

# Towards Developing a Predictive Model Explaining Postnatal Anxiety

Jenna Mayhew & Matt Thomas

**Abstract:** Postnatal anxiety negatively impacts gestational parents and infants yet lacks the clinical attention received by similar postnatal mood disorders. This preliminary study aimed to identify predictors of postnatal anxiety. An archival dataset including prenatal and postnatal screening results (Edinburgh Postnatal Depression Scale and Antenatal (Psychosocial) Risk Questionnaire) from 240 women from Melbourne, Australia, was analyzed using hierarchical regression analysis. Prenatal anxiety explained a large proportion of the variance in postnatal anxiety, consistent with an emerging body of research demonstrating this. A distressing childbirth experience and emotional abuse explained a modest amount of additional variance. Future research incorporating other variables may provide a more comprehensive and clinically useful model for predicting postnatal anxiety.

**Keywords:** prenatal anxiety, postnatal anxiety, postpartum anxiety, Edinburgh Postnatal Depression Scale, predictive modeling, distressing childbirth, early childhood abuse.

## Introduction

Anxiety and depression are the most common complications of the postnatal period (Khanlari et al., 2019). Postnatal anxiety is a broad term to describe a range of anxiety conditions that occur in the postnatal period, the year following the baby's birth. Common emotional and physical symptoms include excessive worry, panic attacks, feeling irritable, feeling restless or on edge, disrupted sleep, and avoiding situations that feel overwhelming. There is a wide range in estimates of postnatal anxiety, with some studies suggesting it impacts up to 40% of gestational parents (Field, 2018) and may be more prevalent than postnatal depression (Lee et al., 2007; Wynter et al., 2013). Despite its prevalence, research and

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**Jenna Mayhew** is an Australian psychologist who has worked with clients across the lifespan including children, adolescents, adults, and older adults struggling with anxiety disorders. **Matt Thomas, PhD**, is a Clinical Psychologist, Principal Practice Lead with Marathon Health, and Adjunct Senior Lecturer in the School of Psychology at Charles Sturt University, Bathurst, Australia.

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perinatal care initiatives have historically neglected to examine postnatal anxiety, with most research, public policy, and screening focusing on depression (Field, 2018).

Anxiety can often be dismissed as a normal part of the perinatal journey throughout the world. However, identification and treatment are critical as the impacts on the gestational parent, baby, and the wider community can be significant. An increasing body of literature suggests that postnatal anxiety can interrupt the mother-infant attachment process, leading to long-term social, emotional, cognitive, and behavioral impacts on the children of affected mothers (Goodman et al., 2011; Hall, 2012; Moehler et al., 2006).

Specifically, postnatal anxiety is associated with negative and disengaged parenting (Barker et al., 2011), increased maternal fatigue (Taylor & Johnson, 2013), and maternal behavior that is over-controlling, and these, in turn, are associated with mood, emotional, and behavioral difficulties in the child (Barker et al., 2011; Dennis et al., 2017). Furthermore, postnatal anxiety carries a financial burden borne by the wider economy.

Perinatal distress (anxiety and depression) represents a financial burden to economies worldwide. This cost is driven by hospital visits, service usage, and medical costs like pharmaceuticals. For example, in Australia, the cost of untreated perinatal depression and anxiety over 20 years is \$728 million (PwC, 2012). This estimate is conservative as it does not include the cost to other family members or relationship breakdowns, which are also potential impacts of untreated perinatal distress (PwC, 2012).

There has been an international move toward routine screening for mood disorders in pregnancy. Screening aims to increase the early detection of perinatal mental health problems and implement population-level prevention and intervention programs. The Centre of Perinatal Excellence (COPE) in Australia recommends that perinatal screening occur as soon as possible in pregnancy, again later in pregnancy, and twice following the birth, including six to twelve weeks after the birth and again thereafter. Anxiety screening is often neglected despite contributing to economic burden and having independent symptoms and impacts unique from depression. Gestational parents who had prenatal depression, as indicated by the Edinburgh Postnatal Depression Scale (EPDS), had a 4.5 times greater chance of developing postnatal depression (Khanlari et al., 2019). The link between prenatal depression and postnatal depression is well established. However, research on the potential link between prenatal and postnatal anxiety is not as established. Furthermore, there is a lack of modeling for predicting postnatal anxiety, leaving a gap in understanding perinatal mental health disorders. The focus of the current

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study was to contribute to the emerging understanding of the roles of a range of factors in prenatal women in predicting postnatal anxiety.

### **Towards Predicting Postnatal Anxiety**

Over the past decade, postnatal anxiety has become increasingly recognized as a common perinatal mental health disorder with predictors and impacts of its own. Although originally designed to screen for postnatal depression, more recently, the Edinburgh Postnatal Depression Scale (EPDS) has also been used to screen for anxiety. A review by Matthey et al. (2013) of six existing validation studies for the EPDS found that it was useful for anxiety screening and that there is emerging evidence that the anxiety subscale can accurately distinguish depression from anxiety. The anxiety subscale (EPDS-3A) is based on three questions in the EPDS. It includes item 3: "I have blamed myself unnecessarily when things went wrong," 4: "I have been anxious or worried for no good reason," and 5: "I have felt scared or panicky for no very good reason." Postnatal anxiety levels can be measured by the EPDS-3A in the postnatal period, with a higher score indicating a higher level of anxiety. Matthey (2008) argued that the EPDS-3A should be used routinely, as women with anxiety disorders are frequently not identified on the full EPDS, and scoring high on the anxiety items but low on depression can result in the overall score being below the full score cut-off of 13.

Field (2018) conducted a narrative review of worldwide research on postnatal anxiety and identified the following predictors:

- Demographic predictors included being a young mother, having higher levels of education, and being employed.
- Psychiatric history predictors included prenatal anxiety and prenatal depression.
- Childbirth predictors included fear of birth, fear of death during delivery, lack of control during labor, low confidence regarding the delivery and delivery staff, cesarean delivery, and premature delivery.
- Environmental predictors included lack of family support, marital/family conflict, and social health issues.

Field's (2018) review provides an overview of the known predictors of postnatal anxiety. However, additional risk factors, such as domestic violence, are known to have a strong link with postnatal depression but have not yet been tested specifically related to postnatal anxiety (Campo,

2015; Howard et al., 2013). The following section outlines existing research regarding likely predictors of postnatal anxiety.

### ***Prenatal Anxiety***

Prenatal anxiety is highly prevalent, with up to 40% of gestational parents experiencing anxiety in pregnancy (Field, 2018). Research is beginning to demonstrate stability in anxiety across the perinatal journey. An Australian study by Grant et al. (2007) found that 33% of participants reported postnatal anxiety, with antenatal anxiety as a strong predictor of postnatal anxiety and mood disorders. Antenatal anxiety led to a five-fold increase in the likelihood of postnatal anxiety, even after controlling for antenatal depression. (Grant et al., 2007). Similarly, a study of 272 women in Croatia found that the rate of anxiety was 35%, with trait anxiety and early postpartum state anxiety being the strongest predictors of postnatal anxiety (Radoš et al., 2018). Finally, using the State-Trait Anxiety Inventory (STAI), Dennis et al. (2013) found that anxiety was relatively stable across an 8-week postnatal period in a sample of 522 women, suggesting that for gestational parents with postnatal anxiety, it is not simply transient anxiety following birth, but remains stable. Although the findings are limited compared to those available for postnatal depression (Field, 2018), there is evidence that prenatal anxiety is predictive of postnatal anxiety; therefore, this was included in the study as a predictor.

### ***Age***

A study of 1,659 women in Qatar found that age was the strongest predictor of postnatal anxiety in their study (Bener et al., 2012). Younger mothers were more likely to experience postnatal anxiety than older mothers. Mothers under 30 years old had the highest levels of anxiety (34.9%), followed by mothers aged 30-34 (26.6%), mothers aged 35-39 (25.7%), and the lowest levels were in mothers aged 40 to 45 (12.1%). Thus, age may be a predictor of postnatal anxiety.

### ***Domestic Violence***

There is an increased risk of domestic violence starting during pregnancy or increasing in severity, if it is already present (Campo, 2015). A systematic review and meta-analysis of domestic violence and perinatal mental disorders found a three-fold increase in the odds of a high level of depressive symptoms in the postnatal period when domestic violence was experienced in pregnancy but did not report anxiety symptoms (Howard et al., 2013). Khanlari et al. (2019) found that 10% of

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women experiencing domestic violence had postnatal depressive symptoms versus only 3.1% of women not experiencing domestic violence. Although neither study focused exclusively on postnatal anxiety, it is often comorbid with postnatal depression, making it likely that domestic violence also predicts postnatal anxiety. Therefore, the presence of domestic violence during pregnancy may be likely to predict postnatal anxiety.

### ***Distressing Childbirth Experiences***

There is growing recognition of the negative impact of subjectively distressing birth experiences on gestational parents. A negative perception of the birth experience is associated with postpartum anxiety, and interestingly, this is not associated with postnatal depressive symptoms (Field, 2018). Negative perception includes a fear of birth, low self-confidence during labor, low confidence in the medical staff, and feeling a lack of control during labor. The subjective experience of birth (rather than objective measures such as length of labor or medical interventions) is related to postnatal anxiety (Field, 2018).

A study examining the predictors of postpartum anxiety and depression found that a less positive maternal perception of the recent birth experience was predictive of postnatal anxiety at two and eight months postpartum but was not predictive of postnatal depression, highlighting the unique impact on postnatal anxiety (Bell et al., 2016). Maternal perception was a better predictor than the type of delivery (e.g., assisted) or the presence of any immediate postpartum complications. A study of Israeli women found that 75% of mothers with postpartum anxiety felt anger, fear, or emotional detachment during childbirth, highlighting the importance of the subjective experience of the birth and the emotions experienced (Polachek et al., 2014). Therefore, the subjective distress of the birth from the mother's point of view may be likely associated with postnatal anxiety.

### ***Emotional Abuse in Childhood***

A systematic review showed that emotional abuse and neglect were associated with increased perinatal distress, including anxiety and depression (Choi & Sikkema, 2016). The rates of childhood emotional neglect ranged from 34% to 75% (Choi & Sikkema, 2016). The impact of childhood maltreatment (including sexual abuse, physical abuse, and emotional abuse) in predicting postnatal anxiety was mixed, with two of the four studies finding that it was predictive. In addition, a more recent study found that even after controlling for exposure to recent stressors

and level of education, childhood maltreatment had a small but significant conditional effect on postnatal distress (Schury et al., 2017). Therefore, early emotional abuse was likely to predict postnatal anxiety.

### *Recent Stressors*

Pregnant people who have experienced any number of recent stressors may be more prone to postnatal anxiety. As with previous predictors, research on the connection between exposure to recent stressors and postnatal anxiety could not be found. However, an existing body of literature shows a robust connection between recent stressors and postnatal depression. A study in the United States found that stressors in pregnancy such as discrimination, food insecurity, job insecurity or job strain, and caring for an ill family member were predictive of an increased number of depressive symptoms compared to women who did not have these stressors (Eick et al., 2020). Another U.S.-based study found that adverse psychosocial events in pregnancy were related to poor outcomes, such as a greater number of preterm deliveries (Haviland et al., 2021). An Australian study with women from socially disadvantaged suburbs demonstrated that a range of stressors, such as major life events, low income, and domestic violence during pregnancy, were correlated with antenatal distress (Edwards et al., 2008). Therefore, exposure to recent stressors was included in the study.

### **The Current Study**

Postnatal anxiety has only recently attracted the attention of researchers, policymakers, and clinicians. Unlike postnatal depression, substantial gaps exist in understanding the factors that contribute to women experiencing postnatal anxiety. Identifying pregnant women at higher risk of developing postnatal anxiety means that early intervention can be offered, offsetting the considerable negative impacts of postnatal anxiety on the mother, baby, and society. Existing studies on postnatal anxiety have been largely limited in their applicability due to their broader scope, such as postnatal mood disorders (including depression and anxiety).

Prenatal depression is a well-established predictor of postnatal depression (Ogbo et al., 2018). Likely, this will also occur for anxiety, with prenatal anxiety highly predictive of postnatal anxiety, as Grant et al. (2007) demonstrated. Based on a literature review, variables likely to be linked to postnatal anxiety for Australian women include prenatal anxiety, age, domestic violence, a distressing childbirth experience, emotional abuse in childhood, and exposure to recent stressors. The current study aimed to understand the relationships between these

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variables and how they related to postnatal anxiety in Australian women. It was hypothesized that mothers would develop higher levels of postnatal anxiety if they:

- H1) Rated higher levels of prenatal anxiety.
- H2) Were younger.
- H3) Were exposed to domestic violence in pregnancy.
- H4) Experienced a subjectively distressing childbirth experience.
- H5) Experienced emotional abuse in childhood.
- H6) Were exposed to a recent stressor.

## **Method**

### **Design**

This longitudinal study drew on archival data of women in the perinatal period in Melbourne, Australia, collected by the Centre of Perinatal Excellence (COPE). Participants were included if they had completed screening on two occasions, including once prenatally and once postnatally. The majority of participants provided screening data on two occasions. Seven participants were identified as having provided data on more than two occasions. These were excluded from the study because of uncertainty about whether they were perhaps receiving treatment or engaging in other services in ways that were not typical of the larger cohort.

### **Participants**

Data was collected by COPE using the iCOPE platform. The complete dataset contained 6548 individual entries in an Excel spreadsheet, including results on the Edinburgh Postnatal Depression Scale (EPDS) and the Antenatal (Psychosocial) Risk Questionnaire (ANRQ), as well as several additional demographic questions. The participants received their perinatal care from public hospitals, private hospitals, and obstetricians' offices in Melbourne Central Business District (CBD), with no exclusion criteria. The participants consented to have their results used for research.

Using participant identification numbers and cross-checking with birthdays, 250 participants who had completed one prenatal and one postnatal screen were identified. Another seven participants who had completed three screening tools (i.e. either two screens prenatally and one postnatally, or one screen prenatally and two postnatally) were not included in the study. Participants who had missing data on the

dependent variable or several independent variables were excluded from the study, resulting in 240 participants.

### Measures

Participants answered several demographic questions, followed by the Edinburgh Postnatal Depression Scale (EPDS) and the Antenatal (Psychosocial) Risk Questionnaire (ANRQ).

#### *Edinburgh Postnatal Depression Scale Anxiety Subscale (EPDS-3A)*

The EPDS-3A is an anxiety subscale of the EPDS. Screening for perinatal anxiety is important, although introducing additional screening instruments is often not feasible (Smith-Nielsen et al., 2021). Smith-Nielsen et al. (2021) examined the utility of the EPDS-3A for detecting anxiety in mothers using confirmatory factor analysis and concluded that it could be used for detecting anxiety in mothers. There are three items in the anxiety subscale, giving a total possible score range for the EPDS-3A from zero to nine. Matthey (2008) found that a score of six or more indicated the likely presence of an anxiety disorder postnatally, with a sensitivity of 66.7% and specificity of 88.2%. A validation study of the subscale by Phillips et al. (2009), who also provided empirical evidence for the optimal cut-off score for the EPDS-3A, recommended a cut-off score of four or more however did not provide sensitivity and specificity values.

Van der Zee-van den Berg et al. (2019) showed that the internal consistency of the EPDS depression scale was 0.79 and that the anxiety subscale was 0.61 at one month postpartum. Other research has found internal consistency for the anxiety subscale to be adequate at 0.69 (Kernot et al., 2015), reaching borderline internal reliability. Furthermore, Kernot et al. (2015) found high test-retest reliability for total scores (ICC = 0.92) (Kernot et al., 2015). The EPDS-3A has also been found to have strong correlations with the State-Trait Anxiety Inventory (Giakoumaki et al., 2009), The Symptom Checklist-90 anxiety subscale (Brouwers et al., 2001), and the Beck Anxiety Inventory (Phillips et al., 2009). Small et al. (2007) looked at the performance of the EPDS in English-speaking and non-English speaking respondents and found that it was a cross-culturally valid tool for use in diverse populations in Australia.



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### ***Antenatal (Psychosocial) Risk Questionnaire (ANRQ)***

The ANRQ is a psychosocial assessment tool developed in consultation with midwives and mental health professionals for the maternity setting. It includes 12 items and covers both demographic and psychosocial information. Its domains include perceived childhood maternal support, birth experience, partner emotional support, life stressors, and personality style. It also includes questions about childhood abuse, previous experiences of adult abuse, and current domestic violence. Questions include, “Would you generally consider yourself a worrier?”, “Was your experience of giving birth to this baby disappointing or frightening?” and “Do you feel safe with your current partner?” Participants respond on a five-point scale that includes: 1 = *Not at all*, 2 = *A little*, 3 = *Somewhat*, 4 = *Quite a lot*, and 5 = *Very much*. Sensitivity was 0.62 and specificity was 0.64 using a clinically relevant cut-off score of 23 to determine participants’ overall mental health risk. These scores are relatively low; however, the tool was not used for the overall score in this study. It was only used to gather data on specific variables, including domestic violence, subjectively distressing childbirth, emotional abuse in childhood, and exposure to a recent stressor.

### **Procedure**

This research was approved by the Charles Sturt University Ethics Committee, protocol number H21159.

In Australia, perinatal mental health screening is mandatory in all public facilities and is voluntary in private facilities. COPE is an Australian not-for-profit organization that supports this screening via the iCOPE platform, an interactive, web-based platform that provides efficient and effective perinatal screening. The platform enables screening on a tablet, and scores are automatically calculated for both the health professional and the patient. In addition, it also facilitates the collection of data for research purposes.

Participants attending prenatal and postnatal health visits at public and private hospitals and private obstetrics offices in Melbourne, Australia, who had subscribed to the iCOPE platform, were given an iPad and asked to complete the survey. The survey included demographic questions, followed by the EPDS and the ANRQ. Those who had consented to their data being used for research purposes had their data entered into COPE’s dataset. The deidentified archival dataset obtained from COPE contained a comprehensive collection of the relevant demographic and mental health variables for this study,

including prenatal anxiety, age, domestic violence, a distressing childbirth experience, childhood abuse, recent stressors, and Postnatal anxiety levels. The variables were calculated and recoded to enable analysis, as described below.

- Prenatal anxiety was based on the EPDS-3A during pregnancy. As Phillips et al. (2009) recommended, a cut-off of four was used to categorize participants as experiencing or not experiencing prenatal anxiety. It was a categorical variable.
- Age was calculated via participants' date of birth and the data collection date. It was a continuous variable.
- Domestic violence was addressed on the ANRQ domestic violence screening question (no question number, third final question), which asks: "Do you feel safe with your current partner?" Participants were given a 5-point scale to respond. Participants who answered *not at all*, *a little*, or *somewhat* were coded as having experienced domestic violence. Participants who answered *very much* or *quite a lot* were coded as not having experienced domestic violence.
- Distressing childbirth was based on the question (no question number) "Was your experience of giving birth to this baby disappointing or frightening?" on the ANRQ. Participants were provided with a 5-point scale. Participants who answered *somewhat*, *quite a lot*, or *very much* were coded as having experienced a distressing childbirth. Participants who answered *not at all* or *a little* were coded as not having had a distressing childbirth experience.
- Emotional abuse was based on the question (no question number) "Were you emotionally abused when growing up?" on the ANRQ. Participants were given the option to reply with *yes* or *no*.
- Recent stressors were based on the question (no question number) "Have you had any stresses, changes, or losses in the last 12 months (e.g., separation, domestic violence, unemployment, bereavement)?" on the ANRQ. Participants were given the option to reply with *yes* or *no*.

### Analyses

Analyses were completed using SPSS Statistics 28. The preliminary analysis involved the calculation of frequencies and distributions of the study variables, including the dependent variable (postnatal anxiety) and the six independent variables (prenatal anxiety, age, domestic violence, distressing childbirth, emotional abuse, and recent stressors).

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Analyses were conducted to ensure that variables of interest met assumptions for normality of distribution and linearity. Bivariate relationships between study variables were analyzed to address the relevant hypotheses. These analyses included one-way ANOVAs and correlational analyses to determine the significance and strength of the variable's relationship with postnatal anxiety. Those independent variables related to postnatal anxiety were admitted to multivariate modeling analyses. Multivariate predictive modeling of postnatal anxiety was undertaken using hierarchical multiple regression analyses.

### **Results**

The results are presented in four sections corresponding to the study's aim and six hypotheses. The first section details the distribution and frequencies of the study variables, followed by correlations and one-way ANOVAs to determine the relationships between the key study variables and postnatal anxiety. Finally, the results of the hierarchical regression analyses predicting postnatal anxiety are presented.

#### **Distributions and Frequencies of Study Variables**

The final sample included 240 participants. Preliminary analysis was conducted for frequency scores, missing values, data, and variable assumption testing (skewness z-score). Table 1 shows the distributions of postnatal anxiety as measured by the EPDS-3A and age. It also shows the distributions and frequencies of prenatal anxiety (EPDS-3A) as both a continuous variable and when using the two recommended cut off scores of four and above and six above.

**Table 1**

*Frequencies and Distributions of Postnatal Anxiety, Age and Prenatal Anxiety*

Variable	N	%	M	SD	Range		
					Min	Max	Z-Skew
<i>Postnatal Anxiety</i>			2.60	1.87	0	8	2.18
<i>Prenatal Anxiety</i>	240	100%	2.93	2.01	0	8	1.08
0-3	162	68%					
4-5	51	21%					
6-9	27	11%					
<i>Age (years)</i>			33.85	4.27	24	48	2.86

*Note.* Z Skew = Skew/Standard error of skew (Tabachnick & Fidell, 2019).

Table 1 shows that the mean prenatal anxiety scores were relatively low at 2.93. The distribution of the continuous variables appear to be within normal limits with z-skew <3.00 (Tabachnick & Fidell, 2019). The frequencies table shows the number of participants in various groups based on the two recommended cut-off scores of four and above and six and above. Only 27 participants (11%) would be grouped as having prenatal anxiety, using a cut-off score of six and above. However, using the lower cut-off score of four and above, 78 participants (32%) met the criteria for prenatal anxiety. As such, the lower score of four was used for further analysis. At 33.85, the mean age for the sample was approximately 2.75 years older than the mean maternal age of 31.10 for Victoria, Australia (Australian Institute of Health and Welfare [AIHW], 2021). A one-sample t-test found a significant difference between the mean age of the sample and the mean age of women giving birth in Victoria, Australia  $t(239) = 9.97, p = <.001$ .

Frequencies and proportions of participants within groups for the categorical variables of prenatal anxiety, domestic violence, distressing childbirth, emotional abuse, and recent stressors are presented in Table 2.

**Table 2**

*Frequencies of Prenatal Anxiety, Domestic Violence, Distressing Childbirth, Emotional Abuse and Recent Stressors Variables (n = 240)*

Variable	n	%
<i>Prenatal Anxiety</i>	240	
Yes	78	32.5%
No	162	67.5%
<i>Domestic Violence</i>	240	
Yes	1	0.4%
No	239	99.6%
<i>Distressing Childbirth</i>	235	
Yes	84	35.0%
No	151	62.9%
<i>Missing</i>	5	2.1%
<i>Emotional Abuse</i>	240	
Yes	19	7.9%
No	221	92.1%
<i>Recent Stressors</i>	240	
Yes	67	27.9%
No	173	72.1%

Table 2 shows groups for prenatal anxiety based on the EPDS-3A. Of the 240 participants, 32.5% were categorized as experiencing prenatal anxiety using a cut-off of four or more. Only one respondent selected that they felt *somewhat* safe. No one selected *a little* or *not at all* in response to feeling safe in their relationship. As insufficient participants rated *a little* or *not at all* for creating a group of participants who had experienced domestic violence, this variable was not included in further analyses. Reports of having experienced emotional abuse in childhood were also low at 7.9%. In summary, five of the six original variables for inclusion in the model for understanding predictors of postnatal anxiety were included for further analysis: prenatal anxiety, age, distressing childbirth, emotional abuse, and recent stressors.

## Relationships Between Study Variables

Pearson correlations were conducted to determine the strength of relationships between the continuous variables of age and postnatal anxiety to test hypothesis 2: younger mothers are more likely to have

higher levels of postnatal anxiety. Contrary to Hypothesis 2, no significant relationship was found between age and postnatal anxiety,  $r(239) = .00, p = .95$ . Therefore, age was not included as a covariate in further analyses.

A series of one-way Analyses of Variance (ANOVA) were conducted to test the hypotheses that the prenatal study variables contributed to postnatal anxiety. The results are presented in Table 3.

**Table 3**

*Differences in Postnatal Anxiety Scores between Groups on Study Variables*

Variable	Mean	SD	F	df	p
<i>Prenatal Anxiety</i>			501.19		< .001
Yes	4.81	0.93		1	
No	1.53	1.12		238	
<i>Distressing Childbirth</i>			12.45		<.001
Yes	3.20	1.8		1	
No	2.33	1.82		233	
<i>Emotional Abuse</i>			4.08		<.05
Yes	3.42	2.24		1	
No	2.52	1.82		238	
<i>Recent Stressors</i>			4.41		ns
Yes	3.00	2.00		1	
No	2.44	1.80		238	

Table 3 shows significant differences in postnatal anxiety scores between participant groups for each variable, except for recent stressors. A relatively large difference was observed between mean postnatal anxiety scores for the prenatal anxiety groups. The results supported hypotheses 1, 4, and 5. However, hypotheses 2 and 6 were not supported. The variables of prenatal anxiety, distressing childbirth experiences, and emotional abuse were each shown to relate to postnatal anxiety and were entered into multivariate analyses.

### Hierarchical Multiple Regression

The independent variables of prenatal anxiety, distressing childbirth, and emotional abuse were categorical and met the assumptions for linear regression analysis (Tabachnick & Fidell, 2019). The current study aimed to understand the relationships between these variables and how they related to postnatal anxiety. Consequently, these

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three variables were entered into the analysis using a stepwise method to examine the variance in postnatal anxiety explained by distressing childbirth and emotional abuse beyond that explained by prenatal anxiety.

The analysis produced two models. The first model with only prenatal anxiety as a predictor explained almost 68% of the variance (adjusted R squared = .676) in postnatal anxiety. The second model included distressing childbirth and emotional abuse and explained approximately an additional 2.5% of the variance (adjusted R squared = .700). The results of this hierarchical regression modeling are shown in Table 4.

**Table 4**

*Modelling Postnatal Anxiety*

Model	Unstandardized		Standardized		
	Coefficients		Coefficients		
	B	SE	$\beta$	t	p
Model 1 (Constant)	1.57	.08		18.56	<.001
Prenatal Anxiety	3.24	.15	.82	22.19	<.001
Model 2 (Constant)	1.37	.01		14.55	<.001
Prenatal Anxiety	3.17	.14	.80	22.22	<.001
Distressing Childbirth	.46	.14	.12	3.30	.001
Emotional Abuse	.81	.25	.12	3.27	.001

Table 4 shows that prenatal anxiety explained the majority of variance in postnatal anxiety. These analyses also tested whether other relevant variables could explain variance in addition to that explained by prenatal anxiety. The results showed that distressing childbirth and emotional abuse contributed an additional 2.5% of the variance. Although this is a relatively small amount, the results of the t-tests indicated that they both contributed significantly to the model.

## Discussion

This study aimed to understand the factors in pregnancy predictive of postnatal anxiety, thus contributing to the developing body of knowledge on postnatal anxiety. Compared to postnatal depression, there is relatively little research available on postnatal anxiety despite it arguably being more prevalent (Field, 2018) and having predictors and

consequences that are different from those of postnatal depression (Barker et al., 2011; Bell et al., 2016; Goodman et al., 2011; Hall, 2012; Moehler et al., 2006). It is important to identify women at risk of postnatal anxiety to offer them timely support and intervention and avoid the known negative impacts on the mother, baby, and the economy. It was hypothesized that the following six variables would contribute to higher levels of postnatal anxiety: prenatal anxiety, age, domestic violence, distressing childbirth, emotional abuse, and recent stressors. This study has made an important step towards this understanding by demonstrating the substantial predictive power of prenatal anxiety for postnatal anxiety.

The results showed that three of the six factors—prenatal anxiety, distressing childbirth experience, and emotional neglect in childhood—were significant predictors of postnatal anxiety. Age and exposure to recent stressors were not found to contribute to postnatal anxiety in this sample. The impact of domestic violence was unable to be assessed due to insufficient disclosure by participants.

An important finding of the present study was that prenatal anxiety alone, when using a cut-off score of four points or more on the EPDS-3A, was highly predictive of postnatal anxiety. There is debate about whether a cut-off score of four or six should be used; both scores have been presented as appropriate thresholds for determining prenatal anxiety in validation studies (Matthey, 2008; Phillips et al., 2009). When looking at the frequencies of women with elevated prenatal anxiety using each of the cut-off scores, it was evident that a cut-off score of four was required for the present analysis as just 11% of participants would have been identified as having prenatal anxiety using the cut-off score of six or more. By using the cut-off score of four, 32% of participants met the threshold for prenatal anxiety, and this was highly predictive of postnatal anxiety in this sample.

A distressing childbirth experience and emotional abuse in childhood were found to hold some predictive value. This contribution is consistent with previous research findings (Bell et al., 2016; Choi & Sikkema, 2016; Field, 2018; Polachek, 2014; Schury et al., 2017). A distressing childbirth experience was of particular interest as it has been found to impact only postnatal anxiety and not postnatal depression (Field, 2018). Regarding childhood emotional abuse, this was disclosed by 8.5% of participants, far less than figures reported in other studies, which range from 34% to 75% (Choi & Sikkema, 2016). It is possible that underreporting occurred in this sample, leading to women who had experienced emotional abuse in childhood being categorized in the non-abused group, consequently producing weaker results. Women may have found it confronting to answer questions about childhood abuse and either underreported if they feared stigmatization or opted not to complete the screening a



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second time, resulting in their screening tools not being included in this study. A distressing childbirth experience and emotional abuse in childhood remain variables of interest despite this study's relatively weak predictive power.

Age was found to have no significant relationship with postnatal anxiety, unlike the study in Qatar by Bener et al. (2012), which found that age was the strongest predictor of postnatal anxiety, with women under 30 having the highest levels of anxiety. The most compelling explanation for this is that the older age of women in this study sample (average of 33.85 years, with the youngest mother being 24) led to this not being significant. It is also possible that the social circumstances of women in Qatar are so different from those in Melbourne, Australia, that the finding from the Bener et al. (2012) study is not generalizable.

Previous research reported that exposure to recent stressors is predictive of postnatal anxiety (Edwards et al., 2008; Eick et al., 2020; Haviland et al., 2021; Leigh & Milgrom, 2008), but the results of the current study did not support this. Two of these studies were in the United States, and one was based in socially disadvantaged suburbs of Adelaide, Australia. As above, the inconsistency in this finding may be due to differences between populations. The current study was based on Australian women in a major city. Stressors found in the United States and socially disadvantaged areas in Australia, such as housing and food insecurity, may be less typically experienced by women in Melbourne visiting city-based healthcare facilities. The women who did experience a recent life stressor, such as a loss, may have felt supported in these situations, offsetting the consequent impact of postnatal anxiety. It is speculated that stressful life events experienced by pregnant women who do not have access to appropriate resources or support are predictive of postnatal anxiety. However, exposure to stressors is not in and of itself a predictor. Future research that explores the type of stressor and the level of support and resources that the woman has access to could provide a further understanding of this important issue.

The final regression analysis did not include domestic violence due to a lack of reporting on this variable. Despite high levels of acceptability of the ANRQ with Australian women at 97.3% (Reilly et al., 2015), it is speculated that underreporting may have occurred in the sample of the current study. In response to the question: "If you currently have a partner, do you feel safe in this relationship?" on the ANRQ, no women reported feeling unsafe, which was unexpected as pregnancy is a known high-risk period for the onset of domestic violence and increased severity if it was already present (Campo, 2015). In New South Wales, Australia, a study using the EPDS and ANRQ found that 5.9% of women reported physical intimate partner violence (Ogbo et al., 2018). In Australia,

health professionals have a legal requirement to report to child protection authorities if there is a reasonable belief of a significant risk of harm to a child due to abuse or neglect, including a significant risk of harm from exposure to domestic violence. Given the potential and often feared consequences of involvement from child protection government departments, the participants in the current study may have been reluctant to disclose information about domestic violence. Those experiencing domestic violence may have also found it uncomfortable filling out the screening tool the first time and therefore opted not to complete it a second time. The domestic violence variable may be better assessed using a non-self-report measure or asking the question differently. While this variable could not be assessed in this study, it remains an important factor for consideration in future research.

The strong predictive relationship between prenatal and postnatal anxiety in the present study raises an interesting question for practice. That is, could a cut-off score of four on the EPDS-3A be used in practice as a key predictor of postnatal anxiety? Pregnant women who would otherwise be missed by the EPDS total score of 13 due to low scores on depressive items yet high scores on the anxiety items would be identified for further support. As the EPDS is already widely used in pregnancy, clinicians and health professionals could review the EPDS-3A subscale to screen for anxiety. This screening does not require additional screening tools and places no additional burden on pregnant women or the existing support systems. This screening strategy could be implemented with minimal additional time requirements from health professionals making it practical, feasible, and effective. Further research to validate this approach to identifying gestational parents who would benefit from referral for support and treatment of postnatal anxiety seems warranted.

Secondary to this finding, distressing childbirth and emotional abuse in childhood contributed to a significant albeit small amount of variance in postnatal anxiety. The hypotheses that the variables of age, domestic violence, and recent stressors would contribute to postnatal anxiety were not supported. There are several likely explanations for this. The first is the significant difference in mean maternal age between this sample, the samples in previous research, and the general Australian mean. Different predictive variables may exist for younger samples of women than older mothers. Research on perinatal health taken from abroad, and disadvantaged Australian populations, may not be generalizable to women in Melbourne – a relatively affluent city with high levels of public social services.

## **Limitations and Directions for Future Research**

Although the results support the hypothesis that prenatal anxiety is predictive of postnatal anxiety, it is appropriate to recognize several potential limitations of this study. Firstly, of the original 6,548 entries, only 250 participants were found to have one prenatal and one postnatal entry. Only seven participants (who were not included in the study) had completed the screening tools three times, leaving 6,027 single entries. COPE's original data collection aimed to provide in-the-moment screening, identifying women at risk for referring further support rather than following them throughout their perinatal journey. Therefore, it was difficult to identify participants who returned follow-up data in some cases. As such, it may have been that some participants were not included in the current study. It is also plausible that participants who found the screening uncomfortable opted not to complete it again. Further research with an intentional focus on recruiting participants for longitudinal pre and postnatal anxiety research seems warranted.

Secondly, this study contributes knowledge on predictive variables specific to the city of Melbourne demographic. The significantly older age of this group means that these results may not be generalizable to the state of Victoria (in which Melbourne is the capital) or wider Australia (including rural and remote areas). The lack of generalizability reinforces the need for various models of predictors for postnatal anxiety for different populations.

Thirdly, the EPDS-3A is a tool with relatively low levels of internal consistency (Cronbach's alpha of 0.69). It is a practical scale for use in detecting prenatal anxiety in practice and clinical settings as it is brief and is already widely offered to mothers as part of the EPDS. More robust anxiety measures could be used to research pre and postnatal anxiety. Alternatively, further validation studies of the EPDS-3A for identifying clinical anxiety levels, both prenatally and postnatally, using a cut-off score of four, could further validate the current study's findings.

This study has contributed to the emerging and growing body of theoretical and clinical interest in prenatal and postnatal anxiety. The practical and clinical implication of this study is that by identifying prenatal anxiety alone, health professionals may be likely to identify women at risk of postnatal anxiety, offer them intervention, and prevent or reduce the emotional, social, and financial impacts of postnatal anxiety. Directions for future research include using a longitudinal data gathering method and measures with strong internal consistency. It is recommended that data be gathered using non-self-reporting methods

for variables that participants may be reluctant to disclose, such as domestic violence. Finally, completing this research with a broader population may be useful for generalizability. These possible avenues will contribute to the research on postnatal anxiety in women.

### **Appendix**

Jenna Mayhew is available to correspond at [jennamayhew@hotmail.com](mailto:jennamayhew@hotmail.com).  
Dr. Matthew Thomas is available to correspond at [mathomas@csu.edu.au](mailto:mathomas@csu.edu.au).

### **Acknowledgments**

We would like to acknowledge the Centre of Perinatal Excellence (COPE), Melbourne, Australia, for providing deidentified archival data on which this research was based.

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