infant negative reactivity at 2 months old and predictive of infant temperament as assessed by a measure of infant negative reactivity [20].

It is also important to note that the postnatal environment may play a significant role in the transmission and development of anxious temperament in infants, children, and adolescents. For instance, the process of breastfeeding transmits glucocorticoids, such as cortisol, from mother to infant [21]. Breastfed infants whose mothers had elevated cortisol levels have demonstrated increased fearful behaviour and negative temperaments [21,22], and these patterns are not found in formula-fed infants [22]. Additionally, with regard to the link between behavioural inhibition and anxiety disorders later in life, Chronis-Tuscano and colleagues [13] conducted a longitudinal study examining temperament and anxiety in 126 infants and their mothers. Results revealed that mothers who reported stable and consistent behavioural inhibition over their children's involvement in the study had a significantly higher likelihood of having adolescents diagnosed with anxiety disorders [13]. Not only does anxiety interfere with a child's social and emotional development, but it is the most prevalent psychiatric disorder among children and adolescents [23] and often persists into adulthood causing individuals significant impairment across multiple domains of life [24,25].

Issues related to single and multi-method reporting

A limitation of many studies is the issue of single reporter bias [26], a methodological concern that arises in numerous empirical investigations of children's behaviour. The problematic nature of single reporter designs is grounded in a substantial literature indicating that social and emotional behaviours, such as internalizing, frequently exhibit variation across situational contexts [27]. One methodological approach to remedy this dilemma has been the use of multiple reporters to assess the target behaviour. However, while the intuitive benefits of a multiple reporter approach are easily grasped, the use of multiple reporters to assess social and emotional behaviours introduces its own unique set of problems. Assessments of target behaviour often differ across reporters [28], and research has yet to resolve the debate as to which individuals (e.g. parent, teacher, trained observers or child) are the most accurate reporters of child anxiety [29].

In a seminal, meta-analytic study, Achenbach and colleagues [28] investigated the consistency of multiple reporters of behavioural and emotional problems of children and adolescents. While they found fairly high correlations among similar reporters (e.g., parent pairs), the mean correlation among different reporters was low (e.g., parent/teacher). The investigators report that each class of reporter differentially contributes to the variance of target variables, arguing that target variables differ across contexts, rather than that certain types of reporters offer less valid or reliable reports. Yet others have suggested that parents are the most reliable reporters of externalizing behaviours and children the most reliable reporters of internalizing behaviours [27]. In young children, however, it has been hypothesized that children are more likely to share worries and concerns with their parents, resulting in parents as the most reliable reporter of internalizing symptoms [30]. Further exploration is warranted to determine the specific nature and contribution of the different reporters (e.g., parents, teachers, objective observers) on child internalizing behaviours.

The current study

The purpose of this study was two-fold. First, we aimed to examine if maternal report of anxiety during pregnancy differentially explains preschool-aged children's internalizing behaviour over and above a mother's trait anxiety. Second, using multi-reporter methodology, we aimed to examine if maternal anxiety during pregnancy would predict multiple reporters' perceptions of child internalizing behaviour. It was hypothesized that after controlling for a mother's current level of anxiety, maternal anxiety during pregnancy would significantly predict children's internalizing behaviour as reported by the mother, teacher, and observer ratings (Figure 1).

Method

Design and recruitment

Data for this pilot study were collected from mothers with children enrolled in a college affiliated nursery school and a local government sponsored preschool, Head Start, which provides comprehensive early childhood services to low-income families. Both schools were located in the same rural town in the Northeast United States. The children's preschool lead teachers also participated in the study. Parents and teachers were asked to complete various questionnaires that assessed the primary study variables. Second, observations of children's behaviour in their preschool class were conducted via an observation room. Participation in the study was completely voluntary. The authors strictly adhered to the methodology approved by the institution's Institutional Review Board.

Study instruments

All participants were asked to complete a demographic questionnaire. The following measures assessed primary study variables.

State trait anxiety inventory (STAI): The STAI consists of 20 questions assessing state anxiety and 20 questions assessing trait anxiety. Some sample state questions included "I feel calm, I am worried, and I am jittery." Sample trait questions included "I felt calm, cool and collected, and I felt inadequate." In our sample, reliability for the state anxiety measurement was $\alpha=.93$, and reliability for trait anxiety was also $\alpha=.93$. Two questions in the State portion were modified to ask how a mother generally felt during her pregnancy, and there is support for the reliability of a modified STAI [31,32].

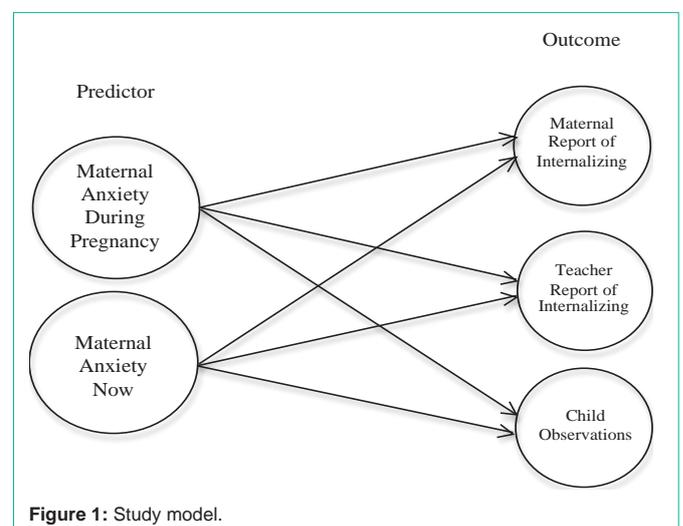


Figure 1: Study model.

Child behaviour checklist (CBCL): Mothers were asked to rate their children on the Internalizing Behaviors subscale of the CBCL, which includes items such as emotional reactivity, anxiety/depression, somatic complaints, and withdrawal [28]. Sample questions included “(my child) doesn’t answer when people talk to him/her, gets too upset when separated from parents, and is too fearful or anxious.” The CBCL subscale was reliable, $\alpha=.86$, for this sample.

CBCL-Teacher rating scale: A teacher rating form of the CBCL, the TRF, was also distributed to all lead classroom teachers. They were asked to complete similar rating scales as the mother’s for each student participant in the study. Reliability for the teacher TRF was respectable at $\alpha=.80$.

Child observations: Observations of each child participant were made from an observation room in his or her classroom during morning free-play sessions. Cluster of shy behaviours, characterized by unoccupied, prolonged onlooking at a partner without accompanying play were observed [33]. A checklist was used to determine which behaviours were observed in the classroom during the observation period, which consisted of six 5-minute sessions broken into 10 second intervals. Three trained research assistants yielded high inter-rater reliability of 92%.

Data analysis

SPSS 19.0 was used to generate descriptive analyses exploring demographic characteristics of the sample. In all analyses, a P-value of less than .05 was considered significant. Pearson product-moment correlational analyses and t-tests were conducted to examine the association between demographic/descriptive, predictor and outcome variables. Hierarchical regression analyses assessed multivariate associations among primary study variables.

Results

Participants included 46 preschool-aged children, their mothers, and teachers. Children’s ages ranged from 3 ½ to 5 years old. Fifty-nine percent of the children were female and mostly White (non-Hispanic). The average socioeconomic status across families was between \$61,400 and \$128,100 (Table 1). No significant demographic differences emerged between children attending the college-affiliated nursery school and Head Start.

Preliminary analyses

The preliminary analyses included tests for normality and multicollinearity. To test for normality, descriptive statistics including skewness and kurtosis were computed, and histograms were reviewed. Mean transformations were conducted when indicated. Due to multicollinearity between predictor variables (anxiety during pregnancy and trait anxiety) the method of *centering the means* was employed according to recommendations by Jaccard and Turrissi [34]. Means and standard deviations for key demographic and primary study variables are presented in (Table 2).

In the current sample, the average rate of maternal trait anxiety was 33.1. The average rate of retrospective report of maternal anxiety during pregnancy was 36.4. Moreover, t-tests revealed that maternal anxiety during pregnancy and trait anxiety were significantly different ($t(45) = 21.97, p<.001$), with mothers reporting higher

Table 1: Demographic Characteristics of Participants (n = 46).

Variable	% of sample	Mean	SD	Range
Sex				
Female	58.7% (n=27)			
Male	41.3% (n=19)			
Birth weight		7.590	1.5283	3.2-10.6
Child’s birth order		1.89	.823	1-4
1	37.0% (n=17)			
2	39.1% (n=18)			
3	21.7% (n=10)			
4	2.2% (n=1)			
Full term				
Yes	89.1% (n=41)			
No	10.9% (n=5)			
Mom delivery age		32	4.006	18-39
Married (at delivery)				
Yes	91.3% (n=42)			
No	8.7% (n=4)			
Married (now)				
Yes	84.8% (n=39)			
No	10.9% (n=5)			
	Did not report marital status (n=2)			
Income				
Less than \$25,530	6.5% (n=3)			
\$25,350-\$61,400	10.9% (n=5)			
\$61,400-\$128,100	56.5% (n=26)			
\$128,100-\$278,450	23.9% (n=11)			
	Did not report income (n=1)			
Years of Education		15.83	2.036	12-22
Ethnicity	100.0% white (n=46)			
Employed (at delivery)				
Yes	71.7% (n=33)			
No	28.3% (n=13)			
Employed (now)				
Yes	58.7% (n=27)			
No	41.3% (n=19)			

Table 2: Mean, Standard Deviation, Range, Kurtosis, and Skewness of Variables.

Variable	Mean	SD	Range	Kurtosis	Skewness
Maternal Anxiety during Pregnancy	36.35	10.804	23-71	1.163	1.135
Maternal Anxiety Now	33.09	10.215	20-63	1.241	1.058
Child Internalizing (Parent Report)	7.61	6.347	0-27	.939	1.194
Child Internalizing (Teacher Report)	4.09	4.330	0-17	1.602	1.39
Child Retention	2.47	2.16	0-9.67	2.86	2.56

anxiety during pregnancy (mean=36.35) than current anxiety (mean=33.09). Similarly, in the current sample, maternal report of children’s internalizing was significantly higher (mean=7.61) than teacher report of children’s internalizing (mean=4.09).

Correlational analyses

Pearson product moment correlations were conducted to examine associations among all demographic variables and primary study variables. All demographic variables significantly correlated with primary study variables were controlled for in multivariate analyses. Older mothers had children who were rated lower on internalizing behaviour by teachers ($r = -.30, p = .04$). Birth order

Table 3: Intercorrelations of Demographic and Primary Study Variables (n=46).

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
1. Child's birth order	1	.043	-.035	.218	-.148	-.047	.374*	.215	.017	.177
2. Mother delivery age		1	-.285	.021	-.588**	-.506**	-.101	.118	-.14	-.299*
3. Birth weight			1	.502**	.285	-.206	-.214	-.047	-.200	.048
4. Full term				1	-.108	.122	.381**	.121	.289	-.007
5. Married at delivery					1	.750**	-.053	-.186	.007	.192
6. Married (now)						1	.190	.010	-.025	.142
7. Maternal Anxiety during pregnancy							1	.544**	.495**	.103
8. Maternal anxiety now								1	.248	-.055
9. Parent report of Child Internalizing									1	.308*
10. Teacher report of Child Internalizing										1

was associated with higher anxiety during pregnancy score ($r = .37$, $p = .01$), such that first time mothers reported more anxiety during their pregnancies. Preterm labour was also related to anxiety during pregnancy ($r = .38$, $p = .009$), with mothers who had preterm babies reporting higher levels of anxiety.

Among primary study variables, maternal ratings of anxiety during pregnancy were significantly correlated with present levels of maternal anxiety ($r = .54$, $p < .001$). High maternal ratings of children's internalizing were significantly correlated with high levels of maternal anxiety during pregnancy ($r = .50$, $p < .001$). Maternal ratings of child internalizing were also correlated with teacher ratings of shyness ($r = .31$, $p < .05$) (Table 3).

Primary analyses

Pearson product moment correlations indicate that the demographic variables of preterm labour and higher birth order were significantly correlated with the independent variables. Therefore, preterm labour and birth order were controlled for in the first step of all regression analyses. Additionally, due to the potential multicollinearity between anxiety during pregnancy and trait anxiety, trait anxiety was entered into the second step. The results of the regression analyses are below and indicated in (Table 4).

Hierarchical regression analyses indicated that after controlling for birth order, preterm birth and trait anxiety, 1) anxiety during pregnancy significantly predicted children's internalizing behaviour as reported by the mother ($\beta = .53$, $p < .01^*$), 2) anxiety during pregnancy did not significantly predict children's internalizing behaviour as reported by the teacher ($\beta = .17$, $p = .42$), and 3) anxiety during pregnancy did not significantly predict children's reticent behaviour as observed by study researchers ($\beta = .10$, $p = .62$).

Discussion

The purpose of this pilot study was to 1) examine if maternal report of anxiety during pregnancy differentially explained preschool-aged children's internalizing behaviour over and above a mother's trait anxiety, and 2) use multi-reporter methodology to examine if maternal anxiety during pregnancy would predict multiple reporters' ratings of child internalizing behaviour. Hierarchical multiple regression analyses indicated that after controlling for a mother's current level of anxiety, maternal anxiety during pregnancy significantly predicted child internalizing behaviour as reported by the mother, but not by the teacher or observer ratings.

Taken together, our most notable finding is that maternal trait anxiety was not significantly correlated with child internalizing

Table 4: Hierarchical Multiple Regression Analyses (N=46).

I: Dependent variable = Maternal Report of Child Internalizing.

Predictor	SE	β	R ²	F	p
I. Full Term Birth	.475	.299	.086	2.013	.052
Birth Order	.182	-.048	.086	2.013	.749
II. Trait Anxiety	.014	.234	.138	2.234	.119
III. Maternal Anxiety during Pregnancy	.016	.527	.294	4.258	.004**

Note. $p < .05$ * $p < .01$ ** $p < .001$ ***

II: Dependent variable = Teacher Report of Child Internalizing.

Predictor	SE	β	R ²	F	p
I. Full Term Birth	.488	-.048	.034	.749	.756
Birth Order	.187	.188	.034	.749	.228
II. Trait Anxiety	.015	-.094	.042	.616	.546
III. Maternal Anxiety during Pregnancy	.019	.166	.058	.626	.418

III: Dependent variable = Observation of Child Reticence.

Predictor	SE	β	R ²	F	p
I. Full Term Birth	1.055	-.122	.036	.799	.432
Birth Order	.404	-.121	.036	.799	.436
II. Trait Anxiety	.033	.102	.038	.549	.774
III. Maternal Anxiety during Pregnancy	.041	.102	.044	.467	.619

behaviour, but maternal anxiety during pregnancy was. One could argue that as a child ages, his or her environment becomes an increasingly important factor in developmental outcomes. And although this is true, our findings also implicate the vital role of the prenatal environment in temperamental outcomes in preschool-aged children. The biological processes that occur during the prenatal stage are an integral factor in the developmental foundations of temperament [35,36]. This study supports the potential ongoing effects of the prenatal environment on children's temperament characteristics [37], and also lends credence to the extension of an animal-based prenatal stress model to human children [38].

With regard to examining the reliability of multiple reporters as it relates to this paradigm, the findings suggest that the association between prenatal stress and child internalizing is most robustly explained by maternal report of child internalizing. Despite issues related to common reporter variance, there are many reasons why maternal report of child internalizing may be the most accurate method of assessment as compared to teacher and observer ratings [29,39]. For instance, it is possible that over the course of their time in preschool, children developed comfort with their preschool teachers, classrooms and peers, thus demonstrating fewer symptoms of shyness. Furthermore, mothers know their children across contexts and can answer questions about their behaviours from a global perspective. Children may not exhibit as many internalizing behaviours in a comfortable and supportive classroom as compared to public places or other less familiar venues. Children may also be more likely to

share worries and concerns with their parents, which could lead to higher parental rating of child internalizing behaviours [30]. Our finding revealed that mothers reported higher child internalizing scores than teachers, which supports these explanations.

Methodological interpretations for this finding are also warranted. The reliability coefficient for teacher report of internalizing was respectable at $\alpha=.80$; however, this reliability coefficient was lower than that of maternal report of anxiety and may be less reliable when measuring the latent construct. It is also plausible that observer ratings of child reticence did not assess the same latent constructs as measured by the CBCL. Observer ratings of reticence were purely behavioural; and purely behavioural ratings may fail to capture the important social and cognitive dimensions of internalizing. Additionally, it is possible that anxious mothers are more likely to over report and distort their children's symptoms [30]. Overall, however, we should be careful not to dismiss the knowledge that a mother has of her children across contexts.

Study Limitations

The retrospective design of this study is a significant and noteworthy limitation. Mothers were asked to recall their experiences and emotions from 4 years prior; however, pregnancy and the birth of a child are a very important and reminiscent time in a woman's life, and there is precedence that mothers may be better able to remember circumstances associated with pregnancy than other life events [40]. There are also postnatal factors, such as breastfeeding, that were not assessed in the present design. Breastfeeding could play an important role in the transmission of stress hormones from mother to infant, thus affecting mood and temperament [21]. Moreover, retrospective reports of anxiety have been shown to be reliable in past studies [41,42]. Issues of multicollinearity among variables are a concern when measuring state and trait anxiety variables. Therefore, appropriate statistical methods of centring the means were employed to reduce the effects of multicollinearity. Next, this pilot study had a small sample size ($n=46$), limiting statistical power. All subjects were White, mostly from middle to high socioeconomic status, which may have been a protective factor against elevated levels of socioeconomic stresses during pregnancy. Homogeneity of the sample also limits generalizability of findings to diverse populations, particularly women of ethnic and racial minority status who may experience more stressors during pregnancy than middle class White women [43,44]. Finally, given the study design, we were unable to determine causality. It is possible that a child's current level of internalizing skewed maternal memories of their own stress and anxiety during pregnancy.

Implications and Future Directions

Pregnancy is a naturally anxiety-provoking time for a mother and therefore, healthcare providers should be careful not to psychopathologize normative stress and anxiety during pregnancy. However, combining psycho education and assessment of both the physical and emotional aspects of pregnancy is an important area of intervention for pregnant women. Given the potential long-term implications of stress and anxiety on a developing fetus, healthcare providers and Obstetricians should employ regular screenings for maternal anxiety during pregnancy. In an effort to improve proximal

and distal outcomes, pregnant mothers who are identified as highly anxious should be referred for therapeutic services or advised on the use of coping strategies to manage stress.

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