Risk Factors for Depression, Anxiety and Stress in Expectant and New Mothers

Danielle Clout

July 2015

A thesis submitted for the degree of Doctor of Philosophy (Clinical Psychology) of the Australian National University

This page has been intentionally left blank

Acknowledgements

First and foremost, I would like to thank my supervisor, Associate Professor Rhonda Brown for her consistent support and guidance over the 18 months we have been working together. Without this help, and extra encouragement when I had my second baby, I very much doubt I would be submitting this thesis. I'd also like to thank my other panel members, Associate Professor Richard O'Kearney and Dr Phillipa Butcher for their feedback throughout the journey. Thirdly, I would like to extend thanks to my previous supervisor, Associate Professor Ross Wilkinson for his guidance in the early stages of my research. Although he was unable to remain on my supervision team, I wish him the best for his future endeavours at Newcastle University.

A special thank you to all of the participants in this study. Completing lengthy questionnaires in the last trimester of pregnancy, and in the early months of parenthood is not always an easy task, so I very much appreciate all the women who participated and helped make this research possible.

Lastly, I would like to thank my family and friends for the love and support they have provided during the completion of this thesis. Special thanks go to my husband, for his unwavering belief in my ability to reach this goal, and for spending many evenings and weekends' child wrangling without complaint. Finally, I'd also like to thank our two children, Alexander and Madeleine. Even though they are too young to have any understanding of the journey, they have motivated me to keep on track, and to overcome all obstacles along the way. I am very much looking forward to PhD free family life!

Abstract

The perinatal period represents a time of increased vulnerability to experience psychological distress in many women. Postpartum depression (PPD) is a well-recognised mental health concern that is known to have deleterious effects on some new mothers and their relationship with their spouse and infant. Recently, anxiety and stress have been recognised as symptoms that are commonly comorbid with (or occur independently of) perinatal depression, although less is known about the psychological and non-psychological risk factors for these affective states. Thus, using a community sample of 105 women in their third-trimester of pregnancy, the aim of this thesis was to broaden the current conceptualisation of psychological distress in the perinatal period to include the affective states of psychological stress and anxiety, and to examine a broad range of factors that have previously been identified as risk factors for perinatal depression, and to assess their potential role in the aetiology of perinatal anxiety and stress.

Paper 1 examined the relationship between attachment-avoidance, attachment-anxiety, and marital relationship quality during pregnancy, and symptoms of postpartum depression, anxiety, and stress. The study results indicated that marital satisfaction and emotional affection significantly predicted depression levels, and marital satisfaction significantly predicted anxiety levels. In addition, mediational analyses indicated that dyadic satisfaction significantly mediated the relationships between high attachment-anxiety to worse anxiety and depression, and it also mediated the relationship between high attachment-avoidance to later anxiety and depression symptoms.

Paper 2 explored the potential contribution of attachment-avoidance and attachment-anxiety in a woman's relationships with her parents and close friends and the association of these factors to her experience of depression, anxiety, and stress

during the third-trimester of pregnancy and 4-6 months postpartum. In addition, changes in the women's attachment networks were examined across the transition to parenthood. The study results showed that women who were high on attachment-anxiety in relation to their mothers and close friends were more likely to experience depression during pregnancy, but only attachment-anxiety to their mothers predicted high depression levels postpartum. In addition, women's attachment-anxiety to their mothers and attachment-avoidance to their friends predicted high anxiety levels during pregnancy, and attachment-anxiety to their mothers predicted high stress levels during pregnancy. Further, the size of the women's attachment networks remained stable from the third-trimester to the postpartum, although they tended to rely less on their partners and close friends for attachment needs in the postpartum.

Paper 3 evaluated the different aspects or functions of social support during the third-trimester of pregnancy as potential predictors of depression, anxiety, and stress levels during pregnancy and at 4-6 months postpartum. The study results showed that the perceived unavailability of self-esteem support predicted high depression levels in the third-trimester, whereas less perceived appraisal support predicted high stress and anxiety levels during pregnancy. However, only total social support score predicted high stress and depression levels postpartum, whereas none of the social support variables predicted postpartum anxiety.

Lastly, *paper 4* examined a range of sociodemographic, pregnancy, obstetric, and postnatal variables as potential risk factors for postpartum depression, anxiety, and stress. The study results showed that caesarean delivery was associated with high postpartum depression, anxiety, and stress levels. In addition, child sleep problems were related to high depression levels, child health problems were related to high anxiety, a greater number of recent stressful life events were related to high stress levels, and

maternal sleep problems were related to greater PPD. However, these results became non-significant after controlling for prenatal levels of maternal distress. Nonetheless, the women who underwent caesarean delivery reported higher prenatal stress, anxiety, and depression levels, relative to women who did not undergo the procedure.

Taken together, the results of the four studies are likely to have implications for the screening of women during the perinatal period, and they may assist healthcare professionals who work with expectant and new mothers. In particular, the study results suggest that a woman's relationships with her family and close friends as well as with her spouse may be important in shaping her psychological experiences including perinatal distress. In addition, the totality of social support rather than any particular aspect of social support appears to buffer against the potential to experience maternal distress, although self-esteem and appraisal support may be important. Finally, the women who had a caesarean delivery were more likely to be distressed in the third-trimester of pregnancy and also at 4-6 months postpartum. Thus, the results point to the need to screen pregnant women for mental health problems if they have a marked preference for caesarean delivery.

Certification

I certify that the substance of this thesis has not already been submitted for any degree and is not currently being submitted for any other degree or qualification.

I certify that any help received in preparing this thesis and all sources have been acknowledged in this thesis.

Danielle Clout

Table of Contents

List of Tables

Paper 3

Paper 4

List of Abbreviations

ABS	Australian Bureau of Statistics
ANOVA	Analysis of Variance
ANQ	Attachment Network Questionnaire
ANU	Australian National University
ART	Assisted Reproductive Technology
CI	Confidence Interval
CS	Caesarean Section
DAS	Dyadic Adjustment Scale
DASS	Depression, Anxiety, and Stress Scales
DV	Dependent Variable
ECR	Experiences in Close Relationships Scale
EPDS	Edinburgh Postnatal Depression Scale
GAD	Generalised Anxiety Disorder
ISEL	Interpersonal Support Evaluation Inventory
IV	Independent Variable
IVF	In Vitro Fertilisation
PPD	Postpartum Depression
RS	Relationship Structures Questionnaire
SES	Socioeconomic Status
SLE	Stressful Life Events
T1	Time 1
T2	Time 2

Chapter 1

Introduction and Perinatal Mood Disorders

Having a baby is believed to be one of the most joyful and rewarding times in a woman's life. For most new parents, the birth of a child brings happiness and rewards including a sense of achievement and the fulfilment of reproductive needs and social expectations (Petch & Halford, 2008). However, the perinatal period, which spans from pregnancy to the first 12-months postpartum, is a period of major transition (Matthey, 2010) that can include changes to significant relationships and prior roles, challenges, considerable upheaval, and psychological distress. It is also a time when expectant and new mothers undergo many physical and biological changes throughout pregnancy, birth, and breastfeeding. Thus, although pregnancy is arguably one of the most normal of physiological processes, it is associated with many significant stressors including uncomfortable symptoms such as nausea and vomiting that can interfere with the quality of the woman's perinatal life (Chou, Avant, Kuo, & Fetzer, 2008; O'Brien & Naber, 1992). In addition, the postpartum period requires significant adjustment to adapt to the demands of motherhood and infant care, and the lack of sleep and fatigue, which are commonly expressed concerns by women at this time (Dennis & Ross, 2005; Goyal, Gay, & Lee, 2007).

In addition, significant relationship changes can occur over the transition to parenthood, including changes in the division of household work, leisure, intimacy, the emotional tone of personal interactions, and relationship satisfaction (Feeney, Hohaus, Noller, and Alexander, 2001). As a result of these changes, most studies have shown that after the birth of a child, couples tend to experience more frequent arguments, an overall increase in marital tension (Cox, Paley, Burchinal, & Payne, 1999), and a reduction in marital satisfaction (Mitnick, Heyman, Smith, & Slep, 2009). The perinatal

period may also represent a time of significant change and upheaval in the woman's family and social support networks, which can either provide a buffer against perinatal stress and distress or increase a woman's vulnerability to experience distress in this period (Bost, Cox, Burchinal, & Payne, 2002).

Thus, for some women, the perinatal period can be a time of significant psychological distress, such that they may experience symptoms of depression, anxiety and/or stress. In particular, depression in the perinatal period has received considerable research and clinical attention. *Postpartum depression* (PPD) is considered to be especially important as it is associated with substantial and sometimes permanent changes in the infants and new mothers, and her relationships and family circumstances (Pope, 2000). However, more recently, there has been growing recognition that mental health concerns across the transition to parenthood are not restricted to mood disorders, but may also include symptoms of anxiety and stress that may themselves lead to profound effects on new mothers (Britton, 2008; George, Luz, De Tychey, Thilly, & Spitz, 2013; Miller, Pallant, & Negri, 2006; Rallis, Skouteris, McCabe, & Milgrom, 2014).

In *Chapters 1* and *2*, detailed information is provided on perinatal depression and anxiety, including their characteristics, prevalence, symptom trajectory, and the associated adverse consequences in women, their infants, and their relationships. Finally, the small existing literature on perinatal maternal stress and the importance of more broadly considering the definition of maternal psychological distress will be outlined.

In *Chapters 3 and 4,* information on the role of interpersonal variables in the aetiology of perinatal distress will be presented, including both attachment and marital relationship quality, and the interaction between these two variables. Chapter 4 will also

discuss the impact of a woman's relationship with her parents and close friends, and the individual functions of social support, on her psychological adjustment over the transition to parenthood. *Chapter 5* will then address the role of non-psychological variables in the aetiology of perinatal distress, including sociodemographic, pregnancy, obstetric and postpartum factors. This chapter will include variables such as age, income, education level, pregnancy planning, delivery mode, recent stressful life events, and maternal and infant sleep quality. Lastly, *Chapter 6* will outline the current research, including the overall aims and objectives, the introduction to the four papers comprising the thesis, the methodology, and statistical analysis techniques.

Perinatal Mood Disorders

Postpartum mood disorders that include the 'baby blues' or 'maternity blues', PPD, and puerperal psychosis are the most well researched and recognised maternal mental health concerns after the birth of a baby. A brief summary of the clinically accepted differences in the prevalence, typical symptom onset, duration, and treatment of the disorders is provided in Table 1 provided by Robertson, Grace, Wallington, and Steward (2004).

Table 1

A Summary of the Differences in Postpartum Affective Disorders

Disorder	Prevalence (%)	Onset	Duration	Treatment
Maternity Blues	30-75	3-4 days postpartum	Hours-2weeks	None, other than reassurance
Postpartum Depression	10-15	Within 6 months	Weeks - months	Treatment usually required by health professional
Puerperal Psychosis	0.1-0.2	Within 2 weeks	Weeks-months	Hospitalisation usually required

Note. Taken from Robertson et al. (2004)

The 'baby blues' or 'maternity blues' are the most commonly observed postpartum mood disturbance. The symptoms typically include mild mood lability, irritability, tearfulness, generalised anxiety, and sleep and appetite disturbances (Robertson et al., 2004). The prevalence estimates for the state range from 30-75% of new mothers (O'Hara, Neunaber, & Zekoski, 1984), although the symptoms generally do not interfere with the mother's ability to function or provide infant care (Buist, 1996). The two main theories regarding the causation of the 'baby blues' centre on the

biological and hormonal changes that occur in women after childbirth. The first hypothesis suggests that the 'blues' may result from the triggering of the limbic system when oxytocin levels increase after childbirth (Insel, 1992). In contrast, the second theory proposes that they are related to the rapid decline in progesterone and oestrogen levels in the days after delivery (Harris, Lovett, & Newcombe, Read, Walker, & Riad-Fahmy, 1994). Fortunately, the 'blues' do not usually require medical or psychological treatment, and they typically resolve within days to several weeks postpartum (Nonacs & Cohen, 1998).

In contrast, puerperal or postpartum psychosis is a rare but serious condition that is characterised by psychotic episodes that can include elated mood, disorganised behaviour, mood lability, delusions, and hallucinations that are associated with childbirth (Brockington, Winokur, & Dean, 1982). The woman's delusional beliefs often focus on the infants, and sometimes the new mothers report experiencing auditory hallucinations that instruct them to harm themselves or the infant (Nonacs & Cohen, 1998). Prevalence estimates for the disorder indicate that puerperal psychosis affects only about 0.1-0.2% of new mothers, with the onset typically being within the first 2-4 weeks postpartum (Kendell, Chalmers, & Platz, 1987). Some studies have identified primiparity as a risk factor for the occurrence of postpartum psychosis (Blackmore et al., 2006), and other risk factors include a family or personal history of psychosis and a previous experience of perinatal infant death (Dowlatshahi & Paykel, 1990). Women with puerperal psychosis require close clinical observation that typically includes hospitalisation, due to the potential life-threatening and severe nature of the symptoms, for the woman and her infant (Robertson, Jones, Haque, Holder, & Craddock, 2005). The prognosis of postpartum psychosis is generally favourable, although the women

remain at risk of developing future postpartum and/or non-postpartum episodes of bipolar affective disorder (Reich & Winokur, 1970).

Antenatal Depression

The overwhelming majority of the research evaluating depression in women over the transition to parenthood has focused on PPD, although some research has suggested that the rates of depression may be higher in pregnancy than in the postpartum period (Da Costa, Larouche, Drista, & Brender, 2000; Evans, Heron, Francomb, Oke, & Golding, 2001). In addition, a significant proportion of the women who are diagnosed with PPD were also found to be depressed during pregnancy (Gorman et al., 2004). Thus, a brief outline of the depression experienced by women during pregnancy is provided below.

In the psychological literature, there has been some controversy as to whether the depression observed in women in the perinatal period, especially PPD, is distinct from the depression occurring at other times in a woman's life. However, the majority of evidence suggests that antenatal and postnatal depression is largely the same as depression occurring at other times in the lifespan (Boath & Henshaw, 2001). The *Diagnostic and Statistical Manual of Mental Disorders Fifth Edition* (DSM-V) supports this viewpoint, and the description of Major Depression includes an antenatal or postpartum onset up to the first 4-weeks. The DSM-V criteria for major depression, and therefore antenatal and postpartum depression are presented in Table 2.

Table 2

Diagnostic Criteria for Major Depression

	DSM-V Criteria
Symptoms	Five or more of the following 9 symptoms (including at least one of depressed mood and loss of interest or pleasure) - Depressed mood - Loss of interest or pleasure - Change in weight or appetite - Insomnia or hypersomnia - Psychomotor agitation or retardation - Loss of energy or fatigue - Worthlessness or guilt - Impaired concentration or indecisiveness - Recurrent thoughts of death or suicidal ideation or attempt.
Duration of Symptoms	Symptoms present nearly every day for a minimum of two weeks
Clinical Significance	Symptoms cause significant distress or impairment Symptoms are not attributable to a substance or medical condition Symptoms are not better explained by a psychotic disorder There has never been a manic or hypomanic episode. This exclusion does not apply if the hypomanic episode was substance-induced or attributable to a medical condition

Prevalence estimates for antenatal depression range from 13.5% to nearly 30% of pregnant women (Evans et al., 2001; Fellenzer & Cibula, 2014), although there is some indication that the depression rates may decrease during pregnancy (Teixeira, Figueiredo, Conde, Pacheco, & Costa, 2009). For example, in a study by Felice, Saliba, Grech, and Cox (2004), depression rates across pregnancy and the early postpartum ranged from 15.5% in early and mid-pregnancy, 11.1% in the third-trimester, and 8.7% in the postpartum period.

This antenatal depression is important as it can be associated with an elevated risk of poor pregnancy outcomes such as slower foetal growth rate, premature delivery,

and low birth weight (Grote, Bridge, Gavin, Melville, Iyengar, & Katon, 2010). For example, Diego, Field, Hernandez-Reif, Schanberg, Kuhn, and Gonzalez-Quintero (2009) found that women with prenatal depression had a 13% greater incidence of premature delivery and a 15% greater incidence of low birth-weight, relative to non-depressed women. However, several studies have indicated that the adverse neonatal outcomes may be mediated by the adverse effects of co-occurring factors such as tobacco, alcohol and other drug use, poorer health, or inadequate medical care (Lancaster, Gold, Flynn, Yoo, Marcus, & Davis, 2010). More recently, Evans et al. (2012) has shown that the antenatal rather than postnatal exposure to depression was important in terms of the child's cognitive development.

However, less is known about the risk factors for prenatal depression in women, although several studies have indicated that the risk factors may include multiparity (Halbreich, 2004; DePiertro, Sipsma, & Costigan, 2008) and whether or not the pregnancy was planned (Fellenzer & Cibula, 2014). Thus, additional research is required to evaluate the risk factors for antenatal depression, especially since pregnancy provides an ideal opportunity for the screening and prevention of depressed mood, as it is easily identifiable and the women are generally in regular contact with their health carers (Austin & Lumley, 2003).

Postpartum Depression

Postpartum depression (PPD) is a serious and debilitating condition, and it is the most frequent mental health complication associated with childbirth (Gregoire, 1995). The DSM-V specifies that for a diagnosis of PPD to be made, the depression needs to occur in the first 4-weeks postpartum, although in the *International Classification of Diseases* (ICD-10), the period of onset is up to 6-weeks after delivery. However, more

broadly, the clinical and research focus generally extends the definition of PPD to include up to the end of the first year after birth (O'Hara & McCabe, 2013)

The symptoms of PPD are the same as the symptoms of non-PPD depression that occurs at other times (Remick, 2002), but they are distinct from the "normal" sequelae of childbirth, such as changes in weight, sleep, and energy levels. However, such a distinction is a challenge that can complicate clinical diagnosis (Hostetter & Stowe, 2002). Meaning, that while very severe PPD is easily detected, less severe presentations of the disorder can be easily dismissed as normal or the natural consequence of childbirth (Robertson et al., 2004). Thus, in addition to the formal diagnostic criteria for major depression presented in Table 2, Pope (2000) proposes that additional PPD symptoms should be included, since they can occur in some women and may be evident in clinical practice. These additional symptoms are outlined in Table 3 below, from Pope (2000).

Table 3

Potential Additional Symptoms of Postpartum Depression

Possible Additional Indicators of PPD (Pope, 2000)
Fear for the infant (and sometimes fear of the infant)
Extreme and unreasonable disappointment concerning the labour, delivery, breastfeeding, or other aspect of motherhood
Feeling extremely angry (especially directed at partner)
Decreased desire for contact with partner
Anxiety or panicky feelings
Fear of harming the infant
Fear of being alone with or going out with the infant
Fear of harm or death of partner
Fear of being rejected and unwanted by partner
Distressing thoughts of leaving or running away

Prevalence of postpartum depression.

There is some debate in the psychological literature as to whether the perinatal period represents a time of increased vulnerability to depression in women (O'Hara & McCabe, 2013). For example, some research has suggested that the first onset of depression in women tends to peak during the childbearing years (Weissman & Olfson, 1995). In one study, Davé, Peterson, Sherr and Nazareth (2010) linked childbirth to depression diagnosis and antidepressant prescriptions (provided by general practitioners) in the medical records of a large sample of couples over a 12-year period. They found that the incidence of depression and antidepressant prescriptions in the first-year postpartum was the highest at 13.9%, although this fell to 6% in the second-year, and remained steady until the children had reached the age of 12-years. Similarly, Munk-Olsen, Laursen, Pedersen, Mors, and Mortensen (2006) found that mothers had a higher risk of hospital admission for a mental disorder in the first 3-months postpartum. Thus, PPD prevalence appears to peak in the first-year postpartum, and declines thereafter.

In an early and well-regarded meta-analysis of PPD prevalence rates, O'Hara and Swain (1996) examined 59 studies with a total of 12, 810 women and reported an overall prevalence rate of 13%. However, a later systematic review examining research that used interview-based screening reported a higher prevalence rate of 19.2%, for minor and major depression, in the first 3-months postpartum (Gavin, Gaynes, Lohr, Meltzer-Brody, Gartlehner, & Swinson, 2005). In a recent Australian study, Woolhouse, Gartland, Perlen, Donath, and Brown (2014) found that 16.1% of women reported depressive symptoms during the first 12-months postpartum. Currently, the prevalence estimates for PPD vary widely in the literature, with estimates ranging from 3 to more than 25% of new mothers in the first 12-months postpartum (Dennis, Janssen, & Singer,

2004). The reasons for the wide fluctuation in PPD rates likely include differences in the screening instruments and cut-off scores used in the studies, the period of time under consideration, population-level characteristics, and the statistical methods employed (Gaillard, Le Strat, Mandelbrot, Keïta, & Dubertret, 2014; O'Hara & McCabe, 2013; Le Strat, Dubertret, & Le Foll, 2011). Furthermore, many women are observed to experience *sub-clinical* or at least moderate to mild depressed mood. Thus, it is estimated that an additional 15% of women may experience clinically significant depression symptomatology in the postpartum period but receive no PPD diagnosis (Bernazzani, Saucier, David, & Borgeat, 1997). Nonetheless, despite the intense focus on PPD and PPD screening in the clinical setting, several studies have suggested that approximately 40-50% of all cases of PPD will go undetected in women (Gale & Harlow, 2003).

Trajectory of postpartum depression.

Nearly one-half (40-50%) of all new PPD cases have an onset within the first 3-months after childbirth (Pope, 2000). In some women, the 'baby blues' simply continue and become more severe, although other women experience a period of initial wellbeing that is followed by a gradual onset of depression (Robertson et al., 2004). In regards to duration, the available research suggests that approximately 25-60% of PPD cases remit within the first 3-6 months postpartum, and a further 15-25% remit within the first 12-months (Pope, 2000). Similarly, Smith and Howard (2008) found that maternal depression typically declined from 6 to 24 months postpartum. Nonetheless, McMahon, Trapolini and Barnett (2008) found that 56% of the women who were diagnosed with depression at 4-months postpartum went on to report depression between 1 to 4 years postpartum. Furthermore, there is reported to be a 30-50% risk of relapse of PPD in future pregnancies (Weissman & Olfson, 1995), and this risk is especially high in

women who experience depression for the first time during the transition to parenthood (Cooper & Murray, 1995).

Screening of postpartum depression.

Many depression-rating scales have been developed and validated for use in non-postpartum populations. However, the validity of the scales has been questioned in terms of their utility in the postpartum period, mainly due to the inclusion of somatic items (e.g. weight loss, lack of sleep) which are viewed as normal sequalae of postpartum adjustment, rather than being due to depression (Milgrom, Martin, & Negri, 1999); and this may artificially inflate the estimates of PPD risk. As a result, the *Edinburgh Postnatal Depression Scale* (EPDS) was developed as a PPD screening tool that excluded somatic symptoms (Cox, Holden, & Sagovsky, 1987) to assist clinicians with the detection of depressed mood in the postpartum period. Using this measure, routine screening can detect many depressed women who might otherwise be missed by routine care (Fergerson, Jamieson, & Lindsay. 2002). Screening tools are also widely used in research settings to assess the presence and severity of perinatal depressive symptomatology. The Edinburgh Postnatal Depression Scale (EPDS) (Cox et al., 1987) is a 10-item self-report instrument that is easy to administer and score in clinical practice and research. It is considered to have strong psychometric properties including a specificity of 78% and sensitivity of 86%, and has been validated for use in perinatal populations in many countries, including Australia (Boyce, Stubbs. & Todd, 1993; Kowalenko, Barnett, Fowler, & Matthey, 2000).

Nonetheless, there is a lack of clarity as to the best EPDS cut-off score to be used in in clinical practice and research, which impacts on the detection and prevalence estimates of PPD. Some clinicians and researchers have suggested using a cut-off score >=9 to detect women who are likely to be depressed postnatally (Dennis, 2004).

However, other researchers have strongly advocated for the use of scores >12 to indicate PPD (Pope, 2000).

Risk factors for postpartum depression.

As highlighted in the National Institute for Health and Care Excellence, Antenatal and Postnatal Mental Health Guidelines (NICE, 2015), most mental health problems, including depression, are not unique to the perinatal period, and the aetiological factors will be similar to the aetiology of mental health problems at other times in women's lives. Many cross-sectional and prospective longitudinal studies have evaluated the risk factors for PPD, and several meta-analyses of the risk factors have been conducted (Beck, 2001; O'Hara & Swain, 1996; Robertson et al., 2004). No single risk factor has received unambiguous support as a predictor of PPD, although several risk factors have received greater support than others. Possibly the best established risk factors for PPD are a past history of depression and experiencing depression during pregnancy (Beck, 2001; Pope, 2000; Robertson et al., 2004). In a recent Australian study, Patton et al. (2015) found that perinatal depressive symptoms are mostly preceded by mental health problems that begin before pregnancy, and usually in adolescence or young adulthood. They found that 34% of women with a history of mental health problems experienced symptoms of perinatal depression, compared with only 8% of those with no prior history. Additionally, PPD tends to be more severe and longer lasting in the women who have a prior history of depression (Nonacs & Cohen, 1998).

Other than these factors, research examining the vulnerability factors for PPD is generally divided into confirmed, probable, and possible risk factors (Pope, 2000). Other *confirmed* risk factors for PPD include a poor marital relationship, lack of social support, and the experience of recent stressful life-events (SLE) (Beck, 2001; Matthey

et al., 2004; Pope, 2000; Robertson et al., 2004). *Probable* risk factors include a family history of affective disorders, maternal personality and high levels of neuroticism, a negative cognitive style, obstetric complications (e.g. caesarean delivery), and measures of infant health, behaviour and temperament. However, the studies evaluating these factors have shown only weak to moderate correlations with PPD, and there may be methodological issues with the studies (Pope, 2000). Finally, the research on *possible* risk factors includes factors such as maternal age and parity, cessation of breastfeeding, and childhood abuse, although the studies have tended to yield mixed results (McMahon et al., 2011; Reck et al., 2008; Wilkinson & Scherl, 2006; Ystrom, 2012).

Consequences of postpartum depression.

Like the major depression that can occur at other times in a women's life, PPD can lead to substantial personal suffering and diminished functioning in many spheres of her life (O'Hara & McCabe, 2013). Thus, the consequences of depression in the postpartum can be far-reaching and may exert long-term effects on the woman, her relationships, the infant, and her social network. For example, in the new mother, there is an increased risk of experiencing depression in future pregnancies (Weissman & Olfson, 1995), which may increase the risk of inadequate self-care and obstetric complications (Gotlib, Whiffen, Wallace, & Mount, 1991). In addition, women with PPD have been shown to experience significantly greater impairment in daily functioning and reduced wellbeing in terms of their mental health and physical and social functioning (Boyce, Johnstone, Hickey, Morris-Yates, Harris, & Strachan, 2000).

Furthermore, PPD may impact on the woman's marital relationship and her partner. Roberts, Bushnell, Collings, and Purdie (2006) found that the men who had a partner with PPD were themselves at an increased risk of a depressive disorder, non-specific psychological issue, and/or problem fatigue, or they were more likely to seek a

marital separation or divorce (Carro, Grant, & Gotlib, 1993). Several recent studies have focused on new fathers and their psychological health over the transition to parenthood (Cockshaw, Muscat, Obst, & Thorpe, 2014; Leach, Mackinnon, Poyser, Fairweather-Schmidt, 2015), although such an evaluation is beyond the scope of this series of studies.

In addition to the parents, recent research has suggested that maternal depression can exert an adverse effect on the infant and the mother-infant relationship, and the effects may persist into childhood and adolescence. For example, women with PPD show a dampened coordination with the infant's gaze and touch (Beebe et al. 2008), and their interactions with the child may be characterised by a higher degree of hostility and unresponsiveness (Dietz, Jennings, Kelley, & Marshal, 2009; Flykt, Kanninen, Sinkkonen, & Punamäki, 2010). Furthermore, Vliegen, Luyten and Biringen (2009) found that postpartum depressed mothers showed significantly impaired emotional availability, in particular, a difficulty in engaging in play interactions with their infants, as observed by clinicians and on self-report measures.

Finally, maternal depression is thought to be associated with behavioural, cognitive, and health-related consequences in the developing child (O'Hara & McCabe, 2013). Brennan, Hammen, Andersen, Bor, Najam, & Williams (2000) examined the impact of maternal depression on child behavioural problems, and found that the severity and chronicity of maternal depressive symptoms predicted child behavioural problems at age 5-years. In addition, several reviews have shown that PPD predicts poorer language and IQ development in the children, and that this effect persists into childhood and adolescence (Brand & Brennan, 2009; Grace, Evindar, & Stewart, 2003; Sohr-Preston & Scaramella, 2006). Furthermore, PPD may be associated with adverse infant and child physical health outcomes (Ban, Gibson, West, & Tata, 2010), including

poor child growth (Ertel, Koenen, Rich-Edwards, & Gillman, 2010; Gress-Smith, Luecken, Lemery-Chalfant, & Howe, 2012). Taken together, the results suggest that maternal PPD can exert a significant impact on several facets of family and infant wellbeing. Thus, further research is required to further delineate the experiences that may contribute to mental health problems in new mothers.

Treatment of postpartum depression.

Antidepressant medication remains the most common treatment for PPD, despite the fact many women have a preference for psychotherapy (Pearlstein et al., 2006). The main advantage of antidepressant medication in the primary care setting is that the primary care physician can manage it, it is relatively safe (even for breastfeeding women), and there may be few available psychotherapy referral sources (Meltzer-Brody, 2011). Open antidepressant trials have reported some success using a variety of antidepressants to reduce depression symptoms over 2-3 months of treatment (Pearlstein et al., 2006). However, the controlled trials have tended to yield more equivocal results (O'Hara & McCabe, 2013).

Psychological interventions are the other primary treatment for PPD, and are considered an attractive option for many women, particularly those with mild to moderate symptoms, as it allows them to avoid the effects of pharmacotherapy on themselves and breastfeeding infants (DelRosario, Chang, & Lee, 2013). The four main psychological approaches that have been used to treat PPD are general counselling, interpersonal psychotherapy, cognitive- behavioural-therapy (CBT), and brief psychodynamic psychotherapy (O'Hara & McCabe, 2013).

Two major meta-analyses have looked at the effectiveness of psychological treatments on PPD. Dennis and Hodnett (2007) examined 10 studies comparing psychological or psychosocial interventions to treatment-as-usual controls. They found

the interventions achieved a 30% greater reduction in depression symptoms, than treatment-as-usual. However, the authors noted that most of the studies were limited by sample size and low methodological rigor. In a second meta-analysis, Cuijpers, Brannmark, and van Straten (2008) compared 17 psychological treatments with waitlist controls, and found that psychological treatments led to moderate improvements. Furthermore, the authors found only small differences in effectiveness between different psychotherapy modalities, suggesting that common non-specific factors may mediate improvement for all psychological interventions for PPD. In a more recent meta-analysis including women with antenatal as well as postnatal depression, Sockol, Epperson and Barber (2011), found intervention groups demonstrated a significantly greater reduction in symptoms than control groups. Furthermore, the authors found that individual treatment was superior to group-based treatment, and interpersonal psychotherapy appeared to be more effective than cognitive-behavioural based interventions. At present, psychological treatment, particularly interpersonal psychotherapy is better validated than antidepressant medication for perinatal depression, and should be considered as a first-line treatment option, especially for pregnant and breastfeeding women (Stuart & Koleva, 2014).

However, few studies have evaluated the potential for the prevention of PPD. Boath, Bradley and Henshaw (2005) conducted a systematic review of the available PPD prevention RCTs and found that seven supportive and psychological interventions, one unpublished antidepressant trial, and one trial of calcium carbonate all showed short-term prevention success. However, none of the studies demonstrated any success beyond 4-months postpartum. More recently, Fisher, Wynter, and Rowe (2010) found that a brief psycho-educational program had some success in reducing the onset of common postpartum mental health problems in partnered first-time mothers, including

PPD. This intervention focused on the parent's learning needs as they pertain to infant behavioural management, and also some adjustment tasks related to the intimate partner relationship.

Conclusion

Perinatal mood disorders including prenatal and postnatal depression are significant mental health problems that often go undetected and untreated in women (Gale & Harlow, 2003). The psychological literature suggests that the presentation of PPD is similar to the depression observed at other times in the woman's life (Boath & Henshaw, 2001). However, maternal depression is associated with frequent recurrent episodes, high levels of distress in partners and other relationships, and often deleterious effects on infant and child development (Brand & Brennan, 2009; Roberts et al., 2006; Weissman & Olfson, 1995). Thus, screening and early detection of the disorders is vital. Due to the high prevalence of PPD, the disorder continues to receive substantial clinical and research attention. However, symptoms of maternal anxiety and stress have recently been described as distinct states from depression that are common and equally debilitating (Miller et al., 2006; Rallis et al., 2014). This view is gradually leading to a broader view of the psychological distress that is experienced by women in the postpartum period. The following chapter will therefore outline the existing research on perinatal anxiety, and the limited existing literature on perinatal stress.

Chapter 2

Anxiety and Stress in the Perinatal Period

Due to the dominance of PPD in the perinatal literature, some researchers have questioned whether what is currently conceptualised as PPD may actually include other symptoms (e.g. anxiety), but that depressive behaviour is simply the most easily recognised (Marrs, Durette, Ferraro, & Cross, 2009). Thus, there is a growing need to consider anxiety symptoms and disorders in the perinatal period, as a separate entity to depression. However, our knowledge of anxiety during this period is limited and sometimes contradictory (Ross & McClean, 2006; Wardrop & Popadiuk, 2013). The following section outlines some of the research on anxiety in women in the transition the parenthood.

Perinatal Anxiety

Anxiety prevalence.

The perinatal period is considered to be a time of significant risk in terms of anxiety morbidity (Brockington, Macdonald, & Wainscott, 2006). Milgrom et al. (1999) were one of the first groups to point to the importance of distinguishing between anxiety and depression in order to provide appropriate treatment that targets the specific aetiology of anxiety. Similarly, Matthey, Barnett, Howie, and Kavanagh (2003) have identified a "hierarchical diagnostic custom" that requires the depression symptoms to take precedence, even when the anxiety symptoms are a prominent feature. This can lead to some difficulty in establishing the prevalence of anxiety, and it can lead to cases of anxiety being undetected and untreated.

At present, the research evaluating the prevalence of anxiety in the perinatal period has either focused on anxiety disorders such as Generalized Anxiety Disorder, Panic Disorder, and Posttraumatic Stress Disorder (Wenzel, Haugen, Jackson, &

Brendle, 2005; Bandelow, Sojka, Broocks, Hajak, Bleich, & Rüther, 2006; Ayers, 2004), but less often on symptoms of anxiety (Britton, 2005; 2008). In regards to anxiety disorders, Matthey et al. (2003) found that 16.2% of new mothers were diagnosed with a pure anxiety disorder such as phobia or panic disorder at 6-weeks postpartum. They also found that 82% of the phobias had the first onset in the postpartum period, potentially lending credence to the idea that anxiety disorders are more common at this time than at other times in a woman's life. Further, in a recent review, Ross and McLean (2006) showed that the prevalence rate for OCD ranged from 2.7% - 3.9%, postpartum panic disorder ranged from 1.3 - 2%, and GAD ranged from 4.4 - 8.2% of new mothers. They also found that relative to point prevalence rates at other times in the lifespan, the postpartum period represented a time of heightened vulnerability for women.

Similarly, the prevalence rate of anxiety symptoms during pregnancy is estimated to be 8 - 21% of women, depending on the time during the pregnancy and the screening tool utilised (George et al., 2013; Henderson & Redshaw, 2013; Yelland, Sutherland & Brown, 2010). Thus, some researchers have suggested that anxiety symptoms are as or more common than depression in the postpartum period. For example, Reck et al. (2008) evaluated the prevalence rates for anxiety disorders and symptoms, and estimated that about one-third (32.5%) of women experienced significant anxiety symptoms in the first 6-weeks after birth, whereas only 6.1% experienced PPD, lending support to the idea that anxiety symptoms may be more common than postpartum depressed mood.

However, one of the issues that potentially limits the reliability of the anxiety prevalence estimates is the lack of an anxiety-specific instrument that is routinely used in the perinatal period (Rowe, Fisher, & Loh, 2008). Some researchers have suggested

that the EPDS (Cox et al., 1987) is able to assess anxiety (Ross et al., 2003), although others suggest it is not sensitive enough to detect anxiety that is not comorbid with depression (Matthey, Henshaw, Elliot, & p, 2006). In addition, Matthey (2008) found that although there are anxiety-specific questions in the EPDS, when only the total score was used, 11 of 18 women with anxiety disorders did not screen positive for an anxiety disorder, using this measure. However, more recent research suggests that a 3-item anxiety scale imbedded within the EPDS can reliably distinguish between depression and anxiety, although anxiety assessment is still not commonplace in the primary care setting in the perinatal period (Matthey, Fisher, & Rowe, 2013)

Trajectory of anxiety symptoms.

The research evaluating the course of anxiety in the transition to parenthood has yielded conflicting results. For example, Grant, McMahon and Austin (2008) showed that there was considerable stability in anxiety from pregnancy to the postpartum, as assessed by diagnostic interview and maternal self-reports, thus, prenatal anxiety was found to be a significant predictor of postnatal anxiety. In contrast, other research has shown that the symptoms of anxiety tend to fluctuate over the perinatal period. For example, Teixeira, et al. (2009) found that anxiety symptoms follow a U-shaped pattern during pregnancy, being higher during the first-trimester, decreasing during the second-trimester, and then increasing again in the third-trimester.

In the postpartum period, Britton (2008) showed that anxiety symptoms affected one-quarter (24.3%) of women immediately prior to hospital discharge, but this increased to 30.7% by 1-month postpartum. However, conversely, Paul, Downs, Schaefer, Beiler, and Weisman (2013) showed that anxiety scores were highest prior to leaving hospital and then declined quickly, with the 2-week, 2-month, and 6-month

assessments indicating the relative stability of significant anxiety in 5.8 - 7.2% of new mothers over time.

Furthermore, the course of anxiety symptoms may be different for first-time mothers than for multiparous women. For example, Dipietro et al. (2008) found that anxiety in multiparous women tended to decrease from pregnancy through to the first 24- months postpartum, whereas the first-time mothers showed the opposite trajectory, with anxiety symptoms tending to get worse over time. Similarly, Don, Chong, Biehle, Gordon, and Mickelson (2014) interviewed 104 couples from the third-trimester of pregnancy to 9-months postpartum, and they found that about 90% of the new parents experienced little anxiety during pregnancy, and this tended to decrease after the birth of the child. However, in contrast, the remaining 10% reported moderate anxiety during pregnancy, which remained stable after the birth, and then tended to slowly decline. The authors showed that the women with worse *pre*natal depression, low expected parenting efficacy, and less prenatal relationship satisfaction were more likely to be in the moderate and stable anxiety group.

Risk factors for perinatal anxiety.

In comparison to PPD, the research evaluating risk factors for perinatal anxiety is in its infancy. Several studies have examined risk factors for anxiety during pregnancy, finding that it is associated with younger age, ethnic minority status, single parenthood, living in a disadvantaged area, having an unwanted pregnancy, and/or experiencing long-term health problems, although of these factors, only long-term maternal health problems were found to be related to postnatal anxiety (Henderson & Redshaw, 2013)

In contrast, Vythilingum (2008) focused on interpersonal predictors of antenatal anxiety and determined that anxiety risk factors included a poor marital relationship and

less social support. Finally, a comprehensive study evaluated the course of maternal anxiety in the first-month postpartum, and antecedents of high state-anxiety at 1-month postpartum, using information obtained prior to hospital discharge following childbirth. Increased anxiety at 1-month was shown to be correlated with higher pre-discharge state- and trait-anxiety levels, a history of psychiatric problems (including depressed mood), a higher number of medical and negative social life-events, a lack of pregnancy planning and prenatal class attendance, higher perinatal stress, and a longer hospital stay, although it was inversely correlated with education and household income. Using multivariate modelling, high trait-anxiety, education, > two-year history of depression, and high perinatal stress accounted for 50% of the variance in state-anxiety at 1-month postpartum (Britton, 2008), similar to the results of Wenzel et al. (2005) who identified that lower socioeconomic status (SES) and personal and family psychiatric history were predictors of high anxiety using the Beck Anxiety Inventory.

Consequences of perinatal anxiety.

The experience of anxiety can be challenging at any time. However, managing one's anxieties at the same time as adapting to the new demands of motherhood may potentially be more distressing. The consequences of maternal anxiety are less established than for PPD, although significant potential effects of anxiety on new mothers, their infant, and their relationships has been identified. For example, antenatal anxiety has been shown to increase a woman's risk of PPD, even after controlling for antenatal depression (Beck; 2001; Matthey et al., 2003; Milgrom et al., 2008). More recently, Alipour, Lamyian, and Hajizadeh (2012) found that antenatal state- and trait-anxiety at 28 and 38-weeks gestation predicted an increased risk of PPD in the first 3-months postpartum, even after they excluded all the women with a personal or family history of depressive or other illnesses which might increase their vulnerability. In

addition, Hart and McMahon (2006) found that higher postpartum anxiety was associated with more negative attitudes towards the self and motherhood, and these effects were greater in relation to maternal anxiety than depression.

Postpartum anxiety has also been found to exert a deleterious effect on marital relationships (Matthey, Barnett, Ungerer, & Waters, 2000). For example, Wenzel et al. (2005) found that maternal anxiety was associated with relationship distress above and beyond the impact of depression, and even sub-threshold anxiety symptoms may be detrimental to the relationship between the mother and infant (Zelkowitz & Papageorgiou, 2005). Finally, antenatal anxiety has been shown to be related to adverse neonatal outcomes including prematurity, low birth weight (Schetter & Tanner, 2012; Hedegaard, Henriksen, Sabroe, & Secher 1993; Field et al., 2010), and greater epidural use during labour and caesarean delivery (Alder, Fink, Bitzer, Hösli, & Holzgreve, 2007). In addition, Glasheen, Richardson, Kim, Larkby, Swartz, and Day (2013) fount that exposure to medium to high intensity maternal anxiety during pregnancy and the postpartum was related to an increased risk of conduct disorder in the male children. Thus, in summary, postpartum anxiety is associated with a greater risk of PPD in women, and a potential adverse impact on marital relationship quality and the child.

Comorbidity of perinatal anxiety and depression.

Comorbidity between anxiety and depression symptoms is common, even during the perinatal period (Field et al., 2003; Heron, O'Connor, Evans, Golding, & Glover, 2004; Matthey et al., 2003). In one study, nearly 50% of the clinically depressed pregnant and postpartum women had clinically significant comorbid anxiety (Ross et al., 2003). Similarly, Andersson, Sundström-Poromaa, Wulff, Aström, & Bixo (2006) showed that more than 20% of the women with a psychiatric diagnosis during pregnancy had presented with comorbid anxiety and depression. This comorbidity

between prenatal anxiety and depression has been shown to be a risk factor for later PPD (Heron et al., 2004).

In regards to the temporal relationship between the states, Skouteris, Wertheim, Rallis, Milgrom, and Paxton (2009) showed that anxiety was relatively stable over the pregnancy, more so than depressive symptoms. In addition, depression during the second-trimester of pregnancy predicted high anxiety symptoms in late pregnancy, whereas late pregnancy anxiety predicted depression in the first 3-months postpartum, after controlling for social support, prior depression, and sleep quality. Such results suggest that anxiety and depression are difficult to separate temporally or, alternately, that different temporal patterns exist in different individuals.

However, despite the high comorbidity with depression, postpartum anxiety remains a distinct clinical problem. In an early study, Ballard, Davis, Handy and Mohan (1993) found that more than 6% of mothers met criteria for GAD at 6-weeks postpartum, and the mothers who experienced anxiety showed distinct symptom profiles to those of depressed mothers. Similarly, in a study comparing EPDS scores with clinical interview data, more than 50% of the women shown by the EPDS to be likely suffering from major depression were in fact suffering from disabling anxiety, as indicated by the clinical interview. Even the women who suffered from an adjustment disorder (e.g. mild depression) were misdiagnosed as having major depression (Rowe et al., 2008). Thus, with the intense research and clinical focus on depression, Miller et al. (2006) have identified that there is a substantial risk that when anxiety and depression co-exist, the treatment will focus on depression to the exclusion of the anxiety.

Conclusion

Taken together, the above research indicates that anxiety across the perinatal period is common, distinct from depression, and may exert deleterious effects on

women, their relationships, and infant (Matthey et al., 2000; Rowe et al., 2008; Zelkowitz & Papageorgiou, 2005). However, relatively little attention has focused on anxiety during the perinatal period and little is known about its aetiology (Wardrop & Popadiuk, 2013). In addition, anxiety screening does not routinely take place in the primary care setting (Matthey et al., 2013), thus, potentially leading to the distress in women going largely unrecognised, unsupported, and untreated. Furthermore, as detailed below, the research examining maternal stress as a distinct affective state is scarce. Thus, the next section outlines the current research on maternal stress and it argues for the consideration of a broader definition of maternal psychological distress in the transition to parenthood.

Stress Across The Perinatal Period

Lovibond and Lovibond (1995a) describe stress as a negative emotional state that is distinct from anxiety and depression and which involves chronic high arousal and impaired functioning. The transition to motherhood is often considered to be stressful (Britton, 2008), but to date, the literature has mostly focused on the pregnancy and neonatal outcomes of high stress such as the timing of the delivery, infant size at birth, and longer-term effects on child development (DiPietro, 2012). In addition, other studies have focused on assessing perceived stress around parenting in new mothers (Kendrick, Oberlander, Norris, Tomfohr, Zhang, & Grunau, 2010), infant-related stressors (Hopkins, Campbell & Marcus, 1987), and the link between stress and depressive symptomatology (Terry, Mayocchi, & Hynes, 1996). However, very few studies have examined stress as an affective outcome in women during the perinatal period or the factors that increase a woman's vulnerability to experience psychological stress during the perinatal period.

Nonetheless, Miller et al. (2006) has examined the prevalence of postnatal distress using the EPDS (Cox et al., 1987) and the Depression, Anxiety, Stress Scales (DASS-21) (Lovibond & Lovibond, 1995a). Using a convenience sample of 325 first-time mothers of 6- week to 6-month babies, they showed that 29% of the women reported at least one mild to extremely severe distress category on the DASS-21, and 10% reported stress and anxiety symptoms without depression. In addition, the EPDS failed to identify 6% of the women who were anxious or stressed and 4% of the women who scored in the mild to moderate range for depression, using the DASS. This finding is especially noteworthy due to the author's use of a low (and therefore less conservative) EPDS cut-off score (>9). Thus, the authors concluded that stress and anxiety was experienced by a significant proportion of new mothers whose stress and distress was not necessarily detected using routine screening methods.

More recently, Rallis (2008, cited in Rallis et al., 2014) have assessed depression, anxiety, and stress in the first-year postpartum. Nearly one-quarter (22%) of the women were stressed, anxious, and depressed, and 10% were stressed and anxious. In addition, this distress peaked at 6-8 weeks, 22-28 weeks, and 42-44 weeks postpartum, although the states were labile (i.e. increasing and decreasing) over time. The authors concluded that there is a need to monitor women for symptoms of anxiety and stress in the first-year postpartum in order to best capture their range of experiences at this time. Thus, Miller et al. (2006) and Rallis et al. (2008) have both argued that the DASS-21 was a useful tool for screening a broader range of maternal distress symptoms, as it captures the symptoms of depression, anxiety, and stress in a brief measure.

Rallis et al. (2014) recently conducted a review of the perinatal literature, between 1998 and 2013, to identify the studies, which focused on the experience of

maternal stress as a distinct affective state. The above two studies were the only studies they could locate that used a broader conceptualisation of perinatal distress, assessing the experience of stress as well as depression and anxiety. Therefore, they concluded that future studies should seek to investigate maternal stress as a distinct affective state in the perinatal period so as to permit a more comprehensive examination of women's experiences during the transition to motherhood.

Finally, Betts Wiliams, Najman, and Alati (2014) examined the relationship between prenatal depression, anxiety and stress symptoms and infant outcomes. One group of mothers were shown to exhibited high levels of depression, anxiety, and stress symptoms during pregnancy, and their children showed greater externalising and internalising behaviour and depressive symptoms. In contrast, the same relationship was not demonstrated between postnatal psychological distress and infant outcomes, suggesting a pivotal role for *pre*natal maternal distress. However, this study did not focus on maternal stress, although this and similar findings on the impact of perinatal stress on infant developmental outcomes (Huizink, de Medina, Mulder, Visser, & Buitelaar, 2003) suggest that maternal stress may also impact adversely on child health and behaviour.

Conclusion

Research examining anxiety and stress in women in the perinatal period suggest that the states are often experienced in conjunction with (or independent of) depression, and they are sufficiently common to warrant further research and clinical attention (Miller et al., 2006; Rallis et al., 2014). Given the potential adverse effects of untreated psychological distress in the perinatal period, it is important to appreciate the breadth of negative emotional states that may affect women at this time. In addition, the risk factors for PPD are largely established (i.e. Beck, 2001; O'Hara & Swain, 1996; Pope,

2000; Robertson et al., 2004), although few prior studies have sought to establish the risk factors for maternal stress and anxiety to assist in improving the identification of maternal distress when it is present.

Currently, many of the confirmed risk factors for PPD are interpersonal and social in nature, for example, marital relationship quality and social support (O'Hara & Swain, 1996; Pope, 2000). In addition, a small literature has explored the variables in relation to maternal anxiety, although very few studies have explored them in relation to maternal stress. In the next chapter, *attachment theory* will be considered as a key theory that is reported to inform about the manner in which romantic partner difficulties and difficulties in other relationships may increase the risk of maternal distress in the perinatal period. In addition, the theory is posited to be especially relevant to the investigation of stressful transitional times, such as the perinatal period, that are believed to activate the attachment system and an individual's working model of attachment (Mikulincer & Florian, 1998). Thus, in the following chapter, the contribution of attachment and marital relationship quality to psychological adjustment and distress in expectant and new mothers will be examined.

Chapter 3

Attachment and Marital Relationship Quality

The transition to parenthood can be a time when a new mother's relationships are especially important, as they seek to manage the demands of infant care and renegotiate the relationship with their spouse (Feeney et al., 2001). *Attachment theory* proposes that in times of high stress individuals are inclined to seek out support from others (Bowlby, 1988). Thus, attachment theory is considered to be a relevant theoretical framework to assist in understanding a person's close relationships during transitional periods, which are typically associated with high stress (Rholes et al., 2001). Therefore, attachment theory may be potentially useful in understanding why a woman's relationships with her partner, family, and social support network can either protect against or increase her vulnerability to experience psychological distress in the perinatal period. In addition, the quality of the marital relationship including satisfaction and disagreement level of the couple is an established risk factor for PPD (Beck, 2001; O'Hara & Swain, 1996; Pope, 2000), and to a limited extent perinatal anxiety (Figueiredo et al., 2008; Vythilingum, 2008).

The following section provides detailed information on attachment theory, adult attachment, and the current research literature linking attachment to postpartum psychological distress, in particular PPD. It will then outline the research reporting on the association between marital quality and perinatal psychological distress, and the likely interplay between marital relationship quality and adult attachment.

Attachment Theory

Attachment theory (Bowlby, 1969; 1980) is a cognitive-behavioural theory of interpersonal functioning that concerns "the propensity of human beings to make strong affectional bonds to particular others" (Bowlby, 1977, p.201). It was originally

developed to describe the infant-caregiver bond and infant attachment behaviour, which is regulated by a distinct, goal-oriented evolutionary-behavioural system that has the primary goal of proximity-maintenance by the nurturing caregiver with the biological aim of promoting infant security and survival (Bowlby, 1982). Bowlby (1973) proposed that the quality of the infant-caregiver attachment relationship was predominantly determined by the caregiver's emotional availability and responsiveness to the child's needs. The resulting attachment bond refers to the degree of felt security experienced by the child and their belief that the world is safe (Bretherton, 1985; Sroufe & Waters, 1977).

A *secure attachment* bond is considered to exist when the caregiver is responsive and available in times of need (Mikulincer & Shaver, 2007), providing the child with felt security and confidence in a secure-base from which they can explore the world (Ainsworth, 1989). In contrast, an *insecure attachment* bond forms when the caregiver is inconsistent or non-existent in their responsiveness and attention (Mikulincer & Shaver, 2007). In this situation, infants will adjust their attachment-seeking strategy to elicit a maximal response from the caregiver, through attention seeking, protest behaviour, or they will give up trying altogether. Bowlby (1982) suggests that over time these variations in attachment bonds and behaviour can alter the operation of the attachment system and lead to individual differences in attachment patterns and interpersonal functioning.

Research examining the individual differences in attachment system functioning tends to revolve around the concept of *attachment style*. This important addition to attachment theory was made by Ainsworth, Blehar, Waters and Wall (1978) who used a procedure known as the 'Strange Situation' to explore the differences in infant-caregiver attachment relationships. Using this experimental paradigm, they observed

the infant's pattern of responses to the separations and reunions with their mother, and from the observations they identified three distinct attachment styles: secure, anxious/ambivalent, and anxious/avoidant. Ainsworth and colleagues found that during the strange situation procedure, the secure children demonstrated exploratory behaviour and used their mother as a secure-base, whereas the anxious/ambivalent children were inconsistent in their attempts to gain the mothers attention, and avoidant/ambivalent children actively avoided their mother. These attachment styles are believed to reflect the underlying organisation of the attachment system, which gives rise to *internal working models* that permit the individual to generate relational expectations and a context in which to interpret the relationships (Bowlby, 1973). The consolidation of these accessible working models is believed to be the psychological process that accounts for continuity of one's attachment style across the lifespan (Waters, Merrick, Treboux, Crowell, & Albersheim, 2000).

Adult Attachment

Despite the initial research focus on children, recent attention has focused on the perpetuation of attachment styles from childhood into adulthood (Hazan, Campa, & Gur-Yaish, 2006), and the role attachment can play in the development and maintenance of intimate relationships (Feeney, 2002). Thus, although Bowlby (1979) hypothesised that the functions and dynamics of the behavioural system are similar across the lifespan, it wasn't until a decade later that Hazan and Shaver (1987) expanded the model to examine adult romantic relationships. They showed that early parenting and attachment security differences can produce relatively long-lasting differences in relationship styles such that the three major attachment styles described by Ainsworth et al. (1978) were found to also exist in adult relationships (Hazan & Shaver, 1987; Shaver & Hazan, 1988). Thus, there are some similarities between

infant-caregiver attachment and adult attachment, but there are some differences such as sexual attraction and the greater degree of mutual support and reciprocity in romantic relationships (Feeney & Noller, 2004).

The early research on adult attachment (Hazan & Shaver, 1987) tended to assess attachment styles using a categorical measure based on the infant typology developed by Ainsworth et al. (1978). However, recent studies have shown that two orthogonal dimensions underlie this measure, and so these dimensions have become the focus of contemporary research on adult attachment (Brennan, Clark, & Shaver, 1998). The first attachment dimension, *avoidance*, assesses the adult's desire to limit intimacy and maintain psychological and emotional independence from others (Rholes, Simpson, Campbell, & Grich, 2001). It is thought to index the positivity of an individual's image of others and it is therefore referred to as the 'model of other' dimension to reflect a person's expectations about caregiver responsiveness during times of distress (Williams & Riskind, 2004).

In contrast, the second dimension, *anxiety* or *ambivalence*, assesses a person's concern that their relationship partner may not be available or supportive when needed. It is therefore characterised by a fear of abandonment and the desire for extreme closeness (Feeney, 1999), and it is said to reflect the positivity of an individual's self-image and is referred to as the 'model of self' dimension, to reflect a person's beliefs about their lovability and acceptability to the attachment figure (Williams & Riskind, 2004). Thus, in intimate relationships, an individual who is high on ambivalence tends to idealise their partner when things are going well (Hazan & Shaver, 1987), but view the relationship more negatively when attempting to resolve conflict in the relationship (Simpson, Rholes, & Phillips, 1996). In contrast, a person who scores low on both dimensions is considered to be *securely attached.* That is, they tend to report comfort

with their dependency and intimacy and they do not worry about being abandoned or unsupported (Rholes et al., 2001).

The primary advantage of utilising the above dimensions to assess the variability in attachment style is that they appear to approximate the reality of individual differences in attachment, relative to the use of discrete categories (Strahan, 1995). In addition, previous studies have shown a moderate positive correlation between the dimensions of attachment avoidance and attachment anxiety (Fraley, Waller, & Brennan, 2000). Further, these working models of attachment are thought to be malleable during early development, however, once consolidated, they become relatively stable across the lifespan (Fraley & Waller, 1998).

Finally, attachment theory contends that *stressful situations* should elicit a person's attachment-related behaviour, which normally lies dormant in non-stressful contexts (Bowlby, 1988). That is, in the event of an 'activating' situation such as poor health, a person's secure attachment is believed to function as a buffer against the potential to experience psychological problems, thus, permitting them to rely on others for comfort and support. However, in contrast, an insecure attachment style is thought to lead to poor coping and maladjustment to the stressor (Shaver & Hazan, 1993). Thus, the adult working models of attachment are thought to be activated during stressful or transitional times, and given the recognition of the demands of pregnancy and the early postpartum period, some researchers have argued that attachment theory is uniquely suited to the study of the transition to parenthood (Alexander, Feeney, Hohaus, & Noller, 2001).

The Transition to Parenthood, Attachment, and Maternal Psychological Distress

The perinatal period is a time of substantial transition and adjustment for women and their relationships. Thus, it is a time in which working models of

attachment are likely to be activated, and as a result, either buffer or increase a woman's vulnerability to experience distress. In support of this proposition, Mikulincer and Florian (1998) examined attachment security as a predictor of psychological adjustment in primiparous women undergoing the transition to parenthood, relative to matched childless married women. They found that an insecure attachment style predicted greater psychological distress, but only in the women transitioning to parenthood, suggesting that having a baby constitutes a significant enough stressor to activate a woman's working model of attachment, which may then impact on their psychological adjustment.

Bowlby (1980) initially developed attachment theory in part to explain the origins of depression and other psychological disorders, since attachment theory is thought to provide a framework for understanding a depressed person's thoughts, beliefs, expectations and behaviour within and across their relationships (Bowlby, 1980). For example, Bowlby (1988) suggested that stressful experiences can worsen depression by triggering and enhancing negative beliefs about the self, as being unworthy of love and support, and by prompting negative perceptions about others as being unloving and unsupportive. Thus, since the 1980s, considerable research has examined the role of attachment in the development of depression across the lifespan. A consistent finding in this literature is that the individuals who are high on anxious attachment are more likely to report depression, whereas secure individuals are the least likely to experience depression, and avoidant people fall somewhere in the middle (Cooper, Shaver, & Collins, 1998).

Several studies have utilised an attachment framework to examine the transition to parenthood and postpartum distress. In an early study, Feeney, Alexander, Noller and Hohaus (2003) examined the relationship between attachment and *depression* in

transitioning and non-transitioning couples. Using the ASQ to assess attachment orientation, they found that attachment anxiety increased the risk of transitioning women to experience depression, even after controlling for a broad range of other risk factors. The results were interpreted to indicate that attachment anxiety could trigger depressive episodes in women who showed no initial signs of depression, supporting the earlier study results of Mikulincer and Florian (1998). Thus, the results suggest that the transition to parenthood is a stressful enough time that it can activate a woman's working model of attachment and thereby potentially increase their vulnerability to experience depression.

In another early study, Meredith and Noller (2003) compared depressed (N=25) and non-depressed (N=47) new mothers on a range of variables including maternal attachment, marital quality, the mother-infant relationship, and PPD. They showed that an insecure (i.e. anxious) adult attachment style was associated with high depression levels and less marital satisfaction, although there was no relationship between marital quality and depression. However, the size of the sample was small and the authors therefore recommended that the relationships be explored in further detail. In addition, similar to the abovementioned studies, this study focused only on the early postpartum period. Thus, more recently, McMahon, Barnett, Kowalenko and Tennant (2005) examined the factors underlying PPD beyond the first 12-months postpartum. Using the ASQ to measure attachment, they found that relationship anxiety, low maternal care in childhood, and marital dissatisfaction were all significantly related to depression levels at 12-months, and contrary to the above studies, they found that avoidant attachment was moderately related to PPD.

More recently, Wilkinson and Mulcahy (2010) examined attachment in depressed (N= 47) and non-depressed mothers (N = 68). They found that the clinically

depressed mothers reported more preoccupied (i.e. high anxiety, low avoidance) and fearful (i.e. high anxiety, high avoidance) attachment. In addition, irrespective of diagnosis, the attachment styles that were characterised by a negative model of self were related to lower relationship quality with the baby and spouse, less perceived social support, and higher depression levels. However, the role of dismissing (i.e. low anxiety, high avoidance) attachment was less clear. Thus, the authors concluded that in the context of childbearing, a negative model of self and others may predispose a woman to experience depression, whereas a negative model of others by itself did not appear to be depressogenic.

Finally, in a very recent review of the relationship between attachment style and PPD, Warfa, Harper, Nicolais, and Bhui (2014) showed that maternal adult attachment style and PPD likely share a common aetiology, but that an insecure adult attachment style represents an additional risk factor for PPD. Furthermore, they showed that an anxious attachment style was associated with PPD symptoms more often than avoidant attachment styles, mirroring the research outlined above (Wilkinson & Mulcahy, 2010). The authors concluded that future research investigating the relationship between adult attachment style and PPD is an emerging priority from both the research and clinical perspective.

However, no prior studies appear to have specifically examined the attachment predictors of *perinatal anxiety* and *stress* in the transition to parenthood, although a small body of research has examined attachment in relation to anxiety in non-expectant samples. Safford, Alloy, Crossfield, Morocco, and Wang (2004) examined the relationship between attachment style, cognitive style, and depression and anxiety symptoms in a college sample. They found that an insecure attachment style was associated with anxiety and depression symptoms, although the relationship between a

negative cognitive style and the states was stronger than the relationship between insecure attachment and the states. Thus, the results lend support to the idea that attachment variables can predict anxiety in addition to depression.

In addition, Williams and Riskind (2004) have examined the links between adult romantic attachment, cognitive vulnerabilities to depression and anxiety, self-reported anxious and depressive symptoms, and general and specific relationship outcomes. They proposed that an insecure adult attachment style might lead to the development of cognitive vulnerabilities, which then increase the risk of anxiety and/or depression. After controlling for the cognitive vulnerabilities, they found that attachment-anxiety was associated with anxiety and depression, whereas avoidant-attachment only predicted anxiety symptoms. This led the authors to conclude that a negative view of self (i.e. attachment-anxiety) may result in anxiety or depression, whereas a negative view of others (i.e. attachment-avoidance) will only contribute to the development of anxiety. Such a finding may provide some insight into the results of a previous study which failed to find a link between attachment-avoidance and PPD (Wilkinson & Mulcahy, 2010), since it is possible that attachment-avoidance is more strongly related to the experience of anxiety during the perinatal period.

Finally, several prior studies have examined the potential impact of maternal anxiety on the mother-child relationship. Using clinical observations of mother-infant attachment, Avant (1981) found that highly anxious mothers received low attachment scores, and the mothers high on attachment security tended to report low anxiety. However, this study was limited by a small sample size (N=30). In addition, in contrast to these findings, Edhborg, Nasreen, and Kabir (2011) showed that worse anxiety during pregnancy was positively related to their emotional bonding to the infant at 2-3 months postpartum, although the study was conducted in rural Bangladesh, so the

women may have been systematically different to the participants in the proposed research studies. Thus, to date, no prior studies have examined the impact of working models of attachment on the experience of maternal anxiety and stress during the perinatal period and so the relationships will be explored in the proposed research studies.

Marital Relationship Quality and the Postpartum Period

The arrival of a new baby and the changes in family structure and functioning can exert an enormous impact on marital relationship quality and marital satisfaction (Belsky, Lang, & Rovine, 1985; Cowan & Cowan, 2000; Levy-Shiff, 1994). For example, research has indicated that on average the new parents will experience a moderate decline in their relationship satisfaction (Mitnick et al., 2009), and issues of importance are likely to include the division of household labour, amount of time the parents spend together, how their leisure time is spent, their physical and emotional intimacy, and paid work (Kluwer, 2008 cited in Kluwer, 2010). In an early study, Belsky and Rovine (1990) found evidence of four distinct subgroups in terms of the way the couple's relationship satisfaction changed over the transition to parenthood: strongly declining, declining, stable, and increasing. Specifically, the couples that reported the highest cohesion and satisfaction with the relationship before the birth tended to cope better with the challenges related to childbearing and child rearing, and they were more likely to be in the stable and increasing subgroups (Feeney et al., 2001). In contrast, a decline in marital satisfaction is reported to occur more strongly among wives than husbands (Twenge et al., 2003), possibly due to the increased level of changes and demands on women over the perinatal period.

Similarly, aspects of the marital relationship such as quality, level of satisfaction and conflict can influence how women cope with the demands of

pregnancy and the postpartum period. In line with this, several researchers have demonstrated an association between marital relationship quality and satisfaction, and postpartum depression (Matthey et al., 2000; McMahon et al., 2005; Milgrom et al., 2008), and poor marital relationship quality is considered a confirmed risk factor for postpartum depression (Pope, 2000). Furthermore, a poor partner relationship has been associated with both continuation and severity of postpartum depression. Fisher, Feekery, and Rowe-Murray (2002) found that distress severity was consistently related to the quality of women's relationship with their partners in 109 mothers admitted to a mother-baby unit.

In addition to marital quality and satisfaction, aspects of the couple relationship such as level of disagreement and conflict have also been assessed. Cross-sectional and longitudinal studies have shown that new parents report increased amounts of disagreement and conflict relative to before childbirth (Grote & Clark, 2001; Kluwer & Johnson, 2007). Kluwer and Johnson (2007) studied 293 Dutch couples to examine the association between conflict frequency and relationship quality over the transition to parenthood. They showed that higher levels of conflict during pregnancy were related to lower levels of relationship quality across the transition. Furthermore, those with high levels of conflict and low levels of relationship quality during pregnancy were most likely to suffer psychological distress over the transition. Similarly. Johnstone, Boyce, Hickey, Morris-Yates, and Harris (2001) found that having disagreements with a partner was a significant risk factor for postpartum depression at 8 weeks.

Although the relationship between poor marital relationships and postpartum depression has been well established, it is important to consider that depression is both a cause and effect of marital distress in women (O'Mahen, Beach, & Banawan, 2001), and the relationship may be complex and bidirectional. Research has found that

postnatally depressed women are more likely than non-depressed women to report lower marital satisfaction, to view their husbands as unsupportive, and to report more frequent marital problems, which may persist even after the depression remits (Gotlib et al., 1991; O'Hara, Zekoski, Philipps, & Wright, 1990).

Partner relationships have also been linked with anxiety over the perinatal period. Figueiredo, Field, Diego, Henandez-Reif, Deeds and Ascencio (2008) found that women with low positive relationship scores in the prenatal period showed higher state anxiety than those with more positive partner relationships in the postpartum. Additionally they found that women with higher prenatal negative relationship scores demonstrated both higher depression and anxiety than women with a less negative relationship with their partners in the postpartum. This indicates that the quality of the marital relationship impacts on anxiety as well as depression over the transition to parenthood. Similarly, marital relationship quality, less partner support, and relationship adjustment after having a baby has been implicated in the development of perinatal anxiety (Gourounti, Anagnostopoulous, & Sandall, 2014; Vythilingum, 2008; Whisman, Davila, & Goodman, 2011).

Limited research has also found a connection between the partner relationship and maternal perceived stress. Thorp, Krause, Cukrowicz and Lynch (2004) examined whether there was an association between dissatisfaction with partner support and maternal stress in the postpartum period, and secondly whether that association is mediated by demand-withdraw communication between partners. They found that that women with higher levels of perceived stress reported greater dissatisfaction with support from their partner, and the demand-withdraw communication mediated this relationship. However, no studies located have examined the impact of marital relationship quality on maternal stress as a negative affective state. Similarly, few

researchers have examined the specific domains of marital quality (such as satisfaction, intimacy, conflict) and their impact on postpartum distress, particularly symptoms of stress and anxiety.

Martial Quality and Attachment

In addition to protecting against symptoms of depression over the transition to parenthood, secure attachment is also considered a resource that may buffer people from experiencing declines in marital satisfaction during periods of stress or transition (Karney & Bradbury, 1995). Several studies have found evidence to support differences in marital satisfaction and functioning based on the couples' attachment styles. Typically researchers document inverse associations between insecure attachment styles and marital satisfaction for both men and women (Senchak & Leonard, 1992). Unsurprisingly, attachment styles and marital satisfaction have also been found to interact over the transition to parenthood, and this interaction has additionally been associated with the psychological adjustment of both parents.

Rholes et al. (2001) examined how adult attachment orientations predicted changes in marital relationships across the perinatal period. They found that women who had higher levels of anxious attachment and perceived lower levels of spousal support during pregnancy experienced comparatively large declines in perceptions of spousal support, support seeking and marital satisfaction. In comparison, ambivalent women who perceived higher levels of support prenatally reported comparatively good marital functioning at time 2. They also found comparatively meagre disruptive effects of the transition to parenthood on marriages of avoidant women, suggesting their attachment strategy was successful. The interaction between women's ambivalence and perceptions of support prenatally, also predicted declines in their husband's marital

satisfaction and support giving, as well as increases in the husband's anger. This indicates that further research on the dyadic interaction is needed.

Similarly, Möller, Philip, Hwang and Wickberg (2006) examined associations between attachment styles and couple relationships after transition to parenthood using a categorical measure of attachment, and the Dyadic Adjustment scale. They found that when first and second time mothers reported high scores on fearful (high in attachment avoidance and anxiety) attachment, and second time mothers on dismissing (high in avoidance, low in anxiety) attachment, they were less happy in their couple relationships. They found attachment was a significant predictor of couple relationships for the second, but not first time parents. They concluded that having a second child created a more stressful life circumstance, which was more likely to activate the attachment patterns and heighten the link between attachment and relationship satisfaction.

In a study examining the interaction between attachment style and perceptions of spousal support in predicting postpartum depressive symptoms, Simpson, Rholes, Campbell, Tran and Wilson (2003) found that highly anxious women who entered parenthood perceiving greater anger or less support from their husbands had increased levels of depressive symptoms at six months postpartum. They found no increase in depression across the transition for highly avoidant women. They concluded that this might be because highly avoidant people value their relationships less than others and therefore are less inclined to worry about or expect support from their spouse. There were however, low levels of depression in this sample, suggesting they may have been measuring normal transition to parenthood issues, rather than those associated with clinical levels of depression.

Conclusion

Despite the joy involved in parenthood, the available evidence suggests that that the multiple challenges expectant and new mothers face also makes the perinatal period a stressful and transitional one, which can activate working models of attachment (Feeney et al., 2001; Rholes et al., 2001). Research indicates that insecure attachment, particularly attachment anxiety, can increase a woman's vulnerability to experiencing postpartum symptoms of depression (Warfa et al., 2014; Wilkinson & Mulcahy, 2010). Additionally, research with non-transitioning samples suggests that both attachment avoidance and anxiety may be implicated in the development of anxiety symptomatology (Safford et al., 2004; Williams & Riskind, 2004). In a similar vein, marital relationship quality and satisfaction has been implicated in the aetiology of both postpartum depression and anxiety, and may interact with attachment to protect against or increase vulnerability to distress over the perinatal period (McMahon et al., 2005; Simpson et al., 2003).

Although the transition to parenthood is undertaken as a couple, and the marital relationship is paramount in adjustment, other significant relationships exist beyond the couple, such as the relationship with one's parents and peers (Doherty & Feeney, 2004). The next chapter will examine the literature on the contribution of other key attachment relationships to psychological adjustment over the transition to parenthood, the structural changes the attachment network undergoes across the perinatal period, and the impact of social support on the psychological health of expectant and new mothers.

Chapter 4

Family and Peer Relationships, Attachment Networks, and Social Support

Attachment theory was originally developed to address the bond between infants and their caregivers, although it was recognised that the functions of the attachment bonds identified in infant-caregiver observations were also present in an adult's committed close relationships (Ainsworth, 1989). This perspective identifies the adult's desire to be with other close relationship figures (i.e. *proximity-seeking*), seek comfort from others in times of high stress (i.e. *safe-haven*), become distressed when the key relationship figures are unavailable (i.e. *separation-protest*), and to derive a sense of security and confidence from their relationships (i.e. *secure-base*) (Doherty & Feeney, 2004).

In the literatures on attachment in adulthood and the transition to parenthood, the primary focus has been on romantic partners. Thus, little is known about the potential contribution of other key relationships in a new mother's adjustment. Consistent with the findings related to the preeminent role of romantic partners in adult attachment networks (Feeney, 1999; Weiss, 1991), Feeney and Doherty (2004) showed that romantic partners were used by the adults for all four of the abovementioned attachment functions, whereas a supportive partner relationship was most consistently linked to maternal adaption relative to other key relationships (Goldstein, Diener, & Mangelsdorf, 1996). Taken together, the results suggest that women's adjustment during the transition to parenthood is crucially informed by the quality and support of the partner relationship, perhaps more so than other relationships. Furthermore, Ainsworth (1989) and Weiss (1991) note that adult attachment needs not involve a sexual component, and the relationships with parents, children, siblings, and friends also have the potential to be attachment bonds.

Relationship with Parents

Attachment to one's parents is proposed to continue throughout life (Bowlby, 1980) such that most adults seek to maintain meaningful relationships with their parents and depend on them during times of stress (Cicirelli, 1983). In particular, a woman's relationship with her mother appears to be especially important. For example, Calvo, Palmieri, Codato, Testoni, and Sambin (2012) found that young women scored their mothers highest on the secure-base function, regardless of whether they had a romantic partner. Similarly, Doherty and Feeney (2004) found that mothers were ranked second only to partners on most of the attachment functions, supporting the continuing role of mothers in a woman's attachment network. However, the psychological literature on attachment to fathers is significantly lacking (Freeman, 2010), and also quite conflicted. For example, some studies examining attachment figures in young adulthood have found that fathers are the preferred target for attachment support in up to 20% of cases (Freeman & Brown, 2001; Trinke & Bartholomew, 1997), whereas other studies (Doherty & Feeney, 2004) found that less than 1% of young adult females in romantic relationships sought attachment provisions from their fathers.

In the perinatal literature, first-time mothers who recalled greater acceptance from their parents during childhood reported fewer PPD symptoms than those who recalled less acceptance, even after controlling for prenatal depression levels (Crockenberg & Leerkes, 2003). Matthey et al. (2000) also found that a woman's recall of the quality of care she received from her mother during childhood was associated with lower depression levels in the early postpartum period. Similarly, McMahon et al. (2005) showed that women's reports of poor maternal care during childhood was related to higher depression levels at 12- months postpartum, indicating that the effects of this relationship may extend beyond the early postpartum period. Furthermore, the authors

found that an insecure-attachment style mediated the relationship between the reports of poor maternal care and maternal depression. This finding is supported by the results of Choi et al. (2013) who found that depression improved during the postpartum period in the women who received favourable maternal care during their own childhood.

Finally, in a more recent study, Grant, Bautovich, McMahon, Reilly, Leader, and Austin (2012) showed that women who recalled maternal "affectionless control" (or adverse early caretaking) were six-times more likely to be diagnosed with an anxiety disorder during pregnancy and seven-times more likely to be diagnosed with PPD, relative to the women who reported optimal parenting by their mother. In addition, they found that paternal affectionless control was related to higher pre- and postnatal anxiety levels. Taken together, the results suggest that a woman's own parenting history may play a role in the aetiology of maternal psychological distress in new mothers, although few prior studies have examined the quality of a woman's relationships with her own parents, and how this may come to influence her psychological adjustment in the perinatal period.

Relationships with Peers

Close friendships are also thought to be able to fulfil attachment needs (Doherty & Feeney, 2004) as they are usually characterised by trust, dependability, and emotional support, which are all fundamental features of attachment bonds (Fraley & Davis, 1997). Thus, friends (along with romantic partners) tend to replace parents as the preferred source of emotional support and proximity seeking in the transition to adulthood (Freeman & Brown, 2001). In addition, the role of friendships has been explored in the transition to parenthood, although the research is somewhat conflicted. Some studies report that close friendships are likely to suffer after the birth of a child (Feeney et al., 2001) and that the parents expect less support from their friends as well

as less contact and a decline in the friendship network (Kalmijn, 2014). In addition, low quality and support of the friendships is associated with higher depression levels in the mothers of young children (Goldstein & Genero, 1995 cited in Bost et al., 2002). However, in contrast, other studies suggests that although friends may provide less practical support in the transition to parenthood, they can still be a key source of support and offer reinforcement and advice (Gameiro, Moura-Ramos, Canavarro, & Soares, 2011; Leinonen, Solantaus, & Punamaki, 2003).

Attachment Networks

There is certainly recognition that multiple attachment relationships can exist across adulthood, although the number and type of the relationships that comprise an adult's attachment network has been the subject of limited research. Trinke and Bartholomew (1997) found that their participants had on average 5.4 attachment bonds, which were generally comprised of family members, the romantic partner, and friends. However, the size of these networks may decline at least initially in the transition to parenthood (Bidart & Lavenu, 2005).

Nonetheless, few prior studies have addressed the structural changes in a new mother's attachment networks in the transition to parenthood (Bost et al., 2002; Kalmijn, 2012). Feeney et al. (2001) compared the importance of spouses, parents, and friends as attachment figures in new parents, relative to couples without children. They found that the expectant and non-expectant participants reported similar attachment patterns (i.e. spouses first, then parents and friends), although after the birth, the new parents named their parents more often and their spouse and friends less often than childless couples. The authors concluded that the transition to parenthood might enhance a new parent's relationship with their immediate family, and focusing solely on the romantic relationship may be limiting.

In contrast, Bost et al. (2002) examined family networks over the transition to parenthood, but unlike Feeney et al. (2001), they found considerable stability in the mother's ranking of their family networks from the prenatal period to 24-months postpartum, although there were changes in the quality, contact level, and supportiveness of the relationships. Further, in one of the only studies to examine attachment network changes in relation to depression in the perinatal period, the changes in these relationships was shown to be related to parental adjustment and depression during this period. Specifically the authors showed that people with large and consistent networks reported better adjustment, and an increase in support in the relationships across the transition to parenthood was related to lower parental depression levels.

Lastly, Doherty and Feeney (2004) examined the structural changes in attachment networks in adulthood, across a variety of events including the transition to parenthood. Their results support the important role of romantic relationships. However, they also found that relationships with mothers, fathers, siblings, children, and friends met the criteria used to define full-blown attachment figures. In addition, they found that the structure and change in adult attachment networks was related to variables such as parental status, attesting to the important role of significant life-events. Further, in contrast to the findings of Feeney et al. (2001), they found that being a parent predicted weaker attachment to one's own parents. This different result possibly reflects the difference in sampling used in the two studies, with the cohort examined in the Feeney et al. (2001) study being new parents who may wish to seek out their own parents for advice and support, whereas in the Doherty and Feeney (2004) study, the children were of a broad range of ages.

In *summary*, the above study results suggest that a woman's relationships with her parents, siblings, and close friends, and the structural changes that occur in this network during the perinatal period may potentially impact on her psychological adjustment during the transition to parenthood (Bost et al., 2002). However, few prior studies have been conducted in this domain, and those that have focus heavily on symptoms of PPD. Thus, further research is required to explore whether these other relationships and the structure of women's social networks may play any role in the aetiology of perinatal anxiety and stress.

In addition, it is important to recognise that the transition to parenthood occurs in the context of broad social relationships, and the social resources supplied by other significant figures may be important for the mental health of women during the perinatal period. In support of this assertion, a lack of social support has been shown to be a confirmed risk factor in the aetiology of PPD. Thus, the following section provides an overview of the reported relationship between social support and depression, and the limited existing literature related to social support and anxiety in the perinatal period.

Social Support and the Postpartum Period

In an early theoretical analysis of psychosocial factors and stressful situations, Cassel (1974) suggested that social support could serve as a protective factor that buffers or cushions an individual against the physiological or psychological consequences of exposure to stressful situations. Thus, *social support* or the nature and magnitude of the resources that are provided to a person by their social network may be especially important for the psychological adjustment of women during the perinatal period. Accordingly, social support has been linked to less parental stress in the psychological literature (Gameiro et al., 2011) as well as lower depression levels

(Hahn-Holbrook, Schetter, Arora, & Hobel, 2013; Spoozak, Gotman, Smith, Belanger, & Yonkers, 2009), better quality of life (Emmanuel, St John, & Sun, 2012; Webster, Nicholas, Velacott, Cridland, & Fawcett, 2011), and better quality of care provided to the infant (Bradley, Whiteside, Mansell, & Brisby, 1997; Crockenberg, 1981).

Social support may exert a direct effect on a person's sense of wellbeing or it may act as a stress buffer that is of value in stressful situations (Cohen & Wills, 1985). In an early study, Stemp, Turner, and Noh (1986) showed that greater perceived social support from women's family, friends, and neighbours was associated with less PPD, although this did not mean the women had more frequent contact with their social network. In contrast, the women with PPD reported more frequent contacts with their social network relative to non-depressed mothers, suggesting that support quality is more important than support quantity. Since the 1980s, many studies have examined social support in relation to maternal mental health.

A recent comprehensive review of 25 studies examining the relationship between social support and maternal psychological health has indicated that most studies evaluated depression, only four evaluated anxiety, and none evaluated maternal stress levels (Razurel, Kaiser, Sellenet, & Epiney, 2013). Of the available PPD studies, all of them reported a significant association between social support and PPD, except the study by Castle, Slade, Barranco-Wadlow, and Rogers (2008), which reported a non-significant association between social support and PPD, after controlling for prenatal depression levels. In line with the vast majority of studies finding a significant link between low social support and PPD, poor social support has been labelled as a confirmed risk factor (Pope, 2000; O'Hara & Swain, 1996).

However, less is known about the relationship between social support and anxiety and stress symptoms during this period, although early evidence points to a

possible association between social support and perinatal anxiety. That is, three of four studies showed that low social support was linked to high prenatal and postnatal anxiety. In the earliest study, Glazier et al. (2004) examined social support and prenatal depression and anxiety, finding that women's perceptions of less social support were related to worse anxiety and depression during pregnancy. In a study examining the postpartum period, Hung (2007) found that greater social support was linked to less anxiety 1- and 5-weeks postpartum, whereas the only longitudinal study showed that women who were dissatisfied with their partner support early in the pregnancy reported higher anxiety and depression levels postpartum (Hildingsson, Tingvall, & Rubertsson, 2008). In contrast, Britton (2008) showed that social support did not predict anxiety levels 1-month postpartum, suggesting that further longitudinal research is required to evaluate the relationship between maternal anxiety and social support.

Forms of social support.

Most of the above studies operationalized social support as the number of available supports and/or the satisfaction with the supports, although comparatively few studies have evaluated the *aspects* of social support that best predict psychological distress in expectant and new mothers (Xie, He, Koszycki, Walker, & Wen, 2009). Some studies suggest that the perception of having someone to talk to about one's problems or *appraisal support* is key to the protective function of social support (Habif & Lahey, 1980). In line with this, PPD has been shown to be related to less social support from non-spousal confidants (Paykel, Emms, Fletcher, & Rassaby, 1980) or a complete lack of a confidant (Stein, Cooper, Campbell, Day, & Altham, 1989). Other forms of emotional social support have also been reported to be integral to a new mothers functioning, including encouragement support (Barkin, Bloch, Hawkins, & Thomas, 2014). However, in contrast, Xie et al. (2009) found that less objectively rated

practical support (e.g. assistance with childcare & household tasks) was most strongly linked to PPD, suggesting that many different aspects of social support may be important in supporting the psychological health of new mothers.

Recently, a large longitudinal study has examined appraisal-, emotional-, instrumental- and informational-support as predictors of PPD at 6- and 12-weeks postpartum. They found that high levels of all four of the social support dimensions predicted a reduction in PPD levels during the first 12-weeks postpartum, although only total social support independently predicted PPD levels at 6- and 12-weeks postpartum (Leahy-Warren, McCarthy & Corcoran, 2011). Taken together, the results suggest that a broad range of social supports may contribute to maternal wellbeing in the early postpartum period, although such a conclusion requires verification using a longitudinal study to evaluate social support as a predictor of maternal stress and anxiety.

In *summary,* the psychological literature has demonstrated that social support and the social resources available to expectant and new mothers is a key contributor to their psychological functioning during the perinatal period, especially in relation to their experience of postpartum depression and anxiety (Hildingsson et al., 2008; O'Hara & Swain, 1996). Thus, low social support is a confirmed risk factor for PPD, although less is known about the predictive relationship between different aspects of social support and maternal psychological distress, especially in regards to stress and anxiety symptoms.

The research outlined thus far has focused on only the interpersonal risk factors identified for PPD, and to a lesser extent anxiety. However, in addition to these factors, a number of non-psychological factors have been examined for their potential role in the aetiology of psychological distress in the transition to parenthood. To provide a more comprehensive analysis of the risk factors for maternal psychological distress in

the perinatal period, the socio-demographic, pregnancy, obstetric, and postnatal risk factors for maternal distress will be outlined in the following chapter.

Chapter 5

Non-psychological Risk Factors

Non-psychological factors have been investigated as potential risk factors for PPD and to a limited extent postpartum anxiety. These risk factors are broadly comprised of socio-demographic risk factors (e.g. age, education level, employment status, and income), pregnancy risk factors (e.g. parity, planned vs. unplanned pregnancy), obstetric risk factors (e.g. assisted vs. spontaneous conception, mode of delivery, gestation age at delivery), and postnatal variables (e.g. recent experience of stressful life-events, feeding method, infant health, and infant and maternal sleep). Overall, the empirical research evaluating these factors has tended to yield more conflicting results than the research examining interpersonal factors, as is detailed below.

Socio-demographic Risk Factors

Research examining the association between *age* and psychological distress in the transition to parenthood has yielded mixed results. Bottino, Nadanovsky, Moraes, Reichenheim, and Lobato (2012) recently examined the relationship between younger maternal age and PPD, and found that age was significantly associated with PPD, independently of other variables including *socioeconomic status* (SES). For every additional year of age, they documented a reduction of 4% in the risk of women developing PPD. This supports other research findings of younger age being related to high PPD levels (Petrosyan, Armenian, & Arzoumanian, 2011; Reck et al., 2008). However, in contrast, other anecdotal reports have suggested that older mothers may be at a greater risk of PPD (Carolan, 2005). Furthermore, other studies have reported no significant association between age and PPD (McMahon et al., 2011; Smith & Howard, 2008) and anxiety (Britton, 2008), and yet others have proposed that the

relationship between age and PPD can be accounted for by SES factors such as low income. Thus, SES factors such as a low income and/or financial distress have consistently been shown to be associated with greater PPD levels (Beck, 2001; Choi et al., 2013; Fisher et al. 2012).

Other socio-demographic variables examined in relation to PPD include *educational attainment* and again the results are somewhat conflicted. For example, Smith and Howard (2008) reported no significant relationship between educational attainment and initial PPD or improvement in PPD over time. In contrast, Fellenzer and Cibula (2014) reported that less educational attainment was related to prenatal depression levels, and it has also been shown to be related to anxiety during the perinatal period. Gourounti et al. (2014) showed that less education was associated with anxiety during pregnancy, whereas Britton (2008) showed that less education was related to high state-anxiety at 1-month postpartum.

Employment status has been examined in relation to PPD. In an early study, Warner, Appleby, Whitton, and Faragher (1996) examined potential demographic and obstetric risk factors and found that maternal unemployment (i.e. no job to return to after maternity leave) was one of four factors that predicted depression levels. Similarly, Goker, Yanikkerem, Demet, Dikayal, Yildirim, and Koyuncu (2012) found that the women who were housewives reported higher EPDS scores, but they found no relationship between income, age or educational attainment and PPD. However, in contrast, Josefsson et al. (2002) showed there was no significant association between demographic data (including age, marital status, and employment status) and PPD symptoms.

Finally, in a recent study, Goyal, Gay, and Lee (2010) examined a range of SES risk factors including income, marital status, education, and employment status, and

they found that low SES was related to high depression levels in late pregnancy and 2- and 3-months postpartum, but not at 1-month postpartum. Furthermore, women with four SES risk factors (i.e. low income, unemployed, no college education, and unmarried) were 11 times more likely to report clinically-elevated depression scores at 3-months postpartum, relative to women with no SES risk factors, even after controlling for prenatal depressive symptoms. In addition, low SES has been linked to higher scores on the Beck Anxiety Inventory (Wenzel et al., 2005), although far less research has examined the relationship between SES and perinatal anxiety.

Pregnancy Risk Factors

Two of the primary pregnancy risk factors that have been explored to date include parity and pregnancy intendedness (i.e. planned vs. unplanned pregnancy). *Parity* has been explored as a risk factor for PPD, and to a lesser extent perinatal anxiety, although the studies have tended to yield mixed results. Some studies have reported no firm association between parity and PPD (Bågedahl-Strindlund & Monsen Börjesson, 1998; Cox, Connor, & Kendall, 1982; Josefsson et al., 2002), whereas other studies have shown that primiparous women were at greater risk of PPD, especially if they were over 30-years of age. In contrast, some studies have shown that multiparous women were more likely to have had contact with psychiatric services relative to first time mothers (Watson, Elliott, Rugg, & Brough, 1984).

However, limited research has explored the relationship between parity and anxiety in the perinatal period. Paul et al. (2013) compared the correlates of depression and anxiety and showed that primiparity was related to a high state- anxiety score but not a high EPDS score, suggesting that parity may be more strongly related to perinatal anxiety than PPD. However, in contrast, Henderson and Redshaw (2013) found no significant link between parity and anxiety during pregnancy.

Unintended pregnancy is a pregnancy that is either unwanted or occurred earlier than was desired (i.e. mistimed) (Orr & Miller, 1997). Prevalence estimates rates for unintended pregnancy tends to vary, with research conducted in western developed nations indicating that 37-48% of pregnancies were unintended, comprising 5 to 23% of all live births (Singh, Sedgh, & Hussain, 2010). The role of pregnancy intention has been explored in relation to the risk of developing PPD, although the results are somewhat contradictory. Some studies have suggested that unintended pregnancy is associated with an increased risk of PPD (Fellenzer & Cibula, 2014; McCrory & McNally, 2013; Warner et al., 1996), whereas other studies report that the prevalence of PPD is higher in women with unintended pregnancies, although after controlling for confounding variables such as prior psychiatric history, the effect is no longer significant (Abbasi, Chuang, Dagher, Zhu, and Kjerulff, 2013).

However, in contrast to the above research, Goker et al. (2012) showed no difference in the EPDS scores of women who wanted the pregnancy and those who did not. Finally, unintended pregnancy has also been linked to postpartum anxiety (Britton, 2008) and high perceived stress in new mothers (Chou et al., 2008). Thus, the demonstrated relationship between pregnancy intention and psychological distress in the transition to parenthood makes some intuitive sense, especially since some research has suggested that the mothers who intend to give birth are more likely to be emotionally and financially prepared (Dagher, Hofferth, & Lee, (2014). Thus, this relationship might therefore be accounted for by other confounding variables (e.g. prior psychiatric history, financial unpreparedness) (Abbasi et al., 2013), rather than principally being associated with pregnancy planning.

Obstetric Risk Factors

Assisted reproductive technology.

Infertility is a problem for a significant minority of couples, with approximately 10% of fertile-aged women reported to experience some form of infertility (Boivin, Bunting, Collins, & Nygren, 2007). Nonetheless, various *assisted reproductive technologies* (ART) are available to help achieve a pregnancy, including in vitro fertilization (IVF) and artificial insemination (Ross, McQueen, Vigod, & Dennis, 2011). Several studies have examined whether the use of ART can increase the risk of PPD relative to the risk after spontaneous conception. For example, Fisher, Hammarberg, and Baker (2005) examined whether ART use was associated with an increased risk of admission to a residential early parenting program for the treatment of a maternal mood disorder or infant sleeping or feeding problem in the first-year postpartum. They showed that 6% of the admitted infants were conceived via ART, relative to only 1.5% of infants in the general population, suggesting that use of ART may increase the risk of early parenting or mood difficulties. Similarly, in another study, the women who had successfully undergone ART were reported to show elevated depression scores during pregnancy, and at 1-week and 3-months postpartum, relative to women who did not undergo ART (Monti, Agostini, Fagandini, La Sala, & Blickstein, 2009).

However, in contrast, an Australian study by McMahon, Ungerer, Tennant, and Saunders (1997) found no significant difference in the EPDS scores of mothers who conceived or did not conceive via IVF, after controlling for age, education level, and infant birth weight. More recently, McMahon et al. (2011) showed that the women who conceived via ART were not at an increased risk of PPD. A strength of this latter study was the use of a large sample size, which has been a limitation in the prior

research. Thus, consistent with this finding, Ross et al. (2011) conducted a systematic review to examine the link between PPD and ART and found that only one out of seven studies (Monti et al., 2009) reported a link between ART and high PPD levels in women, suggesting the link between ART use and PPD is not robust.

ART has also been examined in relation to perinatal anxiety. Monti, Agostini, Fagandini, Paterlini, La Sala, and Blickstein (2008) reported that the women who used ART demonstrated more latent anxiety at 3-months postpartum, and more manifest anxiety during the third-trimester of pregnancy and at 1-week after birth, relative to women who did not use ART. In addition, ART has been linked to elevated anxiety during pregnancy (Hammarberg, Fisher, & Wynter, 2008), with the anxiety centring on the pregnancy and health of the baby (McMahon, Ungerer, Beaurepaire, Tennant, & Saunders, 1997). In contrast, Henderson and Redshaw (2013) showed no significant association between fertility treatment and anxiety during pregnancy.

Finally, few studies have examined use of ART in relation to perinatal maternal stress, and those that have, examined stress that was related to the infertility and reproductive treatments (Eugster & Vingerhoets, 1999), rather than on high perceived stress in relation to a broad range of pregnancy and postnatal stressors. Thus, no clear relationship has been established between ART use and maternal stress in the psychological literature. Nonetheless, the lack of significant results for ART use and PPD may not be surprising given that all ART pregnancies are planned and the women typically have high SES, which are two major risk factors associated with PPD (Beck, 2001; Fisher et al., 2012)

Delivery mode.

Delivery mode has been reported to be related to maternal psychological distress in the literature, although the results are again contradictory. Some studies

suggest that caesarean section and assisted vaginal delivery are associated with a greater risk of PPD (Xie, Lei, Wang, Xie, Walker, & Wen, 2011; Yang, Shen, Ping, Wang, & Chien, 2011) and perinatal anxiety (Paul et al., 2013). For example, an early study by Boyce and Todd (1992) showed that the women who had an emergency *caesarean-section* were at six-times greater risk of developing PPD at 3-months postpartum, relative to the women having a spontaneous vaginal or forceps delivery. However, Johnstone, Boyce, Hickey, Morris-Yates, and Harris (2001) have argued that the studies showing an association between PPD and delivery mode were limited by the use of retrospective designs and susceptibility to potential recall bias. Thus, they prospectively examined the obstetric factors as risk for PPD, after controlling for socio-demographics, personality, and psychiatric history, and they found that the obstetric variables were no longer related to increased odds of PPD.

Since then, the majority of the research has supported the findings of Johnstone et al. (2001). A meta-analysis by Carter, Frampton and Mulder (2006) examined the studies on caesarean delivery and PPD, and they concluded that there was no significant association between the factors. In total, five studies were identified with a significant adverse relationship, 15 with no significant relationship, and four studies that yielded mixed results. The authors argued that a possible explanation of the mixed study results is that caesarean delivery is likely to be influenced by factors such as whether the caesarean delivery was planned or unplanned, occurred in an emergency setting, anaesthetic use, and other factors (e.g. psychological distress during pregnancy). More recent research has also failed to find a significant relationship between caesarean delivery and PPD (Goker et al., 2012), and the authors attributed this to the common use of regional anaesthesia and recent improvements in obstetric care.

It is also possible that the link between perinatal psychological distress and caesarean section is bidirectional, and that psychological distress during pregnancy may increase the risk of caesarean delivery. In support of this assertion, Hildingsson, Rådestad, Rubertsson, and Waldenström (2002) showed that pregnant women with depressive symptoms on EPDS screening were more likely to have a preference for planned caesarean delivery. Further, Andersson, Sundström-Poromaa, Bixo, Wulff, Bondestam, and Åström (2003) showed that pregnant women with any psychiatric diagnosis were more likely to give birth by caesarean section. Similarly, Kringeland, Daltveit, and Moller (2010) showed that the strongest predictors of a natural birth were low scores on anxiety and depression. However, in contrast, other studies have reported no significant relationship between antenatal depressive symptoms and delivery via caesarean section (Mancuso, De Vivo, Fanara et al. 2006; Wu, Viguera, Riley, Cohen and Ecker, 2002).

Gestation age at delivery

The birth of a preterm infant has received limited attention as a potential risk factor for PPD. Some studies have reported a significant relationship between prematurity and PPD (Davis, Edwards, Mohay, & Wollin, 2003), whereas others have failed to find support for the association (Pridham, Lin, & Brown, 1996). In a recent systematic review, Vigod, Villegas, Dennis, and Ross (2010) examined the prevalence and risk factors for PPD in women with preterm and low-birth-weight infants. They found that the PPD prevalence estimates were as high as 40% in the early postpartum period in women with a premature infant, and that sustained depression was related to lower birth weight, ongoing infant illness/disability, and perceived lack of social support. In their meta-analysis, they found that four out of the six studies with comparison groups reported increased PPD prevalence rates or higher mean depression

scores in the mothers of preterm infants at some point in the first postpartum year (i.e. Adewuya, Fatoye, Ola, Ijaodola, & Ibigbami, 2005; Drewett, Blair, Emmett, & Emond, 2004; Logsdon & Usui, 2001; Tamaki, Murata, & Okano, 1997).

However, in the study deemed by Vigod et al. (2010) to be most methodologically rigorous, Nielsen, Videbech, Hedegaard, and Dalby (2000) showed no significant difference in the PPD prevalence estimates of the mothers with preterm infants and those who gave birth to full term infants, at 4-months postpartum. Nor was any pregnancy or delivery complication significant, after accounting for pre-pregnancy and antenatal psychiatric distress in women. The authors therefore concluded that it was necessary to determine whether the high maternal scores on the depression scales were reflective of an adjustment disorder (with depressed mood) rather than clinically relevant depression. Thus, overall, Vigod et al. (2010) recommended that additional research is required to examine the relationship between PPD and pre-term delivery, to ensure that targeted clinical interventions can be identified to prevent PPD in this potentially vulnerable obstetric population.

Postpartum Risk Factors

A number of studies have examined a range of postpartum risk factors for PPD including the experience of recent stressful life-events (SLE), infant feeding method, infant health, and infant and maternal sleep quality, as detailed below.

Stressful life-events

The link between recent stressful life events (SLE) and depression has been recognised for a considerable period of time (Benjaminsen, 1981). In an early study examining women's recent history of SLE and PPD, Paykel et al. (1980) showed that the most strongly related factor to PPD at 6-weeks postpartum was the occurrence of recent SLE, even after considering prior history of psychiatric disorders, social

support, and the marital relationship. Since this time, the role of SLE in the aetiology of PPD has been well established (Boyce, 2003; Matthey et al., 2004), and it is now considered to be a confirmed risk factor for the disorder (O'Hara & Swain, 1996; Pope, 2000).

In addition, the experience of SLE has been found to predict symptoms of anxiety in new mothers. Britton (2008) showed that recent negative SLE were correlated with greater anxiety symptoms at 1-month postpartum. However, few other studies have examined SLE in relation to perinatal anxiety, thus, further research is required to examine the potential role of SLE in contributing to greater stress and anxiety during the perinatal period.

Infant feeding method

Breastfeeding initiation and maintenance rates can vary widely and most mothers are reported not to adhere to the World Health Organisation's (WHO, 1995) recommendations to fully breast-feed infants for at least 6-12 months (Wilkinson & Scherl, 2006). Breast-feeding is considered to be an important factor in the postpartum period, as it is said to promote infant cognitive development and protect the child against infection and some chronic diseases (Kramer et al., 2008; Parico et al., 2006). Furthermore, breastfeeding cessation has been shown to exert a potential negative impact on the mothers including an increased risk of breast and ovarian cancer (Ip, Chung, Raman, Trikalinos, & Lau, 2009). Many studies have also explored whether one of the consequences of never breastfeeding infants or early weaning of the infant is an increased risk of PPD.

Some prior studies have reported that never breastfeeding or early cessation of breastfeeding is related to an increased risk in maternal depression and anxiety (Turner & Papinczack, 2000; Warner et al., 1996; Ystrom, 2012). For example, Ystrom (2012)

found that mixed breastfeeding and bottle-feeding was related to high maternal anxiety and depression levels at 6-months postpartum, although the effect of infant feeding on postpartum anxiety was reduced by half but was still significant, after adjusting for prenatal depression and anxiety. Overall, they concluded that breastfeeding was associated with a reduced risk of maternal anxiety and depression, but that prenatal maternal distress was also related to later breast-feeding cessation. Therefore, they recommended that mothers with anxiety and depression in the perinatal period require additional breastfeeding support and coping strategies in case of unintended breastfeeding cessation.

However, in contrast, other research has reported no significant link between breastfeeding initiation or status and postpartum depression and anxiety (Chaudron, Klein, Remington, Palta, Allen, & Essex, 2001; Wenzel et al., 2005; Wilkinson & Scherl, 2006). For example, Wilkinson and Scherl (2006) showed no difference between the formula and breastfeeding mothers on any measure of psychological health including anxiety, depression, positive and negative affect, happiness or life satisfaction, and they suggested that the maternal psychological benefits of breastfeeding might not be as great as presumed.

Infant health

Infant health has previously been examined as a risk factor for PPD, although the direction of the relationship is unclear. In an early study, Mandl, Tronick, Brennan, Alpert, and Homer (1999) evaluated whether the women who brought their neonates for problem-oriented primary care or emergency department visits were at elevated risk of depression. They examined over 1000 women and they showed that after controlling for socio-demographic variables and parity, the women exhibited higher depressive symptoms if their infants had greater than one problem-oriented primary care visit or

one or more emergency room visits. However, frequent well-child visits were not associated with maternal depressive symptoms, thus, neonatal healthcare use patterns may be useful in predicting the women who are at greatest risk of PPD.

Similarly, in a study of over 107,000 women, Ban et al. (2010) found that perinatal depression (i.e. from pregnancy to 6-months postpartum) was related to higher rates of gastrointestinal and lower-respiratory-tract infection in the infants. More recently, Gress-Smith et al. (2012) examined the prevalence of maternal depression at 5- and 9-months postpartum in a low income, predominantly Hispanic sample, and evaluated the potential impact on infant weight gain, physical health, and sleep at 9-months. They showed that 33% of the women had significant depression at 5-months, and 38% were depressed at-9 months postpartum. High depression levels at 5-months were related to less infant weight gain from 5 to 9 months, increased health concerns about the infant, and increased night-waking of the infant at 9-months. The authors concluded that PPD may have significant ramifications for infant physical health, although they acknowledged that other research has shown that children in economically-deprived environments can experience greater physical health concerns from childhood and beyond (Bradley & Corwyn, 2002), suggesting that the relationship between poor infant health and PPD may be complicated by low SES status.

Thus, the relationship between infant health and PPD is likely to be complex, and several mechanisms have been theorised to explain the link between PPD and poor infant health. For example, the prenatal onset of depression may contribute to low birth weight or preterm birth, perhaps via poor nutrition or substance use during pregnancy (Rahman, Iqbal, Bunn, Lovel, & Harrington, 2003). Reciprocal effects between the maternal depression and aspects of the infant's health may then occur, and possibly exacerbate the long-term consequences in mothers and infants (Gress-Smith et al., 2012). However, most

prior studies in this research area have examined PPD as a risk factor for later poor infant health, rather than evaluating the impact of infant health difficulties on maternal psychological distress.

Infant and maternal sleep

Problems with *childhood sleep behaviour* are commonly reported by Australian mothers, in particular, frequent and prolonged night-waking of the infant, excessive time required for night-time settling, and limited sleep during the daytime (Armstrong, Quinn, & Dadds, 1993). As a consequence, the literature has examined infant sleep problems as both a cause and consequence of maternal psychological distress in the postpartum period, although the results are somewhat contradictory. For example, Karraker and Young (2007) found that maternal depression at 6-months postpartum was only weakly correlated with night-waking in the infant, although the rate of clinically-significant depression was nearly double in the mothers with persistent and severe night-waking in infants, relative to mothers whose infants slept through the night. Similarly, Armstrong, Van Haeringen, Dadds, and Cash (1998) showed that the modification of problematic childhood sleep behaviour was associated with significant improvement in maternal mood.

In addition, several studies have shown that maternal depression can predict problematic infant sleep. For example, Armitage, Flynn, Hofferman, Vazquez, Lopez, and Marcus (2009) reported that the infants of currently or previously depressed mothers took longer to fall asleep, had less sleep efficiency, and woke more often than the infants born to non-depressed mothers, and this was evident from 2-weeks to 6-months postpartum. However, this study did not differentiate between the mothers who were currently depressed and those with a prior depression history. Similarly, Gress-Smith et al. (2012) showed that women with high depression at 5-months had babies

with greater night waking at 9-months. Thus, Sadeh, Tikotzky, and Scher (2010) proposed that parental personality, psychopathology, and related cognitions and emotions might contribute to parental sleep problems or behaviour that ultimately influences infant sleep. The links between infant and maternal sleep and maternal mood are likely to be complex, dynamic, and bidirectional such that poor infant sleep may influence parental behaviour and mood, act as a salient stressor, and be a risk factor for maternal PPD.

Several studies have examined *maternal sleep quality* in relation to maternal psychological distress. For example, a qualitative study of women with PPD reported that a lack of sleep was one of the factors the women felt had contributed to their depression (Ugarriza, 2002). In an Australian study, Bayer, Hiscock, Hampton, and Wake (2007) examined the mental health of mothers in relation to infant sleep. They found that the mothers who reported sleep problems in their 3-6 month old infants also reported poorer mental and physical health in themselves. However, when they controlled for maternal sleep quality, the relationship between mental health and infant sleep quality diminished, suggesting that both poor maternal sleep and infant sleep may contribute to poor mood in new mothers. In addition, Dørheim, Bondevik, Eberhard-Gran, and Bjorvatn (2009) conducted a large scale study of 2830 women showing that the prevalence of sleep problems (using the Pittsburgh Sleep Quality index) was 57.7% at 7-weeks postpartum, and the prevalence of significant depression (using the EPDS) was 16.5% of new mothers. Poorer maternal sleep was related to higher depression levels, even after controlling for other significant risk factors (i.e. poor marital relationship, past history of depression). In particular, sleep disturbance and poor subjective sleep quality were the two most strongly correlated aspects of sleep with maternal depression. Similarly, Goyal et al. (2007) showed that regardless of infant

temperament or characteristics, the mothers who slept less than 4-hours between midnight and 6 am, and those who napped less than 60-minutes a day were at increased risk of depression at 3 months.

Thus, as with infant sleep and PPD, the relationship between poor maternal sleep and poor maternal mood appears to be bidirectional. For example, in a study comparing the quality of sleep in women with and without PPD, Posmontier (2008) showed that the women with PPD experienced poorer sleep quality, and this sleep quality tended to worsen with increasing PPD symptom severity. Specifically, longer sleep latency, waking shortly after sleep onset, and poor sleep efficiency predicted greater PPD severity in the new mothers. Similarly, in another study, shorter total sleep times and increased wakefulness after sleep onset were shown to be related to maternal depression (Armitage et al., 2009). Taken together, the results suggest that difficulty getting to sleep, broken sleep, and poor sleep efficiency may impact most on maternal mood. Nonetheless, further research is required to examine the relationship between infant and maternal sleep and maternal psychological distress in the postpartum period, especially studies examining a broader range of distress symptoms including maternal anxiety and stress.

Conclusion

In addition to the interpersonal risk factors outlined in previous chapters, the risk factors for maternal postpartum distress may include socio-demographic, pregnancy, obstetric, and postnatal factors. However, as outlined above, the literature examining these factors has tended to yield many contradictory results. In addition, most of the studies have focused on maternal depression to the exclusion of other negative affective states including maternal anxiety and stress. Finally, many of the abovementioned studies have been only cross-sectional in nature, thus, there is a need

to evaluate the variables as potential risk factors in a series of longitudinal studies. Thus, in the current series of planned studies, we examined the above potential risk factors (along with the interpersonal risk factors) in relation to maternal stress, anxiety, and depression symptoms at 4-6 months postpartum.

Thus, the following chapter outlines the aims and structure of the four prospective longitudinal studies that seek to extend the current literature by examining a broad range of psychological and non-psychological risk factors, and apply this to the broader conceptualisation of perinatal psychological distress, which includes an examination of anxiety and stress symptoms in expectant and new mothers.

Chapter 6

Summary of the Current Research

Paper 1: Marital Relationship and Attachment Predictors of Postpartum Stress, Anxiety, and Depression Symptoms

There is agreement in the psychological literature that poor marital relationship quality including marital dissatisfaction and marital disagreement is a confirmed risk factor for perinatal distress including postpartum depression and anxiety (Beck, 2001; Pope, 2000). The transition to parenthood is a time when new mothers need to manage the demands of infant care with the rest of their life, including their spousal relationship. *Attachment theory* has been used in prior studies as a theoretical framework to assist in understanding women's close relationships during this transitional period (i.e. Feeney et al., 2001; Wilkinson & Mulcahy, 2010). The model focuses on support-seeking behaviour in individuals in high stress situations, in particular, the individual differences in people's close relationships during such transitional times (Mikulincer & Florian, 1998). Thus, attachment theory can assist in helping to understanding why a woman's relationships with her partner, family, and social support network can either protect against or amplify her vulnerability to experience psychological stress and distress in the perinatal period (Simpson et al., 1998). However, to date, the theory has only been used to explore the relationship working models of attachment and PPD, not perinatal stress and anxiety. Thus, in view of the lack of research addressing the working models of attachment in relation to postnatal anxiety and stress, and the limited research on the role of the marital relationship quality in the aetiology of these states, the objective of *Paper 1* was to evaluate the prospective longitudinal relationships between attachment-anxiety and attachment-avoidance, quality of the partner relationship, and maternal perceptions of stress, anxiety, depression during the perinatal period.

Based on the results of prior studies, it was anticipated that working models of attachment, and the quality of the marital relationship would be associated with postpartum depression and anxiety symptoms, and predict individual variance in the psychological states. Due to the lack of prior research examining stress as a maternal affective state, it was only predicted that stress would be related to less marital satisfaction. Further, based on prior research suggesting that women's working models of attachment will interact with marital quality in the transition to parenthood, it was further anticipated that marital relationship quality predictors would mediate the relationships between working models of attachment to symptoms of depression, anxiety, and stress postpartum.

Paper 2: Quality of Relationships with Parents and Close Friends as Predictors of Stress, Anxiety and Depression Symptoms in Expectant and New Mothers

The overwhelming majority of research examining women's relationships and the experience of psychological distress in the transition to parenthood has focused on the couple relationship and PPD. However, other significant relationships exist in the women's lives, outside the marital relationship (Bost et al., 2002). In addition, it has been established that attachment patterns can exist in other significant adult relationships including the relationship with one's parents and peers (Doherty & Feeney, 2004). However, despite this acknowledgment, few prior studies have evaluated the relationships between quality of the attachment to these figures, and the experience of maternal stress, anxiety, and depression.

Thus, in *Paper 2,* links were explored between the quality of women's attachment to their parents and close friends and their experience of perinatal depression, anxiety, and stress. Based on the limited available literature, it was anticipated that the quality of women's attachment to their mothers would be related to

their experience of psychological distress during pregnancy and in the postpartum. In addition, structural changes in the women's attachment networks were explored in the transition to parenthood. Based on the prior literature, it was expected that the women will rely predominantly on their partners and possibly their mothers to fulfill the four types of attachment functions, i.e. safe haven, secure base, proximity- seeking and separation protest.

Paper 3: Functions of Social Support as Predictors of Stress, Anxiety, and Depression Symptoms in Expectant and New Mothers

The transition to parenthood occurs in the broader context of women's social networks. Thus, social support resources are likely to be particularly important in buffering against the potential for women to experience mental health problems during this time. In fact, a lack of social support has previously been found to be a confirmed risk factor in the aetiology of PPD (O'Hara & Swain, 1996; Pope, 2000). However, less is known about which types or functions of social support can best protect against the experience of PPD or how these functions are linked to the experience of anxiety and stress in expectant and new mothers.

Therefore, in *Paper 3,* the aim was to evaluate the different functions of social support, including tangible support, self-esteem support, appraisal support, and belonging support as potential predictors of stress, anxiety, and depression levels in expectant and new mothers. Based on prior relevant literature, it was anticipated that the functions of social support, especially self-esteem and appraisal support, will be related to symptoms of anxiety and depression in the perinatal period, and that total social support score will predict all three of the affective states. However, due to the lack of research on stress as an affective state in the perinatal period, no additional predictions were made in regards to perinatal stress.

Paper 4: Socio-demographic, pregnancy, obstetric, and postnatal predictors of postpartum stress, anxiety and depression in new mothers

Despite the significant evidence for psychological and interpersonal risk factors for postpartum distress, especially PPD, there is little clarity as to which non-psychological factors are risk factors for poor psychological health in new mothers, including socio-demographics, pregnancy, obstetric, and postnatal risk factors. That is, the research evaluating the relationships between the variables and PPD has tended to yield contradictory results, and few studies have examined the relationship between potential non-psychological risk factors and postnatal symptoms of stress and anxiety.

Thus, in *Paper 4,* a retrospective longitudinal study examined the relationships between a broad range of socio-demographic, pregnancy, obstetric, and postnatal variables in relation to maternal depression, anxiety, and stress levels at 4-6 months postpartum. Based on prior relevant literature, it was expected that socio-demographic variables (i.e. young age, low income, limited educational attainment), pregnancy (i.e. parity, planned pregnancy), obstetric (i.e. delivery mode/caesarean delivery), and postpartum variables (i.e. feeding method, child & maternal sleep, child's health, stressful life-events) would be associated with high postpartum depression, anxiety, and stress.

Summary of Objectives

In summary, the main objectives of this thesis are as follows:

1. Broaden the current conceptualisation of psychological distress in the perinatal period to include the affective state of psychological stress, in addition to perinatal depression and anxiety;

2. Examine a broad range of factors that have previously been identified as risk factors for PPD, to assess their potential role in the aetiology of perinatal anxiety and stress;
3. Explore the relationships between working models of attachment, marital relationship quality, and postpartum symptoms of stress, anxiety, and depression;
4. Examine the potential contribution of women's relationships with their parents and close peers to their experiences of psychological distress during pregnancy and the postpartum period;
5. Study the structural changes occurring in the women's attachment networks during the transition to parenthood;
6. Explore the relationships between different aspects or functions of social support and the experience of anxiety, stress, and depression in expectant and new mothers; and,
7. Examine the potential role of a range of non-psychological factors in the aetiology of postnatal stress, anxiety, and depression.

Methodology

Detailed below is a brief summary of the study methodology that was employed in relation to Studies 1 – 4, and as detailed in Papers 1 – 4.

Participants

Studies 1 - 4 were conducted with full ethics approval from the Australian National University (ANU) Human Research Ethics Committee (Protocol Number 2010/650). The women were indirectly recruited to the study via advertisements placed on a number of online parenting forums and social media sites (e.g. www.essentialbaby. com.au/forums/, www.facebook.com,

www.bubhub.com.au/community/forums/ forum.php), and using email snowballing. One-hundred-thirty-nine Australian expectant primiparous or multiparous women in the third-trimester of pregnancy agreed to participate in the study and completed the baseline study questionnaire. Study inclusion criteria were an age of 18 years or older, female gender, being in cohabiting or marital relationship with the father of the expectant infant, and in the third-trimester of pregnancy, either as a primiparous or multiparous expectant mother. Of these women, 105 then proceeded to complete the study questionnaire at 4-6 months postpartum. Demographic information describing the sample is provided in each of the Papers 1-4.

Procedure

Interested women contacted the researcher by email if they wished to participate in this two-phase prospective longitudinal study. If they were in their third-trimester of pregnancy they were sent a return email with an individual study ID number and link to the online study at about 32-36 weeks gestation. If they were in an earlier stage of pregnancy, their permission was sought to contact them when they reached the third trimester, and if granted, they were emailed in the same manner. They were then emailed again at approximately 4-months postpartum and asked if they still consented to participate, and if they did, they were resent the study ID code and link to the follow-up questionnaire.

Self-Report Measures

The following self-report measures were utilised in this research. Table 4 outlines which measures were collected at each time point, and the measures are outlined in more detail below.

Table 4. List of measures collected at each time point

Time 1 (prenatal)	Time 2 (postnatal)
Depression, Anxiety, and Stress Scales (DASS-21)	Depression, Anxiety, and Stress Scales (DASS-21)
Edinburgh Postnatal Depression Scale (EPDS)	Edinburgh Postnatal Depression Scale (EPDS)
Experiences in Close Relationship Scale (ECR)	Relationship Structures Questionnaire of the Experiences in Close Relationship Scale (Revised) (ECR-RS)
Relationship Structures Questionnaire of the Experiences in Close Relationship Scale (Revised) (ECR-RS)	Dyadic Adjustment Scale (DAS)
Dyadic Adjustment Scale (DAS)	Attachment Network Questionnaire (ANQ)
Attachment Network Questionnaire (ANQ)	Stressful Life Events (SLE)
Interpersonal Support Evaluation Inventory (ISEL)	Pregnancy Variables (Use of fertility treatment, infant gender, induction of labour, delivery mode)
Sociodemographic Variables (age, household income, education level, employment status)	Postpartum Variables (Breastfeeding initiation and current status, child's current health, infant and maternal sleep
Pregnancy Variables (parity, pregnancy Intendedness)	

Depression Anxiety, and Stress Scales (DASS-21; Lovibond & Lovibond, 1995). The DASS-21 has undergone extensive psychometric evaluation to maximally discriminate between the symptoms of depression and anxiety. Items that were rejected from the scale included mostly somatic items such as changes in appetite, weight change, sleep disturbance, tiredness, lack of energy, and poor concentration, which might potentially confound the measurement of PPD. The DASS also measures a distinct affective state characterised by chronic non-specific arousal which the authors termed

"stress". The scale asks participants to rate the presence and severity of negative emotions in the past week, using 4-point scales ranging from 0 (*did not apply to me at all*) to 3 (*applied to me very much/most of the time*), with high scores indicating greater distress. The scores in all three categories are totalled and they can be categorised as indicating the presence of normal, mild, moderate, severe, or extremely severe symptoms. Miller et al. (2006) have endorsed the utility of the DASS in assessing the broader indicators of psychological distress in perinatal women. This scale was utilized in Papers 1 – 4. Detailed psychometric information is provided on the scale in Papers 1-4.

Edinburgh Postnatal Depression Scale (EPDS; Cox, Holden, & Sagovsky, 1987). The EPDS was used to assess symptoms of postnatal depression over the past week. This 10-item scale asks participants to rate the intensity of their depressive symptoms using 4-point Likert type scales ranging from 0 to 3, with high scores indicating worse depression. A score of 9 or more out of 30 indicates the need for further depression screening in the person. However, consistent with the majority of the recommendations (i.e. Pope, 2000), a more conservative cut off score >12 was utilised in the study analyses. This scale was utilized in Papers 1 and 4. Detailed psychometric information is provided on the scale in Papers 1and 4.

Experiences in Close Relationships Scale (ECR; Brennan, Clark, & Shaver, 1998). A modified version of the ECR was used to assess the women's working models of attachment. The modified version of the scale is comprised of 20-items (from the original 36) that assess attachment-anxiety (10-item; i.e. concerns of fear of abandonment and insecurity), and attachment-avoidance (10-item; i.e. concerns of discomfort with intimacy and compulsive self-reliance). The scale asks participants to describe their feelings about close relationships using 5-point Likert type scales ranging from 1 (*Strongly Disagree*) to 5 (*Strongly Agree),* with high scores indicating greater attachment- anxiety and

attachment-avoidance. The scale was modified for this research to control the overall length of the time 1 questionnaire. The 20-items which loaded most highly on attachment anxiety and avoidance (10-items each) were selected, with the modified version having strong psychometric properties. This scale was utilized in Paper 1. Detailed psychometric information is provided on the scale in this paper.

Relationship Structures Questionnaire of the Experiences in Close Relationships-Revised (ECR-RS; Fraley, Heffernan, Vicary, & Brumbaugh, 2011). This scale was used to assess the women's attachment in relation to close relationships. The scale is designed to assess attachment-avoidance and attachment-anxiety in four key relationships, with the mother, father, marital partner, and close friend. The scale asks participants to rate the items in relation to the different attachment targets, using 7-point Likert scales ranging from 1 (*Strongly Disagree*) to 7 (*Strongly Agree*), with high scores indicating greater attachment-avoidance and –anxiety, in relation to each of the four targets. The ECR-RS subscales are thought to predict intra- and interpersonal outcomes better than the broader measures of attachment (Fraley et al., 2011). In Paper 1, this study utilised the marital subscale, and in Paper 2, the mother, father, and close friend subscales were used. Detailed psychometric information is provided on the scale in Papers 1 and 2.

Dyadic Adjustment Scale (DAS; Spanier, 1976). The DAS was used to assess marital relationship quality. This 32-item scale is comprised of 4 subscales: *dyadic consensus* or level of agreement on topics that are relevant to relationship functioning (13-item); *dyadic satisfaction* or level of tension and discord (10-item); *dyadic cohesion* or the tendency to engage in activities together (5-item), and *affectional expression* related to the level of emotional affection (4-item), which are totalled to give a total score. In this research project, the subscales were examined separately to assess the potential impact of each measure of relationship functioning on the

psychological health of new mothers. This scale was utilized in Paper 1. Detailed psychometric information on the scale is provided in Paper 1.

Attachment Network Questionnaire (ANQ; Trinke & Bartholomew, 1997). A modified version of the ANQ was used to measure women's attachment network changes in the transition to parenthood. The adapted version of the two-part measure asks respondents to list up to 10 people to whom they "feel a strong emotional tie, regardless of whether that tie is positive or negative". Respondents provided the details of the gender, age, and relationship to each person. In the original version of the measure, ethnic background is also assessed. This was removed for the current study as it was not considered relevant to the research question. In the second part of the measure, participants selected up to three people they had identified in part 1, and rated them in order of importance for each of the four attachment functions of safe haven, secure base, proximity seeking, and separation protest. The benefit of this measure is the ability for the participants to list more than one person under each of attachment function, in order to gain a better understanding of their attachment hierarchy. This scale was utilized in Paper 2. Detailed psychometric information on the scale is provided in paper 2.

Interpersonal Support Evaluation List (ISEL, 48-item; Cohen & Hoberman, 1983). The ISEL was used to assess the perceived availability of four different functions of social support including: *tangible support* (i.e. material aid and support), *appraisal support* (i.e. person(s) to talk to about one's problems), *self-esteem support* (i.e. being positively compared to others), and *belonging support* (i.e. people one can do things with). The scale asks participants to rate their social support resources using 4-point Likert type scales, ranging from 1 (*definitely false*) to 4 (*definitely true*), across the four support types, with high scores in each category indicating greater perceived

availability of social support, and the subscores are totalled to provide a total score. This scale was utilized in Paper 3. Detailed psychometric information on the scale is provided in Paper 3.

Non-Psychological Risk Factors. Questionnaire items were divided into four subcategories: socio-demographic, pregnancy, obstetric, and postpartum variables. At time 1, expectant mothers were asked about *socio-demographics* including their age, education level, employment status, and household income. The expectant mothers were also asked several *pregnancy* questions including their parity (i.e. primiparous [no other children] or multiparous [has other children], and pregnancy intendedness (i.e. planned vs. unplanned pregnancy). In addition, at time 2, the women were asked a range of *obstetric* questions including whether they required fertility assistance, including their use of fertility drugs, IVF, or other medical interventions (yes/no), the gender of the infant (male/female), whether the delivery was induced (yes/no), and the mode of delivery (vaginal/vacuum extraction/ forceps delivery/emergency caesarean/planned caesarean). The vacuum extraction and forceps items were combined to give an assisted vaginal delivery score, and the emergency and planned caesareans were combined to give a caesarean score. This scale was utilized in Paper 4.

At time 2, women were asked about *postpartum* factors including their use of breastfeeding (initial & at follow-up, yes/no), ratings of the child's current health (5-point scale, excellent to poor), extent to which the child's sleeping patterns or habits were a problem (4-point scale, large problem to no problem at all), and maternal sleep quality over the past month (5-point scale, very good to very bad). In addition, the number of *stressful life-events* experienced by the women in the prior 12-months was computed from a list of 15 stressful situations and events including severe illness, injury or assault (self or close relative); death of parent, partner or child; death of close relative or friend; serious

problem with close friend or relative; moved interstate; moved within the state; crisis at work or in career; lost job; unsuccessful job seeking for >1-month; major financial crisis; problems with police or law; something of value was lost or stolen; alcohol problem (self/someone in household); and, drug problem (self/someone in household), from which a total score was derived. This scale was utilized in Paper 4.

Data Analysis: Paper 1

All statistical analyses were performed using IBM SPSS statistical software (Version 22). Internal consistencies of all of the scales and subscales were examined using Cronbach's alpha (Cronbach, 1951), with values above .70 and .80 representing acceptable and excellent internal consistencies, respectively. All the variables with the exception of attachment-avoidance were skewed, with significant ($p<.001$) Kolmogorov-Smirnov and Shapiro-Wilk normality tests, indicating that the variables had non-normal distributions. Data transformations did not normalise the score distributions, and the same profile of results was obtained using square-root-transformed and untransformed data. Thus, the untransformed data was used in this paper. Non-normal distribution of data is typical in social sciences research, and violation of this assumption is not considered to cause issues with using parametric statistical analysis techniques when sample size is adequate (over 30), with parametric techniques also having the advantage of better statistical power (Pallant, 2007). Furthermore, the use of non-parametric statistics is most appropriate when the area of study is best represented by the mean score (Pallant, 2007), which is not the case for these research questions. Therefore, parametric statistics have been selected for use in this paper. Descriptive analyses and Pearson's correlation coefficients were conducted on all key study variables.

Separate hierarchical multiple regression analyses were conducted to identify the *time 1* attachment and marital quality variables that predicted depression, anxiety, stress, and EPDS at *time 2*. Mediational analyses were then conducted to evaluate the potential mediators of the relationship between attachment insecurity (i.e. anxious and avoidant attachment) to maternal psychological distress (i.e. depression, anxiety, stress, PND), with the marital quality (or dyadic adjustment) variables assessed as mediators. Only the IVs that predicted the states in the hierarchical regression analyses were tested as potential mediators. Mediation effects were assessed using Baron and Kenny's (1986) required conditions for mediation, which include that (i) the IV is significantly associated with the mediator, (ii) the IV is significantly associated with the DV in the absence of the mediator, (iii) the mediator is significantly associated with the DV, and (iv) in the presence of the mediator, the effect of the IV on the DV is reduced to zero (full mediation) or is still significant (partial mediation). Mediation was also assessed using bootstrapping techniques. Indirect effects were assessed by examining the 95% confidence intervals (CI) produced by the test. If the CI did not contain 0 then mediation is said to have occurred.

Data Analysis: Paper 2

All statistical analyses were performed using IBM SPSS statistical software (Version 22). Internal consistencies of the scales and subscales were examined using Cronbach's alpha (Cronbach, 1951), with values above .70 and .80 representing acceptable and excellent internal consistencies, respectively. The variables were skewed and the Kolmogorov-Smirnov and Shapiro-Wilk normality tests were all significant ($p<.05$) indicating that they had non-normal distributions. Data transformations did not normalise the score distributions, and the same profile of results was obtained using square-root-transformed and the untransformed data. Thus,

the untransformed data was used in this paper. Non-normal distribution of data is typical in social sciences research, and violation of this assumption is not considered to cause issues with using parametric statistical analysis techniques when sample size is adequate (over 30), with parametric techniques also having the advantage of better statistical power (Pallant, 2007). Furthermore, the use of non-parametric statistics is most appropriate when the area of study is best represented by the mean score (Pallant, 2007), which is not the case for these research questions. Therefore, parametric statistics have been selected for use in this paper. Descriptive analyses and Pearson's correlation coefficients were conducted on all key study variables.

Multiple regression analyses were conducted to identify the *time 1* predictors (i.e. attachment to mother, father, and friends) of depression, anxiety, and stress levels prenatally (i.e. cross sectional analyses). Hierarchical multiple regression analyses were then conducted to identify the *time 1* attachment predictors of depression, anxiety, and stress at *time 2* (i.e. longitudinal analyses). The attachment network subscores were analysed using paired samples *t*-tests and repeated-measures analysis of variance (ANOVA) to determine whether or not the use of each attachment figure changed between the third-trimester and 4-6 months postpartum, and whether each attachment figure was used differentially for the four attachment functions.

Data Analysis: Paper 3

All statistical analyses were performed using IBM SPSS statistical software (Version 22). Internal consistencies of the scales and subscales were examined using Cronbach's alpha (Cronbach, 1951), with values above .70 and .80 representing acceptable and excellent internal consistence, respectively. Aside from total social support score, all study variables were skewed and the Kolmogorov-Smirnov and Shapiro-Wilk normality tests were significant ($p<.001$), indicating that the variables

had non-normal distributions. Data transformation did not normalise the score distributions, and the same profile of results was obtained using square-root-transformed and untransformed data. Thus, the untransformed data was used in this paper. Non-normal distribution of data is typical in social sciences research, and violation of this assumption is not considered to cause issues with using parametric statistical analysis techniques when sample size is adequate (over 30), with parametric techniques also having the advantage of better statistical power (Pallant, 2007). Furthermore, the use of non-parametric statistics is most appropriate when the area of study is best represented by the mean score (Pallant, 2007), which is not the case for these research questions. Therefore, parametric statistics have been selected for use in this paper.

Descriptive analyses and Pearson's correlation coefficients were conducted on all the key study variables. Multiple regression analyses were conducted to identify the *time 1* social support variables that predicted depression, anxiety, and stress levels at *time 1*. Hierarchical multiple regression analyses were then conducted to identify *time 1* social support variables that predicted depression, anxiety and stress levels at 4-6 months post-partum, controlling the time 1 dependent variables (i.e. emotional state) at step 1 of the regressions.

Data Analysis: Paper 4

All statistical analyses were performed using IBM SPSS statistical software (Version 22). Internal consistencies of the scales and subscales were examined using Cronbach's alpha (Cronbach, 1951), with values above .70 and .80 representing acceptable and excellent internal consistence, respectively. All continuous variables except age were skewed, with significant ($p<.001$) Kolmogorov-Smirnov and Shapiro-Wilk normality tests, indicating that the variables had non-normal distributions. Data

transformations did not normalise the score distributions, and the same profile of results was obtained using square-root-transformed and untransformed data. Therefore, only the untransformed data was used in this paper. Non-normal distribution of data is typical in social sciences research, and violation of this assumption is not considered to cause issues with using parametric statistical analysis techniques when sample size is adequate (over 30), with parametric techniques also having the advantage of better statistical power (Pallant, 2007). Furthermore, the use of non-parametric statistics is most appropriate when the area of study is best represented by the mean score (Pallant, 2007), which is not the case for these research questions. Therefore, parametric statistics have been selected for use in this paper.

Descriptive analyses and Pearson's correlation coefficients were conducted on all key study variables. Multiple regression analyses identified the socio-demographic, pregnancy, birth, and postnatal variables that predicted depression, anxiety, stress, and EPDS levels at *time 2.* Only the IVs that were significantly correlated with depression (EPDS & DASS-21), and stress were included in the respective regression analysis, and only IVs correlated at $p<.1$ were included in the analysis of maternal anxiety. Hierarchical multiple regression analyses were then conducted to reevaluate the above relationships, after controlling for the time 1 DV. *Post-hoc* independent-samples *t*-tests also compared the stress, anxiety, and depression levels reported by the women who did/did not undergo later caesarian delivery.

Paper 1: Marital Relationship and Attachment Predictors of Postpartum Stress, Anxiety, and Depression Symptoms

Danielle Clout (BSc(hons)[1] and Rhonda Brown [BSc(hons), PhD][1]

Journal of Social and Clinical Psychology

Published in 2016, Volume 35, Issue 4, pages 322-341

1. Australian National University, Australia

Abstract

Background: The purpose of this paper was to evaluate the relationship between attachment-avoidance and -anxiety, and marital relationship quality during pregnancy to the expression of depression, anxiety, and stress postpartum. **Method:** One-hundred-five women participated in a two-phase longitudinal study during the third trimester of pregnancy and at four to six months postpartum. They completed the attachment and relationship measures at time 1, and the measures of stress, anxiety, depression at times 1 and 2. **Results:** The marital relationship variables of affectional expression and dyadic satisfaction significantly predicted depression levels postpartum, whereas dyadic satisfaction significantly predicted anxiety levels. No variables predicted maternal stress levels. Mediational analyses indicated that dyadic satisfaction significantly mediated the relationships between high attachment-anxiety to worse anxiety and depression, and also the relationship between high attachment-avoidance to later anxiety and depression symptoms. **Limitations:** Data were based on self-reports and participating women were predominantly Caucasian, tertiary educated, and with high family incomes. **Conclusion:** The study results suggest that marital relationship quality may contribute to the development of affective symptoms in new mothers to a greater degree than working models of attachment-avoidance and -anxiety. Clinically, the results suggest that partner relationships should be a key focus for clinicians in the perinatal period. The provision of psychological interventions aimed at improving relationship functioning may help to protect new mothers against the potential to experience psychological distress.

The transition to parenthood including the first-year after the child's birth is among the most challenging times in a woman's life. It is a time of new physical and emotional stressors and changes in lifestyle that can place significant strain on the partner relationship, and possibly increase the risk of maternal psychological distress (Bener, Gerber, & Sheikh, 2012). In particular, some women experience *postpartum depression* (PPD) during the perinatal period, with prevalence estimates for PPD ranging from 3 to more than 25% of women in the first 12-months postpartum (Dennis, Janssen, & Singer, 2004), although the prevalence estimates vary depending on sample characteristics, screening instruments, and the statistical methods used (Gaillard, Le Strat, Mandelbrot, Keïta, & Dubertret 2014; O'Hara & Swain, 1996; Le Strat et al., 2011). Established risk factors for PPD are reported to include a prior history of depression, low quality marital relationships, stressful life-events (SLE), and low levels of social support (Dennis et al., 2004; Pope, 2000).

In addition, many women experience significant *anxiety* postpartum (Don, Chong, Biehle, Gordon, & Mickelson, 2014), which is known to be a distinct clinical problem despite its high comorbidity with depression (George, Luz, De Tychey, Thilly, & Spitz, 2013; Matthey, Barnett, Howie, & Kavanagh, 2003; Miller, Pallant, & Negri, 2006; Wenzel, Haugen, Jackson, & Brendle, 2005). That is, perinatal anxiety is likely to be more common than perinatal depression (Britton, 2008; Wenzel, Haugen, Jackson, & Robinson, 2003), affecting 25-45% of new mothers (Britton, 2005, Faisal-Curry & Menezes, 2007). However, few prior studies have evaluated predictors of maternal anxiety, especially longitudinal predictors of the state. Nonetheless, anxiety risk factors are reported to include prior psychiatric history, low socioeconomic status (SES), multiparous status, and SLE (Britton, 2008; Dipietro, Costigan, & Sipsma, 2008; Wenzel et al., 2005). Similarly, few prior studies have evaluated the experience of

maternal stress during the perinatal period, despite Rallis, Skouteris, McCabe, and Milgrom (2014) arguing that it should be viewed as a distinct affective state. Finally, few prior studies have evaluated maternal stress, anxiety and depression symptoms concurrently in the perinatal period, and so there is a need to more comprehensively examine psychological health in women during this time, including factors that predict the three affective states. Only Rallis (2008) cited in Rallis et al. (2014), and Miller et al. (2006) have done so using the *Depression, Anxiety, Stress Scale-21* (DASS-21). This scale is reported to have utility in assessing psychological distress in the perinatal period (Meades & Ayers, 2011), and so we used it as a measure of affective symptoms in this study.

Attachment and *marital relationship quality* have previously been examined as risk factors for PPD onset. Attachment theory (Bowlby, 1969) proposes that the interactions of infants, children and adolescents with their carers will give rise to internal working models of self and others that can help to guide their perceptions and behaviour in future relationships, especially in stressful situations. Thus, the theory provides a useful framework for examining women's psychological adjustment to the changes and upheaval they experience in the perinatal period (Simpson & Rholes, 2008), and these working models are known to predict maternal psychopathology (Williams & Riskind, 2004). In the psychological literature, these internal working models are most often discussed in terms of *attachment-anxiety* (i.e. concern about rejection and abandonment in close relationships), and *attachment-avoidance* (i.e. discomfort with closeness with others) (Brennan, Clark & Shaver, 1998; Simpson, 1990).

Several prior studies have examined PPD during the perinatal period using an attachment framework. Feeney, Alexander, Noller, and Hohaus (2003) found that

attachment-anxiety was related to worse depression in the perinatal period, relative to non-transitioning women, suggesting that the transition to parenthood is sufficiently stressful to activate a woman's attachment style, thereby, possibly increasing her vulnerability to experience depression. Similarly, women who were high on anxious-attachment or low on spousal support reported worse depression symptoms 6-months postpartum, but not the highly avoidant women (Simpson, Rholes, Campbell, Tran, & Wilson, 2003). In addition, clinically depressed mothers have been reported to show more preoccupied (high on attachment anxiety, low on avoidance)- and fearful (high on attachment anxiety and avoidance)-attachment than non-depressed mothers, and their attachment style associated with less perceived social support and poor quality interactions with infants (Wilkinson & Mulcahy, 2010). Thus, it appears that a negative model of self (i.e. attachment-anxiety) may predispose a woman to experience PPD during the perinatal period, although a negative model of *others* (i.e. attachment-avoidance) may not be depressogenic.

However, no prior studies have examined attachment predictors of perinatal anxiety and stress, although attachment has been examined in relation to anxiety symptoms in non-expectant samples. In that small literature, insecure attachment (Safford, Alloy, Crossfield, Morocco, & Wang, 2004; Williams & Riskind, 2004) and avoidant attachment (Williams & Riskind, 2004) were shown to be related to high anxiety levels, suggesting that a negative view of self and others may lead to anxiety and/or depression, whereas a negative view of others may only increase the risk of experiencing anxiety.

Finally, the perinatal period is often associated with major changes in the partner relationship, possibly leading to marital stress (Levy-Shiff, 1994), a decline in marriage quality and satisfaction (Cowan & Cowan, 2000), and greater psychological distress,

although romantic relationships can also protect against the experience of stress and distress (Simpson et al., 2003). In particular, poor marital quality (e.g. less marital satisfaction) and low partner support have been reported to predict high depression levels (Graff, Dyck, & Schallow, 1991; McMahon, Barnett, Kowalenko, & Tennant, 2005; Milgrom et al., 2008). In addition, marital relationships have been explored using an attachment framework. For example, Simpson et al. (2003) examined how a woman's attachment orientation can interact with their marital relationship and perceptions of spousal support to predict PPD, finding that women who were high on attachment-anxiety and felt that their husband was angry or provided them with little support, showed worse PPD 6-months postpartum. Similarly, marital relationship quality, less partner support, and relationship adjustment have been implicated in the development of perinatal anxiety (Gourounti, Anagnostopoulous, & Sandall, 2014; Vythilingum, 2008; Whisman, Davila, & Goodman, 2011). However, relationship quality and attachment style have rarely been examined in relation to maternal stress and anxiety levels.

Thus, in this study we explored the prospective longitudinal relationships between attachment-anxiety and -avoidance, quality of the partner relationship, and maternal perceptions of stress, anxiety, depression, and PPD during the perinatal period. Consistent with the limited available literature it was expected that:

1) Depression symptoms at time 2 will be predicted by high attachment-anxiety (general & marital-specific) and low marital (or dyadic) satisfaction) at time 1;
2) Anxiety symptoms at time 2 will be predicted by high attachment-avoidance and -anxiety (general & marital) and low dyadic satisfaction at time 1;
3) Stress at time 2 will be predicted by low dyadic satisfaction at time 1; and,

4) Significant dyadic predictors in the above planned analyses will mediate the relationships between high attachment-anxiety to worse postpartum stress, anxiety and depression symptoms. All other relationships will be explored without making any *a priori* assertions.

Method

Participants:

This study was conducted with full ethics approval from the Australian National University (ANU) Human Research Ethics Committee (Protocol Number 2010/650). Potential participants were indirectly recruited to the study via advertisements placed on online parenting forums and social media sites (e.g. www.essentialbaby.com.au/forums/, www.facebook.com, www.bubhub.com.au/community/forums/forum.php), and using email snowballing. Study inclusion criteria were an age of 18 years or older, female gender, being in cohabiting or marital relationship with the father of the expectant infant, and in the third-trimester of pregnancy, either as a primiparous or multiparous expectant mother. No reimbursements were provided to the participants.

An *a priori* power analysis indicated that at least 92 participants were required, assuming a small to medium effect size (f^2=.15), and with alpha set at .05, power of .8, and up to 5 predictors when analysing the continuous DASS-21 score. As few research studies have used the DASS-21 for longitudinal research into perinatal distress, a small to medium effect size was assumed based on Yelland et al. (2010) reporting medium effect sizes in similar research. One-hundred-seventy-five women emailed the researcher (DC) and 139 completed the baseline study questionnaire (response rate=79.4%). Most of the women (*N*=105) also completed the follow-up questionnaire at 4-6 months postpartum (retention rate=75%). Analysis showed that women who did

not complete the follow-up questionnaire did not differ significantly on demographic or psychological variables, compared with those who completed both questionnaires. All women were in a marital or cohabiting relationship with the father of the expectant child at both time points.

The mean age of participants was 31.6 years (*SD*=4.35, range 20-43 years). Forty-percent of the women (*N*=56) were multiparous and the rest (*N*=83) were preparing to give birth to their first child. Most participants (*N*=111, 79.9%) were married and the rest lived in a de facto relationship, with a mean relationship length of 6.8 years (*SD*=3.48, range: 11 months - 19 years). Most participants (*N*=130, 93.5%) identified themselves as Caucasian, 3 identified as being Asian, two as South East Asian, one as Indigenous, and 3 as other. More than one-half of the participants (*N*=83, 59.7%) had completed university, 30 (21.6%) had completed TAFE, 23 had graduated from Year 12, and 3 left school at year 10. Less than one-half of participants (N=59, 42.4%) were in full-time employment, one-quarter (*N*=35, 25.2%) were in casual or part-time employment, one-quarter (*N*=40, 28.8%) undertook home duties, and five were unemployed. The mean income of the expectant couples was A$120,381 (*SD*=$67,595, range: $27,000 – $500,000).

Measures

Symptoms of depression, anxiety, and stress over the past week were assessed using the *Depression Anxiety, and Stress Scales (DASS-21)* (Lovibond & Lovibond, 1995). The authors of the scale have attempted to reduce the symptom overlap between the three subscales, so as to measure the unique symptoms of each state, and there is Australian normative data for the scale (Lovibond & Lovibond, 1995). The scale asks participants to rate the presence and severity of negative emotions, using 4-point scales ranging from 0 (*did not apply to me at all*) to 3 (*applied to me very much/most of the*

time), with high scores indicating worse symptoms. The DASS has adequate convergent validity such that the DASS depression scale is correlated strongly with the Beck Depression Inventory (r=.74), and the anxiety scale is correlated with the Beck Anxiety Inventory (r=.81) (Lovibond & Lovibond 1995a;b), and it has high internal consistency, with Cronbach's alpha of .81 for depression, .73 for anxiety, and .81 for stress (Lovibond & Lovibond, 1995). In this study, the internal consistencies of the subscales at time 2 were adequate to high with Cronbach's alphas of .86 for depression, .79 for anxiety, and .76 for stress.

Postnatal depression symptoms over the past week were assessed using the *Edinburgh Postnatal Depression Scale (EPDS)* (Cox, Holden, & Sagovsky, 1987). The EPDS was utilised in addition to the DASS-21 to allow for comparison between the measures with regards to the detection of psychological distress in participants, and to determine whether similar variables are associated with depression symptoms measured with both the EPDS and DASS-21. The EPDS is a 10-item scale, which asks participants to rate the intensity of their depressive symptoms using 4-point Likert type scales ranging from 0 to 3, with high scores indicating worse depression. A score greater than 12 was considered to indicate elevated depression levels in this study, consistent with the recommendation of Pope (2000). The EPDS has well documented reliability and validity including high internal consistency, with a Cronbach's alpha of .87 (Affonso, Horowitz, & Mayberry, 2000). In this study, the EPDS showed high internal consistency, with a Chronbach's alpha of .89 at Time 2.

Attachment style was assessed using a modified version of the *Experiences in Close Relationships Scale (ECR)* (Brennan, Clark, & Shaver, 1998), which is comprised of 20 items that assess attachment-anxiety (10-item; i.e. concern of fear of abandonment and insecurity), and attachment-avoidance (10-item; i.e. concern of discomfort with

intimacy and compulsive self-reliance). The scale asks participants to describe their feelings about close relationships using 5-point Likert type scales ranging from 1 (*Strongly Disagree*) to 5 (*Strongly Agree).* The original 36-item measure is reported to show high test-retest and internal consistency reliability and validity across numerous studies (Mikulincer & Shaver, 2007). In this study, the Cronbach's alphas were high for the avoidance subscale (.87) and anxiety subscale (.9) at Time 1.

Attachment in close relationships was assessed using the *Relationship Structures Questionnaire of the Experiences in Close Relationships-Revised (ECR-RS)* (Fraley, Heffernan, Vicary, & Brumbaugh, 2011). The scale is designed to assess attachment-avoidance and attachment-anxiety in four key relationships: mother, father, marital partner, and close friend, but in this study, only the marital partner data is presented. The scale asks participants to rate the items in relation to the attachment targets, using 7-point Likert scales ranging from 1 (*Strongly Disagree*) to 7 (*Strongly Agree*). ECR-RS subscales are reported to show adequate internal consistency, with Cronbach's alphas of .91 for the anxiety scale and .87 for the avoidance scale, and are thought to predict intra- and interpersonal outcomes better than broader attachment measures (Fraley et al., 2011). At time 1, the subscales showed high internal consistency, with Cronbach's alphas of .87 for the avoidance scale and .91 for the anxiety scale.

Marital relationship quality was assessed using the *Dyadic Adjustment Scale* (DAS) (Spanier, 1976). This 32-item scale is comprised of 4 subscales: *dyadic consensus* or level of agreement on topics that are relevant to relationship functioning (13 item), *dyadic satisfaction* or level of tension and discord (10 item), *dyadic cohesion* or the tendency to engage in activities together (5 item), and *affectional expression* related to the level of emotional affection (4 item). The DAS subscales are reported to show high internal consistency with Cronbach's alpha's of .9 for dyadic consensus, .94

for dyadic satisfaction, .86 for dyadic cohesion, and .73 for affectional expression (Spanier, 1976). At time 1, the internal consistencies of subscales were generally high, with Cronbach's alphas of .85 for dyadic consensus, .78 for affectional expression, .88 for dyadic satisfaction, and .8 for dyadic cohesion.

Procedure

Interested individuals contacted the researcher by email if they wished to participate in the study. Women in the third trimester of pregnancy were sent a return email with a link to the online survey and an individual study ID number to complete at approximately 32-36 weeks gestation (*mean* = 33.9 weeks*, SD* = 2.9, range: 29-39 weeks) (https://anupsych.co1.qualtrics.com/SE/?SID=SV_b2AcZtbcYiWjZl2). If they were at an earlier stage of pregnancy, their permission was sought to make contact when they reached the third trimester, and if granted, they were emailed in the same manner. They were then contacted again by email at approximately 4-months postpartum and asked if they still consented to participate in the follow-up assessment, and if they did, they were resent their study ID code and a link to the follow-up questionnaire: (https://anupsych.co1.qualtrics.com/ SE/?SID=SV_eSazN4fdTc3azYM). The mean time at follow-up was 21.5 weeks (*SD*=2.8, range: 17-28 weeks).

Statistical Analyses

The dependent variables (DV) of psychological stress, anxiety and depression were measured at time 1 and time 2, and postnatal depression was measured at time 2. The relationship and dyadic independent variables (IV) were assessed at time 1. All statistical analyses were performed using IBM SPSS statistical software (Version 22). Descriptive analyses and Pearson's correlation coefficients were conducted on all key study variables. Separate hierarchical multiple regression analyses were then conducted

to identify the *time 1* attachment and marital quality variables that predicted depression, anxiety, stress, and EPDS at *time 2*.

Mediational analyses evaluated potential mediators of the attachment insecurity (i.e. anxious and avoidant attachment) to psychological distress (i.e. depression, anxiety, stress, PND) relationship, with the attachment and marital quality (or dyadic adjustment) variables assessed as mediators, but only if the IVs predicted the states in the hierarchical regression analyses. Mediational analyses were conducted in addition to hierarchical regression analyses, to examine the role of each IV on its own, and its relationship to other possible mediating variables, in order to establish whether a causal relationship may exist. Mediation effects were assessed using Baron and Kenny's (1986) required conditions for mediation, which include that (i) the IV is significantly associated with the mediator, (ii) the IV is significantly associated with the DV in the absence of the mediator, (iii) the mediator is significantly associated with the DV, and (iv) in the presence of the mediator, the effect of the IV on the DV is reduced to zero (full mediation) or is still significant (partial mediation). Mediation was also assessed using bootstrapping techniques. Indirect effects were assessed by examining the 95% confidence intervals (CI) produced by the test. If the CI did not contain 0 then mediation is said to have occurred.

Results

Univariate outliers were detected in all study variables, although the outliers were not excluded as they represented clinically relevant cases of distress, attachment and relationship patterns. The 5% trimmed means were similar to the original means on all variables. All variables with the exception of attachment-avoidance were skewed, with significant ($p<.001$) Kolmogorov-Smirnov and Shapiro-Wilk normality tests, indicating the variables had non-normal distributions. Data transformations did not

normalise the score distributions, and the same profile of results was obtained using square-root transformed and untransformed data (data not shown). Thus, only the untransformed data is presented in this study. Non-normal distribution of data is typical in social sciences research, and violation of this assumption is not considered to cause issues with using parametric statistical analysis techniques when sample size is adequate (over 30), with parametric techniques also having the advantage of better statistical power (Pallant, 2007). Furthermore, the use of non-parametric statistics is most appropriate when the area of study is best represented by the mean score (Pallant, 2007), which is not the case for these research questions. Therefore, parametric statistics have been selected for use in this paper. Multicollinearity was evident between dyadic satisfaction and marital attachment-avoidance (correlation above .7), thus, separate hierarchical regression analyses were run for the attachment and dyadic adjustment variables.

Means, standard deviations and correlation coefficients of the key study variables are provided in Table 1. As expected, stress, anxiety, depression, and postnatal depression were strongly correlated with each other, and moderately correlated with many of the attachment and relationship variables, see Table 1. On the EPDS, 19.3% of women were found to be experiencing elevated levels of depression, and the EPDS detected only one additional case of depression that was not identified by DASS-21 scores. Greater than one-third of women (*N*=41, 39%) had elevated levels of psychological symptoms on the DASS-21, of whom 11 (26.8%) had elevated levels of all three states, and 12 had elevated levels of two affective states. Overall, 15 women (14.3% of the total sample) endorsed symptoms of anxiety and stress, without comorbid depression. The percentage of participants in each of the recommended DASS categories is shown in Table 2.

Table 1

Means, Standard Deviations and Correlations for the Key Study Variables

	M	*(SD)*	ANX	STR	PND	AVO	ANX	MAV	MAX	DCon	AE	DSat	DCoh
DEP	6.36	7.7	.62**	.70**	.73**	.23*	.32**	.15	.30**	-.33**	-.22*	-.33**	-.25**
ANX	4.15	6.24		.66**	.63**	.30**	.22*	.26**	.24*	-.29**	-.25**	-.43**	-.15
STR	11.7	8.7			.70**	.36**	.24*	.19	.22*	-.18	-.23*	-.27**	-.19*
PND	7.5	4.99				.27**	.35**	.24*	.35**	-.38**	-.28**	-.40**	-.37**
AVO	26.67	6.29					.45**	.32**	.31**	-.28**	-.39**	-.32**	-.35**
ANX	22.68	6.44						.16	.59**	-.44**	-.42**	-.29**	-.33**
MAV	8.96	4.37							.46**	-.52**	-.39**	-.77**	-.49**
MAX	5.45	3.82								-.45**	-.39**	-.49**	-.38**
DCon	67.89	7.13									.63**	.66**	.63**
AE	8.30	1.55										.57**	.51**
DSat	51.09	4.84											.61**
DCoh	19.19	2.66											

Note. N = 105. Dep = T2 DASS-21 total depression score, ANX = T2 DASS-21 total anxiety score, STR = T2 DASS-21 total stress score, PND = T2total EPDS score, AVO = attachment-avoidance, ANX = attachment-anxiety, MAV = Marital specific attachment-avoidance, MAX = Marital specific attachment-anxiety, DCon = Dyadic Consensus, AE = Affectional Expression, DSat = Dyadic Satisfaction, DCoh = Dyadic Cohesion.

[a]2-Tailed Pearson Correlation in SPSS, * $p < .05$. ** $p < .01$

Table 2

Percentage of Women Experiencing Stress, Anxiety and Depression Symptoms, using Recommended DASS Clinical Categories

Category		Depression	Anxiety	Stress
Normal	T1	77.1%	65.7%	66.7%
	T2	75.2%	78.1%	72.4%
Mild	T1	9.6%	6.7%	11.5%
	T2	7.6%	4.8%	6.7%
Moderate	T1	5.8%	13.4%	13.4%
	T2	6.8%	11.4%	12.5%
Severe	T1	6.7%	2.9%	4.8%
	T2	5.8%	2.9%	4.8%
Extremely Severe	T1	1%	7.8%	3.9%
	T2	2%	3%	3.9%

Hierarchical multiple regression analyses

Hierarchical multiple regression analyses were conducted to evaluate predictors of symptoms of depression, anxiety, stress, and postnatal depression, separately for the attachment predictors (i.e. general attachment-anxiety & -avoidance, and marital-specific attachment-anxiety and avoidance) and relationship predictors (i.e. dyadic consensus, affectional expression, dyadic satisfaction and dyadic cohesion). In these analyses, time 1 dependent variables were entered at step 1, and the predictors were entered at step 2, see Table 3 and 4.

At step 1, time 1 depression predicted 37.6% (adjusted R^2) of the variance in time 2 *depression*, and at step 2, the model predicted 35.9% of its variance (R^2 change=.008, $F_{4,99}$ =.31, p=.87), but only time 1 depression score predicted time 2 depression. At step 1, time 1 anxiety predicted 31.2% (adjusted R^2) of the variance in time 2 *anxiety*, and at step 2, the attachment variables predicted an additional 1.7% of the variance, increasing it to 32.9% (R^2 change=.04, $F_{4,99}$ =1.63, p=.17), but only time 1 anxiety predicted time 2 anxiety. At step 1, time 1 stress predicted 31.8% (adjusted R^2) of the variance in time 2 *stress*, and at step 2, the model predicted 31.1% of the variance in time 2 stress (R^2 change=.02, $F_{4,99}$=.74, p=.57), but only time 1 stress predicted time

2 stress. In the analysis of *postnatal depression*, attachment variables predicted 13.8% (adjusted R^2) of the variance in EPDS at time 2, but none of the attachment variables predicted postnatal depression at time 2.

Table 3

Summary of Hierarchical Multiple Regression Analysis Results with the Attachment Variables as Predictors

Variable			B	SE B	β	t
Depression	Step 1	Depression Time 1	.65	.08	.62	7.98**
	Step 2	Depression Time 1	.67	.10	.63	6.49**
		Attachment-anxiety	-.58	.07	-.10	-.85
		Attachment-avoidance	.002	.06	.004	.04
		Marital Anxiety	.10	.12	.10	.87
		Marital Avoidance	.01	.80	.01	.06
Anxiety	Step 1	Anxiety Time 1	.51	.07	.56	6.93**
	Step 2	Anxiety Time 1	.48	.08	.53	5.97**
		Attachment-anxiety	-.05	.05	-.10	-.91
		Attachment-avoidance	.04	.05	.09	.90
		Marital Anxiety	.08	.09	.09	.87
		Marital Avoidance	.09	.07	.13	1.31
Stress	Step 1	Stress Time 1	.53	.08	.57	7.04**
	Step 2	Stress Time 1	.48	.09	.52	5.50**
		Attachment-anxiety	-.03	.08	-.05	-.44
		Attachment-avoidance	.07	.07	.10	.97
		Marital Anxiety	.09	.14	.07	.65
		Marital Avoidance	.05	.09	.05	.53
PND		Attachment-anxiety	.15	.09	.19	1.57
		Attachment-avoidance	.07	.08	.09	.87
		Marital Anxiety	.20	.18	.15	1.14
		Marital Avoidance	.13	.12	.12	1.06

Note. N = 105
*p < .05 ** p < .01

In the *marital relationship* analyses, time 1 dependent variable were entered at step 1 and the relationship variables were entered at step 2, see Table 4. At step 1, time 1 depression predicted 37.6% (adjusted R^2) of the variance in time 2 *depression*, and at

step 2, relationship variables increased the variance to 41.3% (R^2 change=.59, $F_{4,99}$ =2.62, p=.04), and time 1 depression, affectional expression, and dyadic satisfaction predicted depression at time 2. At step 1, time 1 anxiety predicted 31.2% (adjusted R^2) of the variance in time 2 *anxiety*, and at step 2, relationship variables increased the variance by 10.1% to 41.3% (R^2 change=.12, $F_{4,99}$ =5.42, p=.001), and time 1 anxiety and dyadic satisfaction predicted anxiety at time 2. At step 1, time 1 stress predicted 31.8% (adjusted R^2) of the variance in time 2 *stress*, and at step 2, relationship variables increased the variance to 32.4% (R^2 change=.03, $F_{4,99}$=1.22, p=.31), but only time 1 stress predicted time 2 stress. In the analysis of *postnatal depression*, relationship variables predicted 16.4% (adjusted R^2) of the variance in time 2 EPDS, but none of the variables predicted postnatal depression at time 2.

Mediational analyses

Mediational analyses evaluated whether the significant time 1 relationship predictors mediated the relationship between avoidant- and anxious-attachment style to worse psychological distress symptoms at time 2. Four mediational analyses evaluated whether time 1 dyadic satisfaction and affectional expression mediated the relationship between time 1 avoidant- and anxious-attachment to time 2 *depression*. Dyadic satisfaction fully mediated the relationship between attachment-anxiety to depression (p=.009, CI=-.35 to -.05) and attachment-avoidance to depression (p=.005, CI=-.38 to -.07), using bootstrapping and Baron and Kenny's (1986) criteria. Affectional expression did not mediate the relationship between attachment-anxiety to depression (p=.36, CI=-.74 to .27) or attachment-avoidance to depression (p=.15, CI=-.88 to .14). Two meditational analyses evaluated whether dyadic satisfaction mediated the relationship between time 1 avoidant- and anxious-attachment to time 2 *anxiety*. Dyadic satisfaction

was found to mediate the relationships between avoidant attachment to anxiety (p=.000, CI=-.36 to -.12) and anxious attachment to anxiety (p=.000, CI=-.38 to -.14).

Table 4

Summary of the Hierarchical Multiple Regression Analysis Results with Dyadic Adjustment Variables as Predictors

Variable			B	SE B	β	t
Depression	Step 1	Depression Time 1	.65	.08	.62	7.98**
	Step 2	Depression Time 1	.67	.10	.64	7.45**
		Dyadic Consensus	-.08	.06	-.15	-1.29
		Affectional Expression	-.64	.26	-.26	-2.47*
		Dyadic Satisfaction	-.18	.09	-.22	-2.01*
		Dyadic Cohesion	.11	.15	.08	.75
Anxiety	Step 1	Anxiety Time 1	.51	.07	.56	6.93**
	Step 2	Anxiety Time 1	.48	.08	.53	6.37**
		Dyadic Consensus	-.08	.05	-.19	-1.64
		Affectional Expression	-.40	.22	-.20	-1.87
		Dyadic Satisfaction	-.24	.07	-.37	-3.33**
		Dyadic Cohesion	-.18	.12	-.16	-1.50
Stress	Step 1	Stress Time 1	.53	.08	.57	7.04**
	Step 2	Stress Time 1	.53	.08	.57	6.49**
		Dyadic Consensus	-.03	.08	-.04	-.32
		Affectional Expression	-.32	.32	-.11	-.10
		Dyadic Satisfaction	-.17	.11	-.19	-1.64
		Dyadic Cohesion	-.002	.18	-.001	-.01
PND		Dyadic Consensus	-.11	.10	-.16	-1.12
		Affectional Expression	-.05	.39	-.02	-.12
		Dyadic Satisfaction	-.27	.14	-.22	-1.67
		Dyadic Cohesion	-.27	.23	-.14	-1.16

Note. N = 105
*p < .05 ** p < .01

Discussion

Several researchers have indicated there is a need to examine stress and anxiety as well as depression in women during the perinatal period (Matthey et al., 2003; Miller et al., 2006; Rallis et al., 2014; Wardrop & Popadiuk, 2013), but few prior studies have

evaluated risk factors for the states. In particular, attachment and marital quality have been evaluated as predictors of PPD, but rarely have they been examined in anxious or highly stressed new mothers. Thus, the aim of this study was to broadly examine baseline attachment style and marital quality predictors of postpartum depression symptoms, anxiety symptoms, and psychological stress levels in new mothers at 4-6 months postpartum.

Somewhat consistent with *hypothesis 1*, the relationship variables of dyadic satisfaction and affectional expression (but not dyadic cohesion or marital disagreement) were shown to predict postpartum depression symptoms, after controlling for antenatal depression. However, none of the general or marital-specific attachment variables predicted postpartum depression levels. These results are supported by prior research indicating that marital relationship quality and satisfaction may contribute to women's psychological adjustment in the perinatal period (Buist & Bilszta, 2005; Graff et al., 1991; McMahon et al., 2005). However, they are inconsistent with reports that anxious-attachment can predict later PPD (Feeney et al., 2003; Mikulincer & Florian, 1998; Wilkinson & Mulcahy, 2010), although in this study we included both general- and marital-specific measures of attachment in the same analyses. Taken together, the results suggest that low marital satisfaction including emotional affection were risk factors for postpartum depression in new mothers, but not attachment style or marital disagreement.

However, a different profile of results was obtained using the EPDS as the measure of postpartum depression such that no attachment or dyadic variables were found to predict PPD. The reason for the different results using the EPDS and DASS-21 is not clear, since both of the depression measures exclude somatic symptoms that are common in the postpartum period (e.g. weight loss, sleep disturbance, and lack of

energy) (Affonso et al., 2000) and they both assess dysphoric mood and loss of enjoyment in activities. However, the DASS tends to focus on the unique symptoms of each affective state rather than the symptoms, which commonly occur in each state (Lovibond & Lovibond, 1995). Thus, the DASS-depression subscale is likely to be tapping a narrower and perhaps more pure experience of depression than the EPDS, although alternately, they may simply be tapping different experiences.

Somewhat consistent with *hypothesis 2*, dyadic satisfaction predicted high anxiety levels in the new mothers at time 2, after controlling for prenatal anxiety levels. Few prior studies have evaluated this relationship, although the finding is supported generally by research indicating that less positive and poorer quality partner relationships are implicated in the development of postnatal anxiety (Figueiredo et al., 2008). However, no attachment variables (i.e. general or marital-specific) predicted anxiety levels in this study. Taken together, the results suggest that the poor marital satisfaction was a risk factor for postpartum anxiety in new mothers, but not attachment style or dyadic disagreement, cohesion or affection.

However, inconsistent with *hypothesis 3,* no attachment or relationship variables predicted postpartum stress levels, after controlling for antenatal stress levels. Few prior studies have evaluated the relationship between relationship quality and maternal stress, although our study results are generally inconsistent with limited existing research suggesting that dissatisfaction with partner support can increase maternal stress levels (Thorp, Krause, Cukrowicz, & Lynch, 2004). This result suggests that maternal stress may be due to factors (e.g. infant sleep, financial strain or other life stressors) other than the quality of the marital relationship or attachment style.

Finally, *hypothesis 4* was partially supported inasmuch as dyadic satisfaction was shown to mediate the relationship between attachment-anxiety and –avoidance to

postpartum depression and anxiety, although affectional expression did not mediate the relationships in depressed women. These results are somewhat consistent with prior study results indicating that new mothers with high anxious-attachment are at an increased risk of postpartum depression when they perceived insufficient support from their partner (Simpson et al., 2003). Similarly, our results likely indicate that anxiously attached women are at an increased risk of postpartum depression if they experience difficulties in their marital relationship, whereas anxiously- and avoidantly-attached women were at an increased risk of experiencing postpartum anxiety if they experience marital dissatisfaction.

Taken together, the study results suggest that a new mother's attachment system may be activated if they are dissatisfied with the quality of the marital relationship, especially if they are anxiously attached; and this may lead to later anxiety or depression symptoms. However, attachment style may be less important if there is no marital dissatisfaction, even if there is marital discord or disagreement, although such a premise has not previously been examined in the literature. Nonetheless, the study results suggest that the partner relationship may be pivotal in its potential effect on the psychological health of new mothers. However, further longitudinal research is required to evaluate the likely complex interplay between attachment style, relationship quality, and maternal psychological distress during the perinatal period.

Finally, the study results should be interpreted in light of several *study limitations.* First, most of the sample was Caucasian, well educated, and with above-average household incomes. Australian population data shows that approximately 35% of 21-35 year olds and 21% of 35-50 year olds are tertiary educatied, compared with almost 60% of the current sample (Australian Bureau of Statistics, 2012). In addition, the mean Australian household income was approximately $106,000AUD, with a

median of $80,000 in 2014 (ABS, 2014), compared with $122,000AUD in this sample. This limits the generalizability of the results to lower SES women. In particular, low SES is a known risk factor for postpartum depression and anxiety (Britton, 2008; Pope, 2000). Second, the study variables were assessed using self-report measures and there is current debate as to the merits of using self-report measures to examine attachment (Shaver & Mikulincer, 2002). Third, the longitudinal study results cannot be used to make causal inferences about the relationships between the study variables, especially since depression can alter perceptions of intimate relationships (Wilkinson & Mulcahy, 2010; Scharfe, 2007) and relationship satisfaction (Trillingsgaard, Baucom, & Heyman, 2014), and the latter variables are also regarded as risk factors for later postpartum depression and anxiety.

In *conclusion*, low emotional affection and dyadic satisfaction predicted higher postpartum depression levels, whereas only dyadic satisfaction predicted postpartum anxiety in new mothers. Attachment style did not predict stress, anxiety or depression levels, and none of the study variables predicted postpartum stress levels. However, mediational analyses indicated that dyadic satisfaction significantly mediated the relationships between high attachment-anxiety to worse anxiety and depression, and it also mediated the relationship between high attachment-avoidance to later anxiety symptoms. The study results suggest that marital relationship quality may contribute to the development of affective symptoms in new mothers to a greater degree than working models of attachment-avoidance and -anxiety. Clinically, the results suggest that partner relationships should be a key focus for clinicians in the perinatal period. In particular, relationship satisfaction, and emotional intimacy and affection, may be important elements of relationship functioning during this time. Established interventions run through Relationships Australia, or the inclusion of relationship topics

and information in antenatal courses, may provide possibilities for delivering targeted interventions with both partners undergoing the transition to parenthood. The provision of psychological interventions aimed at improving relationship functioning may help to protect new mothers against the potential to experience psychological distress, and should be the focus of future clinical research.

References

Affonso, D. D., De, A. K., Horowitz, J. A., & Mayberry, L. J. (2000). An international study exploring levels of postpartum depressive symptomatology. *Journal of Psychosomatic Research, 49*(3), 207-216. doi:10.1016/S0022-3999(00)00176-8

Australian Bureau of Statistics (2012). *Year Book Australia.* 1301.0-2012.

Australian Bureau of Statistics (2014). *Household Income and Wealth, Australia.* 6523.0, 2013-2014.

Baron, R. M., & Kenny, D. A. (1986). The moderator-mediator variable distinction in social psychological research: Conceptual, strategic, and statistical considerations. *Journal of Personality and Social Psychology, 51*(6), 1173-1182. doi:10.1037/0022-3514.51.6.1173

Bener, A., Gerber, L . M., & Sheikh, J. (2012). Prevalence of psychiatric disorders and associated risk factors in women during their postpartum period: A major public health problem and global comparison. *International Journal of Women's Health,4,* 191-200. doi:10.2147/IJWH.S29380

Bowlby, J. (1969). *Attachment and loss: Vol. 1. Attachment.* New York: Basic Books.

Brennan, K. A., Clark, C. L., & Shaver, P. R. (1998). Self-report measurement of adult attachment: An integrative overview. In J. A. Simpson & W. S. Rholes (Eds.), *Attachment theory and close relationships* (pp. 46-76). New York: Guilford Press.

Britton, J. R. (2005). Pre-discharge anxiety among mothers of well newborns. Prevalence and correlates. *Acta Paediatrica, 94*(12), 1771-1776. doi:10.1080/08035250500192664

Britton, J. R. (2008). Maternal anxiety: Course and antecedents during the early postpartum period. *Depression and Anxiety, 25,* 793-800. doi:10.1002/da.20325

Buist, A., & Bilszta, J. (2005). *Beyondblue National Postnatal Depression Program, Volume 1: National screening program* – Retrieved from www.beyondblue.org.au

Cowan, C. P., & Cowan, P. A. (2000). *When partners become parents: The big life change in couples.* Mahwah, NJ: Erlbaum.

Cox, J. L., Holden, J. M., & Sagovsky, R. (1987). Detection of postnatal depression. Development of the 10-item Edinburgh postnatal depression scale. *British Journal of Psychiatry, 150,* 782-786. doi:10.1192/bjp.150.6.782

Dennis, C-L. E., Janssen, P. A., & Singer, A. (2004). Identifying women at-risk for postpartum depression in the immediate postpartum period. *Acta Psychiatrica Scandinavica, 110,* 338-346. doi:10.1111/j.1600-0447.2004.00337.x

Dipietro, J. A., Costigan, K. A., & Sipsma, H. L. (2008). Continuity in self-report measures of maternal anxiety, stress, and depressive symptoms from pregnancy through two years postpartum. *Journal of Psychosomatic Obstetrics and Gynecology, 29*(2), 115-124. doi:10.1080/01674820701701546

Don, B. P., Chong, A., Biehle, S. N., Gordon, A., & Mickelson, K. D. (2014). Anxiety across the transition to parenthood: Change trajectories among low-risk parents. *Anxiety, Stress, & Coping, 27*(6), 633-649. doi:10.1080/10615806.2014.903473

Faisal-Curry, A., & Menezes, R. P. (2007). Prevalence of anxiety and depression during pregnancy in a private setting sample. *Archives of Women's Mental Health, 10,* 25-32. doi:10.1007/s00737-006-0164-6

Feeney, J., Alexander, R., Noller, P., & Hohaus, L. (2003). Attachment insecurity, depression, and the transition to parenthood. *Personal Relationships, 10,* 475-493. doi:10.1046/j.1475-6811.2003.00061.x

Fraley, C. R., Heffernan, M . E., Vicary, A. M., & Brumbaugh, C. C. (2011). The experiences in close relationships – relationship structures questionnaire: A method for assessing attachment orientations across relationships. *Psychological Assessment, 23*(3), 615-625. doi:10.1037/a0022898

Gaillard, A., Le Strat, Y., Mandelbrot, L., Keita, H., Dubertret, C. (2014). Predictors of postpartum depression: Prospective study of 264 women followed during pregnancy and postpartum. *Psychiatry Research, 215*(2), 341-346. doi:10.1016/j.psychres.2013.10.003

George, A., Luz, R. F., De Tychey, C., Thilly, N., & Spitz, E. (2013). Anxiety symptoms and coping strategies in the perinatal period. *BMC Pregnancy and Childbirth, 13,* 233-238. doi:10.1186/1471-2393-13-233

Gourounti, K., Anagnostopoulos, F., & Sandall, J. (2014). Poor marital support associate with anxiety and worries during pregnancy in Greek pregnant women. *Midwifery, 30*(6), 628-635. doi:10.1016/j.midw.2013.10.008

Graff, L. A., Dyck, D. G., & Schallow, J. R. (1991). Predicting postpartum depressive symptoms: A structural modelling analysis. *Perceptual and Motor Skills, 73,* 1137-1138. doi:10.2466/pms.1991.73.3f.1137

Le Strat, Y.L., Dubertret, C., & Le Foll, B. (2011). Prevalence and correlates of major depressive episode in pregnant and postpartum women in the United States. *Journal of Affective Disorders, 135*(1), 128-138. doi:10.1016/j.jad.2011.07.004

Levy-Shiff, R. (1994). Individual and contextual correlates of marital change across the transition to parenthood. *Developmental Psychology, 30,* 591-601. doi:10.1037/0012-1649.30.4.591

Lovibond, S.H., Lovibond, P. F. (1995). *Manual for the depression anxiety stress scales 2nd Edition.* Psychology Foundation of Australia: Sydney.

Lovibond, P. F., & Lovibond, S. H. (1995). The structure of negative emotional states: Comparison of the Depression Anxiety Stress Scales (DASS) with the Beck Depression and Anxiety Inventories. *Behaviour Research and Therapy, 33*(3), 335-343. doi:10.1016/0005-7967(94)00075-U

Matthey, S., Barnett, B., Howie, P., & Kavanagh, D. J. (2003). Diagnosing postpartum depression in mothers and fathers: Whatever happened to anxiety? *Journal of Affective Disorders, 74,* 139-147. doi:10.1016/S0165-0327(02)00012-5

McMahon, C., Barnett, B., Kowalenko, N., & Tennant, C. (2005). Psychological factors associated with persistent postnatal depression: Past and current relationships, defence styles and the mediating role of insecure attachment style. *Journal of Affective Disorders, 84,* 15-24. doi:10.1016/j.jad.2004.05.005

Meades, R., & Ayers, S. (2011). Anxiety measures validated in perinatal populations: A systematic review. *Journal of Affective Disorders, 133*(1), 1-15. doi:10.1016/ j.jad.2010.10.009

Mikulincer, M., & Florian, V. (1998). The relationship between adult attachment styles and emotional and cognitive reactions to stressful events. In J. A. Simpson & W. S.Rholes (Eds.). *Attachment theory and close relationships* (pp. 46-76). New York: Guilford Press.

Mikulincer, M., & Shaver, P. R. (2007). *Attachment in adulthood: Structure, dynamics, and change.* New York: Guilford Press.

Milgrom, J., Gemmill, A. W., Bilszta, J. L., Hayes, B., Barnett, B., Brooks, J., Ericksen, J., Ellwood, D., & Buist, A. (2008). Antenatal risk factors for postnatal depression. A large prospective study. *Journal of Affective Disorders, 108,* 147-157. doi:10.1016/j.ja d.2007.10.014

Miller, R. L., Pallant, J. F., & Negri, L. M. (2006). Anxiety and stress in the postpartum: Is there more to postnatal distress than depression. *BMC Psychiatry, 6,* 12-22. doi:10.1186/1471-244X-6-12

O'hara, M. W., & Swain, A. M. (1996). Rates and risk of postpartum depression – a meta-analysis. *International Review of Psychiatry, 8*(1), 37-54. doi:10.3109/09540269609037816

Pope, S. (2000). *Postnatal depression: A systematic review of published scientific literature to 1999.* National Health and Medical Research Council, Australia.

Rallis, S., Skouteris, H., McCabe, M., & Milgrom. J. (2014). The transition to motherhood: Towards a broader understanding of perinatal distress. *Women and Birth, 27*(1), 68-71. doi:10.1016/j.wombi.2013.12.004

Safford, S. M., Alloy, L. B., Crossfield, A. G., Morocco, A. M., & Wang, J. C. (2004). The relationship of cognitive style and attachment style to depression and anxiety in young adults. *Journal of Cognitive Psychotherapy, 18*(1), 25-41. doi:10.1891/jcop.18.1.25.28046

Scharfe, E. (2007). Cause or consequence? Exploring causal links between attachment and depression. *Journal of Social and Clinical Psychology, 26*(9), 1048-1064. doi:10.1521/jscp.2007.26.9.1048

Shaver, P. R., & Mikulincer, M. (2002). Attachment-related psychodynamics. *Attachment and Human Development, 4*(2), 133-161. doi:10.1080/14616730210154171

Simpson, J. A. (1990). Influence of attachment styles on romantic relationships. *Journal of Personality and Social Psychology, 59*(5), 971-980. doi:10.1037/0022-3514.59.5.971

Simpson, J. A., & Rholes, W. S. (2008). Attachment, perceived support, and the transition to parenthood: Social policy and health implications. *Social Issues and Policy Review, 2*(1), 37-63. doi:10.1111/j.1751-2409.2008.00010.x

Simpson, J. A., Rholes, W. S., Campbell, L., Tran, S., & Wilson, L. (2003). Adult attachment, the transition to parenthood, and depressive symptoms. *Journal of Personality and Social Psychology, 84*(6), 1172-1187. doi:10.1037/0022-3514.84.6.1172

Spanier, G. B. (1976). Measuring dyadic adjustment: New scales for assessing the quality of marriage and similar dyads. *Journal of Marriage and Family, 38*(1), 15-28. doi:10.2307/350547

Thorp, S. R., Krause, E. D., Cukrowicz, K. C., & Lynch, T. R. (2004). Postpartum partner support, demand-withdraw communication, and maternal stress. *Psychology of Women Quarterly, 28*(4), 362-369. doi:10.1111/j.1471-6402.2004.00153.x

Trillingsgaard, T., Baucom, K. J. W., & Heyman, R. E. (2014). Predictors of change in relationship satisfaction during the transition to parenthood. *Family Relationships, 63*(5), 667-679. doi:10.1111/fare.12089

Vythilingum, B. (2008). Anxiety disorders in pregnancy. *Current Psychiatry Reports, 10*(4), 331-335. doi:10.1007/s11920-008-0053-y

Wardrop, A. A., & Popadiuk, N. E. (2013). Women's experiences with postpartum anxiety: Expectations, relationships and sociocultural influences. *The Qualitative Report, 18,* 1-24.

Wenzel, A., Haugen, E. N., Jackson. L. C., & Brendle, J. R. (2005). Anxiety symptoms and disorders at eight weeks postpartum. *Anxiety Disorders, 19,* 295-311. doi:10.1016/j.janxdis.2004.04.001

Wenzel, A., Haugen, E. N., Jackson, L. C., & Robinson, K. (2003). Prevalence of generalised anxiety at eight weeks postpartum. *Archive of Womens Mental Health, 6,* 43-49. doi:10.1007/s00737-002-0154-2

Whisman, M. A., Davila, J., & Goodman, S. H. (2011). Relationship adjustment, depression, and anxiety during pregnancy and the postpartum period. *Journal of Family Psychology, 25*(3), 375-383. doi:10.1037/a0023790

Wilkinson, R. B., & Mulcahy, R. (2010). Attachment and interpersonal relationships in postnatal depression. *Journal of Reproductive and Infant Psychology, 28*(3), 252-265. doi:10.1080/02646831003587353

Williams, K. L., Riskind, J. H. (2004). Adult romantic attachment and cognitive vulnerabilities to anxiety and depression: Examining the interpersonal basis of vulnerability models. *Journal of Cognitive Psychology, 18,* 7-24. doi:10.1891/jcop.18.1.7.28047

Paper 2: Quality of Relationships with Parents and Close Friends as Predictors of Stress, Anxiety and Depression Symptoms in Expectant and New Mothers

Danielle Clout (BSc(hons)[1] and Rhonda Brown [BSc(hons), PhD][1]

Article submitted for publication

1. Australian National University, Australia

Abstract

Background: The purpose of this paper was to analyze the potential contribution of attachment-avoidance and attachment-anxiety in women's relationships with their parents and close friends to their experience of depression, anxiety, and stress symptoms during the third trimester and 4-6 months postpartum. In addition, we examined changes in women's attachment networks over the transition to parenthood. **Method:** One-hundred-thirty-nine women completed the baseline questionnaire, which asked about their recent experience of psychological distress and their attachment to key relationship figures, and 105 women completed the follow-up assessment at 4-6 months postpartum. **Results:** Attachment-anxiety in women's relationship to their mothers and close friends was associated with higher depression levels during pregnancy, but only attachment-anxiety to mothers predicted high depression levels postpartum. However, attachment-anxiety to mothers and attachment-avoidance to friends predicted high anxiety levels during pregnancy, and attachment-anxiety to mothers predicted high stress levels during pregnancy. However, no attachment variables predicted anxiety and stress levels postpartum. The size of women's attachment networks remained stable between pregnancy and the postpartum, although they relied less on their partners and close friends for their attachment needs postpartum. **Discussion:** The results from this study suggest that a woman's relationships with her mother and close friends may buffer against the potential to experience psychological distress during pregnancy and the postpartum period, despite changes in the structure of her attachment relationships during this time.

The transition to parenthood can be a challenging time for expectant and new mothers as they deal with new physical and psychological changes (Webb, Bloch, Coyne, Chung, Bennett, & Culhane, 2008) and as they adjust to the new expectations, roles, and responsibilities of parenthood (Bost, Cox, Burchinal, & Payne, 2002; Logsdon, Wisner, & Pinto-Foltz, 2006). As a consequence, their perceptions of family and peer relationships and networks may become critical as they face the challenges of parenthood and seek to optimize their wellbeing (Barkin, Bloch, Hawkins, & Thomas, 2014; Negron, Martin, Almog, Balbierz, & Howell, 2013).

This transition can also be a time of increased vulnerability to psychological distress in women. *Postpartum depression* (PPD) is the most widely researched psychological consequence of childbearing, and prevalence estimates for PPD range from 3 to more than 25% of new mothers in the first 12-months postpartum (Dennis, Janssen, & Singer, 2004); depending on the sample characteristics, screening instruments, and statistical methods used (Gaillard, Le Strat, Mandelbrot, Keïta, & Dubertret 2014; O'hara & Swain, 1996; Le Strat, Dubertret, & Le Foll, 2011). In addition, *anxiety* symptoms are common in the perinatal period, with prevalence estimates ranging from 6% to over 31% during the first 6-months postpartum (Britton, 2005, 2008; Wenzel, Haugen, Jackson, & Robinson, 2003), suggesting that it is more common than depression during this time (Wenzel et al., 2003). However, stress has rarely been evaluated during the perinatal period, despite some researchers arguing that it needs to be viewed as a separate affective state that should be included in the broader definition of perinatal distress (Miller, Pallant, & Negri, 2006; Rallis, Skouteris, McCabe & Milgrom, 2014).

No singular cause of this perinatal psychological distress has been identified, although close relationships, social support, and attachment have consistently been

implicated in the development of PPD. In particular, *attachment theory* (Bowlby 1969; 1988) is considered to be a useful framework for evaluating significant relationships across the lifespan, with internal working models of attachment thought to influence a person's interpersonal expectations, motivations, and behaviour in intimate relationships (Calvo, Palmieri, Codato, Testoni, & Sambin, 2012). Typically, these intimate relationships are evaluated in terms of *attachment-anxiety* (i.e. concern about rejection and abandonment in close relationships) and *attachment-avoidance* (i.e. discomfort with closeness) (Brennan, Clark & Shaver, 1998; Simpson, 1990). Working models of attachment have previously been shown to predict PPD levels (Feeney, Alexander, Noller, & Hohaus, 2003; Simpson, Rholes, Campbell, Tran, & Wilson, 2003; Wilkinson & Mulcahy, 2010), but the framework has rarely been applied to perinatal anxiety and stress.

Attachment theory was originally used to examine the bond between infants and their caregivers, although it is now recognised that the functions of attachment bonds in infant-caregiver dyads may help to inform the quality of an *adult's* close committed relationships (Ainsworth, 1989). That is, adults typically desire to be with their close relationship figures (i.e. proximity seeking), they seek comfort from them during times of stress (i.e. safe haven), they may become distressed when they are not available (i.e. separation protest), and they will derive a sense of security and confidence from the relationships (i.e. secure base) (Doherty & Feeney, 2004). To date, the main focus of the perinatal attachment literature has been romantic partners (Feeney, 1999; Weiss, 1991) and the small literature indicates that romantic partners are relied on for all four of the above attachment functions (Doherty & Feeney, 2004), and that a supportive partner relationships can best predict a new mother's adaptation (Goldstein, Diener, &

Mangelsdorf, 1996). However, little is known about the potential role(s) of other key relationships (e.g. mother) in women's adjustment to parenthood.

Thus, an expectant mother's relationships with her parents, children, siblings, and friends are also considered to be important attachment bonds (Ainsworth, 1989; Weiss, 1982; 1991), which are also likely to be related to and predict maternal mental health. It has been proposed that a person's attachment to their parents continues throughout life (Bowlby, 1980) so that as adults they tend to maintain meaningful relationships with and depend on them during challenges or times of stress (Cicirelli, 1983), especially their mother. For example, Calvo et al. (2012) found that young women tend to rate their mother highest on the secure-base function, regardless of whether they had a romantic partner. Similarly, Doherty and Feeney (2004) found that mothers were ranked second after the partner on most attachment functions, indicating that they continue to play a role in a person's attachment network. However, the research on attachment to fathers is significantly lacking (Freeman, Newland, & Coyl, 2010), and the available study results are conflicting, especially in regards to the proportion of fathers as the preferred target for attachment support (range: 1 – 20%) (Doherty & Feeney, 2004; Freeman & Brown, 2001; Trinke & Bartholomew, 1997).

Similarly, close friendships are thought to fulfil attachment needs (Doherty & Feeney, 2004) since the relationships are typically characterised by trust, dependability and emotional support, which are fundamental to attachment bonds (Fraley & Davis, 1997). Thus, partners and close friends may come to replace the parents as the preferred source of emotional support and proximity seeking, during the transition to adulthood (Freeman & Brown, 2001). However, few prior studies have evaluated the role of close friendships during the transition to parenthood, with some studies reporting that after the birth of a child, friendships tend to suffer (Feeney, Hohaus, Noller, & Alexander,

2001), with the new parents reporting less contact and support from their friends, and a decline in the friendship network (Kalmijn, 2012). Alternately, other studies have reported that friends may provide less practical help but are still key supports (Gameiro, Moura-Ramos, Canavarro, & Soares, 2011; Leinonen, Solantaus, & Punamäki, 2003), and they may help to buffer against the potential to experience depressive symptoms in mothers of young children (Goldstein & Genero, 1995 in Bost et al., 2002).

Finally, few studies have addressed the structural changes that occur in a woman's attachment networks during the transition to parenthood (Bost et al., 2002; Kalmijn, 2012). Feeney et al. (2001) has examined the attachment figures of new parents relative to couples without children, and they found that new parents tend to rely on their parents more often than their spouse or friends, relative to childless couples. However, in contrast, Bost et al. (2002) found that a mother's attachment networks tended to be stable from the pre- to postnatal period, but there were changes in the quality, level of contact, and supportiveness of the relationships. Further, lower parental depression levels were shown to be associated with greater support provided by the relationships.

In *summary,* recent research suggests that the quality of a woman's attachment to key individuals including her mother, father, and close friends may impact on her psychological wellbeing during the transition to parenthood. However, few studies have evaluated the relationships between the quality of attachment to these figures, and maternal stress, anxiety and depression levels, and few studies have evaluated the relationships longitudinally. Thus, in this study, we examined the links between the quality of attachment to women's parents and close friends, and their symptoms of depression, anxiety and stress during the perinatal period. Maternal attachment to the spouse and the quality of the spousal relationship is examined in another paper (Clout &

Brown, submitted). Consistent with the limited available literature, it was hypothesised that:

1) The quality of a woman's attachment relationship to her mother, as measured by level of attachment anxiety and avoidance, will be inversely related to their depression symptoms, before and after the birth of their child; and,
2) Women are expected to predominantly rely on their partners, and possibly their mothers to fulfil the four attachment functions (i.e. safe haven, secure base, proximity seeking, and separation protest).

All other potential relationships between quality of women's attachment relationships, attachment functions, and maternal stress, anxiety and depression levels will be explored making no *a priori* assertions. In addition, the pattern of women's attachment networks, including changes in their size between pre- to postpartum will be explored.

Method

Participants:

This study was conducted with full ethics approval from the Australian National University (ANU) Human Research Ethics Committee (Protocol Number 2010/650). Potential participants were indirectly recruited to the study via advertisements placed on a number of online parenting forums and social media websites (www.essentialbaby.com.au/ forums/, www.facebook.com, www.bubhub.com.au/community/forums/forum.php), and through email snowballing. Study inclusion criteria were an age of 18 years or older, female gender, being in cohabiting or marital relationship with the father of the expectant infant, and in the third-trimester of pregnancy, either as a primiparous or multiparous expectant mother. No reimbursements were provided to the participants.

An *a priori* power analysis indicated that at least 103 participants were required, assuming a small to medium effect size (f^2=.15), with alpha set at .05, power of .8, and up to 7 predictors when analysing the continuous DASS-21 score. As few research studies have used the DASS-21 for longitudinal research into perinatal distress, a small to medium effect size was assumed based on Yelland et al. (2010) reporting medium effect sizes in similar research. One-hundred-seventy-five women emailed the researcher (DC) and 139 completed the baseline questionnaire (response rate=79.4%). Most of the women (*N*=105) completed the follow-up questionnaire at 4-6 months postpartum (retention rate=75%). Women who did not complete the follow-up questionnaire were not found to differ significantly on demographic or psychological variables when compared with those who completed the questionnaire at both time points. All women were in a marital or cohabiting relationship with the father of the expectant child, at baseline and 4-6 months postpartum.

The mean age of participants was 31.6 years (*SD*=4.35, range 20-43 years). Forty-percent of the women (*N*=56) were multiparous and the remainder (*N*=83) were preparing to give birth to their first child. Most participants (*N*=111, 79.9%) were married and the rest lived in a de facto relationship, with a mean relationship length of 6.8 years (*SD*=3.48, range 11 months to 19 years). Most participants (*N*=130, 93.5%) identified as Caucasian, 3 identified as Asian, two as South-East Asian, one as Indigenous, and 3 as other. More than one-half of participants (*N*=83, 59.7%) had completed university, 30 (21.6%) had completed TAFE, 23 had graduated from Year 12, and 3 left school at Year 10. Less than one-half of participants (N=59, 42.4%) were employed full-time, one-quarter (*N*=35, 25.2%) were in casual or part-time employment, one-quarter (*N*=40, 28.8%) undertook home duties, and five were

unemployed. The mean income of the expectant couples was A$120,381 (*SD*=$67,595, range: $27,000 – $500,000).

Measures

Symptoms of depression, anxiety, and stress over the past week were assessed using the *Depression, Anxiety, and Stress Scales-21 (DASS-21)* (Lovibond & Lovibond, 1995). The authors of the scale have attempted to reduce the symptom overlap between the three subscales so as to measure the unique symptoms of each state (Lovibond & Lovibond, 1995). The scale asks participants to rate the presence and severity of negative emotions, using 4-point scales ranging from 0 (*did not apply to me at all*) to 3 (*applied to me very much/most of the time*), with high scores indicating worse symptoms. There is Australian normative data for the scale (Lovibond & Lovibond, 1995). The DASS depression scale has good convergent validity with the Beck Depression Inventory (r=.74), and the DASS anxiety scale is correlated with the Beck Anxiety Inventory (r=.81) (Lovibond & Lovibond 1995a;b). The scale is reported to have high internal consistency, with Cronbach's alphas of .81 for depression, .73 for anxiety, and .81 for stress (Lovibond & Lovibond, 1995). In this study, internal consistencies of the subscales at Time 1 were .91 for depression, .84 for anxiety, and .88 for stress, and at time 2, they were .86 for depression, .79 for anxiety, and .76 for stress.

Attachment patterns in women's relationships with their mother, father, and close friends were assessed using the *Relationship Structures Questionnaire of the Experiences in Close Relationships-Revised (ECR-RS, 9-item)* (Fraley, Heffernan, Vicary, & Brumbaugh, 2011). This scale asks participants to assess the attachment targets using 7-point Likert scales ranging from 1 (*Strongly Disagree*) to 7 (*Strongly Agree*). The scale has two subscales, attachment-avoidance (6-item) and attachment-anxiety (3-item) for each of the targets. ECR-RS scores are reported to be reliable with

Cronbach's alphas for attachment-anxiety to mother (.84), father (.87), and friend (.83) and Chronbach's alphas for attachment-avoidance to mother (.91), father (.92), and friend (.85). ECR-RS scores are reported to predict intra- and interpersonal outcomes better than general attachment measures (Fraley et al., 2011). In this study, Cronbach's alphas at time 1 were as follows, for attachment-anxiety to mother (.9), father (.92), and friends (.93), and for attachment-avoidance to mother (.94), father (.95), and friends (.93). Marital relationship partners were not evaluated using this scale.

Expectant mother's attachment networks and network changes were measured using an adaptation of Trinke and Bartholomew's (1997) *Attachment Network Questionnaire (ANQ).* This two-part measure asks respondents to list up to 10 people to whom they "feel a strong emotional tie, regardless of whether that tie is positive or negative". Respondents provided details of the gender, age, and their relationship to each person. In the second part, they selected up to three people they had identified in part 1, and rated them in order of importance for the attachment functions of safe haven, secure base, proximity seeking, and separation protest. *Strength of attachment relationships* to the partner, mother, father, friends, close family (i.e. siblings, in-laws, grandparents) and other relationships was calculated by averaging the scores across the four attachment functions (range: 0 to 6) to produce a total score for each figure, and for each function. The scoring of the ANQ was done in the standard manner, however, groups were made for friends, close family, and other relationships, rather than analysing the contribution of some relationships (i.e. siblings, grandparents, cousins) in isolation. The ANQ was shown to have adequate internal consistency in this study, with Cronbach's alphas of .71 at time 1 and .79 at time 2.

Procedure

Interested individuals contacted the researched by email if they wished to participate in the study. Women in their third trimester of pregnancy were sent an email with their study ID number and a link to the online survey to complete at approximately 32-36 weeks gestation (time 1) (*mean* = 33.9 weeks*, SD* = 2.9, range: 29-39 weeks) (https://anupsych.co1.qualtrics.com/SE/?SID=SV_b2AcZtbcYiWjZl2). If they were in an earlier stage of pregnancy, their permission was sought to contact them in the third trimester, and if granted, they were emailed in the same manner at this stage. They were then contacted by email at 4-months postpartum (time 2), and if they agreed to participate, they were emailed a study ID code and a link to the online follow-up questionnaire (https://anupsych. co1.qualtrics.com/SE/?SID=SV_eSazN4fdTc3azYM). The mean time to follow up was 21.5 weeks (i.e. about 5-months postpartum; *SD*=2.8, range: 17-28 weeks postpartum).

Statistical Analyses

All study measures were assessed at time 1 and 2. Routine statistical analyses were performed using IBM SPSS statistical software (Version 22). Descriptive analyses and Pearson's correlation coefficients were conducted on all key study variables. Multiple regression analyses were conducted to identify *time 1* attachment to mother, father, and friends predictors of depression, anxiety and stress levels prenatally (i.e. cross sectional analyses), and, hierarchical multiple regression analyses were conducted to identify *time 1* attachment to the mother, father and friends predictors of depression, anxiety, and stress at *time 2* (i.e. longitudinal analyses). Attachment network subscores were analysed using paired samples *t*-tests to determine whether the use of each attachment figure changed over the two time periods. Repeated-measures analysis of

variance (ANOVA) determined whether the use of each attachment figure differed across the four functions of attachment.

Results

Univariate outliers were detected in depression, anxiety, and stress scores at time 1 and time 2, and attachment-anxiety to the mother, father and close friends, and attachment-avoidance to friends. No cases were excluded as they represented clinically relevant cases of distress and attachment, and the 5% trimmed means were similar to the original means. The variables were all skewed and the Kolmogorov-Smirnov and Shapiro-Wilk normality tests were significant ($p<.05$) indicating they had non-normal distributions. Data transformations did not normalise the score distributions, and the same profile of results was obtained using square-root transformed and untransformed date (results not shown). Thus, only the untransformed data is presented in the study. Non-normal distribution of data is typical in social sciences research, and violation of this assumption is not considered to cause issues with using parametric statistical analysis techniques when sample size is adequate (over 30), with parametric techniques also having the advantage of better statistical power (Pallant, 2007). Furthermore, the use of non-parametric statistics is most appropriate when the area of study is best represented by the mean score (Pallant, 2007), which is not the case for these research questions. Therefore, parametric statistics have been selected for use in this paper. No multicollinearity (above .7) was evident between the independent variables.

Means and standard deviations of the key study variables and Pearson product-moment correlation coefficients between the time 1 attachment target variables (independent variables, IV) and time 1 and 2 depression, anxiety, and stress scores (dependent variables, DV) are provided in Table 1. Depression, anxiety, and stress scores were strongly inter-correlated cross-sectionally and longitudinally. Time 1

depression, anxiety and stress scores were mostly correlated with attachment-anxiety and attachment-avoidance to mothers and friends, but not fathers. Refer to Paper 1 (Clout & Brown, 2016) for DASS-21 prevalence data.

Table 1

Means, Standard Deviations and Correlations for the Key Study Variables

	M	*(SD)*	Dep1	Anx1	Str1	Dep2	Anx2	Str2	MAn	MAv	FAn	FAv	PAn	PAv
Dep1	6.25	7.2		.66**	,66**	.62**	.46**	.50**	.42**	.17	.21*	.16	.45**	.32**
Anx1	6.38	6.9			.70**	.43**	.56**	.59**	.35**	.21*	.03	.08	.23*	.29*
Str1	12.38	9.17				.39**	.39**	.57**	.31**	.30**	.06	.18	.22*	.29*
Dep2	6.36	7.7					.62**	.70**	.37**	.08	.12	.12	.38*	.21*
Anx2	4.15	6.24						.66**	.21*	.06	-.04	-.04	.17	.20*
Str2	11.7	8.7							.35**	.30**	.10	.17	.21*	.21*
MAn	5.44	3.64								.54**	.32**	.15	.35**	.17
MAv	19.28	9.48									.16	.31**	.22*	.30**
FAn	6.58	4.72										.65**	.36**	.20*
FAv	22.77	10.91											.28**	.34**
PAn	5.82	3.28												.67**
PAv	13.11	6.16												

Note. N = 105. Dep1 = DASS-21 total depression score (t1), Anx1 = DASS-21 total anxiety score (t1), Str1 = DASS-21 total stress score (t1), Dep2 = DASS-21 total depression score (t2), Anx2 = DASS-21 total anxiety score (t2), Str2 = DASS-21 total stress score (t2), MAn = attachment anxiety to mother, MAv = attachment avoidance to mother, FAn = attachment anxiety to father, FAv = attachment avoidance to father, PAn = attachment anxiety to close friend, PAv = attachment avoidance to close friend.

[a]two-Tailed Pearson Correlation in SPSS, * $p < .05$. ** $p < .01$

Cross-sectional multiple regression analyses were conducted to determine whether time 1 attachment to mothers, fathers, and friends predicted time 1 depression, anxiety and stress, see Table 2. In the analysis of *depression,* time 1 attachment variables predicted 25.4% (adjusted R^2) of the variance in time 1 depression, and attachment-anxiety to mother and close friends significantly predicted higher depression levels. In the analysis of *anxiety,* time 1 attachment variables predicted 14.4% (adjusted R^2) of the variance in time 1 anxiety, and attachment-anxiety to mother and attachment-avoidance to friends predicted higher anxiety levels. In the analysis of *stress,* time 1 attachment variables predicted 13.3% of the variance in time 1 stress, but only attachment-anxiety to mothers predicted stress levels.

Table 2

Summary of Multiple Regression Analyses Predicting time 1 Depression, Anxiety and Stress Scores.

Variable		B	SE B	β	t
Depression	Mother Avoidance	-.06	.04	-.15	-.14
	Mother Anxiety	.42	.12	-.40	-.14**
	Father Avoidance	.02	.04	.07	.55
	Father Anxiety	-.04	.10	-.05	-.42
	Close Friend Avoidance	.06	.07	.11	.90
	Close Friend Anxiety	.29	.13	.27	2.13*
Anxiety	Mother Avoidance	-.03	.04	-.07	-.61
	Mother Anxiety	.39	.12	.40	3.27**
	Father Avoidance	.02	.04	.06	.47
	Father Anxiety	-.13	.11	-.17	-1.24
	Close Friend Avoidance	.15	.07	.28	2.12*
	Close Friend Anxiety	-.04	.13	-.04	-.29
Stress	Mother Avoidance	.03	.06	.07	.56
	Mother Anxiety	.37	.16	.28	2.25*
	Father Avoidance	.08	.06	.18	1.37
	Father Anxiety	-.21	.14	-.19	-.15
	Close Friend Avoidance	.14	.10	.20	1.48
	Close Friend Anxiety	.001	.19	.001	.01

Note. N = 105

[a]2-Tailed Pearson Correlation in SPSS, * $p < .05$. ** $p < .01$

Hierarchical longitudinal multiple regression analyses were conducted to determine whether time 1 attachment-avoidance and attachment-anxiety to mother,

father and close friends predicted depression, anxiety and stress at time 2, see Table 3. In the analyses, the time 1 DV was entered at step 1, and the attachment variables were entered at step 2. In the analyses of *depression*, time 1 depression predicted 37.6% (adjusted R^2) of the variance in depression; and at step 2, the attachment variables predicted an additional 1.7%, increasing the variance to 39.3%. Only time 1 depression and attachment-anxiety to mother predicted time 2 depression score. In the analysis of *anxiety,* time 1 anxiety predicted 31.2% (adjusted R^2) of the variance in anxiety, and at step 2, the attachment variables predicted an additional 2.4 %, increasing the variance to 33.6%. Only time 1 anxiety predicted time 2 anxiety score. In the analysis of *stress,* time 1 stress predicted 31.8% (adjusted R^2) of the variance in time 2 stress, but at step 2, the attachment variables did not predict additional variance, and only time 1 stress predicted time 2 stress score.

Table 3

Hierarchical Multiple Regression Analyses Predicting Time 2 Depression, Anxiety, and Stress Scores

Variable			B	SE B	β	t
Depression	Step 1	Depression Time 1	.65	.08	.62	7.98**
	Step 2	Depression Time 1	.53	.1	.51	3.61**
		Mother Avoidance	-.06	.04	-.15	-1.53
		Mother Anxiety	.25	.12	.23	2.08*
		Father Avoidance	.05	.04	.14	1.28
		Father Anxiety	-.16	.1	-.18	-.16
		Close Friend Avoidance	-.05	.07	-.08	-.7
		Close Friend Anxiety	.21	.13	.19	1.6
Anxiety	Step 1	Anxiety Time 1	.51	.07	.56	6.93**
	Step 2	Anxiety Time 1	.49	.08	.54	5.84**
		Mother Avoidance	-.03	.04	-.09	-.87
		Mother Anxiety	.07	.11	.08	.66
		Father Avoidance	-.02	.04	-.07	-.54
		Father Anxiety	-.03	.09	-.04	-.36
		Close Friend Avoidance	.04	.06	.07	.59
		Close Friend Anxiety	.02	.11	.03	.21
Stress	Step 1	Stress Time 1	.53	.08	.57	7.04**
	Step 2	Stress Time 1	.46	.08	.49	5.50**
		Mother Avoidance	.02	.05	.05	.45
		Mother Anxiety	.21	.14	.16	1.48
		Father Avoidance	.02	.05	.05	.45
		Father Anxiety	-.04	.12	-.04	-.30
		Close Friend Avoidance	-.01	.08	-.02	-.16
		Close Friend Anxiety	.06	.15	.05	.39

Note. N = 105
[a]2-Tailed Pearson Correlation in SPSS, * p < .05. ** p < .01

Finally, in regards to *attachment networks,* the mean number of people the women listed as having "felt a strong emotional tie to" at time 1 was 8.27 (*SD*=2.2), and at Time 2 it was 8.15 (*SD*=2.25). A paired-samples *t*-test revealed the number of significant people listed did not vary across the time points $t(104)=.49$, $p=.62$.

Paired samples t-tests were used to assess attachment figure total scores across the two time-points, see table 4. Total attachment scores for the partner and close friends significantly decreased from time 1 to time 2, although the total reliance on other attachment figures remained stable over time.

Table 4

Mean Scores for each Attachment Figure at Each Time-point

	Partner	Mother	Father	Friends	Close Family	Other
T1	22.44(2.55)$_a$	6.4(6.2)	2.27(3.15)	7.7(6.7)$_a$	3.3(5.1)	1(3.4)
T2	21.10(4.1)$_b$	7.14 (6.2)	2.1(2.7)	6.1(6.5)$_b$	3.4(4.7)	0.82(2.4)

Note. Higher numbers reflect greater attachment strength (0-24); standard deviations are in parentheses; means within each column differ significantly if they have different subscripts. Those with no subscripts do not differ significantly.

Repeated-measures analysis of variance (ANOVA) was then used to assess use of the attachment figures on each of the four attachment functions. As shown in Table 5, the attachment functions women used differed between the attachment figures (all *p*s<.05), with the partner relied upon strongly for all four-attachment functions, whereas reliance on mothers and fathers was elevated for the secure-base function, and reliance on close friends was elevated for the safe-haven and proximity-seeking functions.

Table 5

Mean Scores on Each Attachment Function for Each Attachment Figure

	Partner	Mother	Father	Friend	Close Family	Other
Safe Haven	16.6(2.9)$_a$	6.2(5.0)$_a$	1.1(2.0)$_a$	6.5(4.8)$_a$	2.9(3.7)$_a$	0.68(1.9)
Secure Base	15.5(3.9)$_b$	7.2(5.2)$_b$	3.4(3.8)$_b$	4.2(4.9)$_b$	2.9(3.9)	0.39(1.3)$_a$
Proximity Seeking	15.9(3.2)	4.1(4.2)^c	0.7(1.3)$_c$	6.5(4.9)$_a$	2.6(3.6)	1.01(2.3)$_b$
Separation Protest	15.3(3.5)$_b$	4.2(4.4)$_c$	1.3(2.1)$_d$	2.9(4.1)$_c$	1.9(3.1)$_b$	0.7(1.9)

Note. Higher numbers reflect greater attachment strength (0-18); standard deviations are in parentheses. For each attachment figure, means within each column differ significantly if they have different subscripts. Those with no subscripts do not differ significantly from any of the other attachment functions.

Discussion

The aim of this study was to extend on prior research by evaluating the quality of women's attachment relationships to their mothers, fathers, and close friends, and

their relationship to depression, anxiety, and stress levels in women during the third trimester and 4-6 months postpartum. In addition, we examined the structural changes that occurred in women's attachment networks during the transition to parenthood.

Hypothesis 1 evaluated whether the quality of women's attachment relationships to their parents and close friends was related to their depression, anxiety, and stress symptom levels. This hypothesis was supported by the study results such that high depression levels were cross-sectionally predicted by attachment-anxiety to mothers and close friends, whereas only attachment-anxiety to mothers predicted depression levels at 4-6 months postpartum. In addition, attachment-anxiety to mothers and attachment-avoidance to close friends cross-sectionally predicted anxiety levels, but the attachment variables did not predict the state longitudinally. Similarly, attachment- anxiety to mothers was cross-sectionally predictive of high stress levels, but not stress levels at 4-6 months postpartum.

Taken together, the results suggest that the quality of an expectant mother's attachment to her mother may contribute to postpartum mental health problems, inasmuch as attachment-anxiety predicted later high depression symptom levels. However, no attachment variables predicted later anxiety and stress levels, although attachment-anxiety to mothers was related to anxiety and stress levels, and attachment-avoidance to close friends was related to high anxiety levels during pregnancy. These latter results suggest that attachment relationships may not contribute to maternal feelings of stress and anxiety, although they may occur in the context of problematic relationships.

The study results are consistent with prior reports asserting the importance of an expectant mother's relationships with her mother and friends over the transition to parenthood (Bost et al., 2002; Doherty & Feeney, 2004; Gameiro et al., 2011;

McMahon, Barnett, Kowalenko, & Tennant (2005), and they suggest that relationships other than with the partner may contribute to the mental health of new mothers. However, attachment to the father was not associated with women's mental health during the transition to parenthood, which accords with prior literature reports of the minor importance of the father as an attachment figure (Doherty & Feeney, 2004).

Hypothesis 2 examined structural changes in the women's attachment networks over the transition to parenthood, and whether they predominantly utilized partners and mothers for the four main attachment functions. The number of people the women felt a close emotional tie to was shown to be stable between the third trimester and 4-6 months post-partum, which is consistent with the results of Bost et al. (2002) who reported there was considerable stability in the size of a woman's network from pregnancy to 24-months postpartum. However, the results are inconsistent with the work of several other groups (Bidart & Lavenu, 2005; Kalmijn, 2014; McCannell, 1987). Second, the women's reliance on partners and friends appeared to decline over time, but there was no significant change in the other attachment figure relationships, including with mothers and fathers. This finding of a reduced reliance on partners and friends over the transition to parenthood is consistent with prior research by Feeney et al. (2001).

Regarding the *structure* of women's attachment networks, intimate partners were rated highest on all four attachment functions at both time points, especially the secure-base and safe-haven functions, relative to other attachment figures. The results suggest that the marital relationship is preeminent during the transition to parenthood. In contrast, mothers and fathers were mostly utilized as a secure-base, and the close friends were used for their safe-haven and proximity-seeking functions. The results are somewhat consistent with prior results indicating that parents continue to provide a

secure-base for their children, which persists into adulthood (Calvo et al., 2012), and close friends also provide attachment needs and functions (Fraley & Davis, 19997). Taken together, the results suggest that the size of women's attachment networks do not change over the transition to parenthood, but there are likely to be changes in their usage of attachment figures, such that they come to rely less on their friends and partner for the four attachment functions, and each attachment figure provides a different set of attachment functions.

Nonetheless, the study results should be interpreted in light of several *study limitations*. First, most of the sample was Caucasian, well educated, and with an above average household income. Australian population data shows that approximately 35% of 21-35 year olds and 21% of 35-50 year olds are tertiary educatied, compared with almost 60% of the current sample (Australian Bureau of Statistics, 2012). In addition, the mean Australian household income was approximately $106,000AUD, with a median of $80,000 in 2014 (ABS, 2014), compared with $122,000AUD in this sample. This limits the generalizability of the results to lower SES women, and those from different cultures, since low socioeconomic status is a known risk factor for postpartum depression and anxiety (Britton, 2008; Pope, 2000). Second, the study variables were assessed using self-report measures and there is some debate over the merits of using self-report measures rather than interviews to examine attachment (Shaver & Mikulincer, 2002). Third, attachment orientation is known to be associated with the size and structure of people's social networks (Rowe & Carnelley, 2005), but the women's general attachment orientation was not assessed in this study. However, relationship-specific attachment variables are reported to be better predictors of intra- and interpersonal outcomes than general attachment factors (Fraley et al., 2011).

In *conclusion,* women's attachment-anxiety to their mothers predicted high depression levels postpartum, but no attachment variables predicted postpartum stress and anxiety levels. However, women's attachment-anxiety and -avoidance to their mothers and friends predicted high depression, anxiety and stress levels during pregnancy. In addition, the women's attachment networks remained stable over the transition to parenthood, although there were changes in their usage of the attachment figures. In particular, new mothers reported a reduced reliance on friends and their partner for the four attachment functions postpartum, and each attachment figure provided a different set of attachment functions. Overall, the study results suggest that the quality of an expectant or new mother's attachment relationships with her mother and close friends may be important, along with the well-established importance of partner relationships. Clinically, this suggests that healthcare providers should be aware of the possibility of a broader range of relationships impacting upon a woman's adjustment during this time. If women report social isolation, or conflict in significant relationships, health care providers should consider providing an appropriate referral to a mental health practitioner, hospital social work or psychology department, or maternal and community groups for those women in the postnatal period.

References

Ainsworth, M. S. (1989). Attachments beyond infancy. *American Psychologist, 44*(4), 709-716. doi:10.1037/0003-066X.44.4.709

Australian Bureau of Statistics (2012). *Year Book Australia.* 1301.0-2012.

Australian Bureau of Statistics (2014). *Household Income and Wealth, Australia.* 6523.0, 2013-2014.

Barkin, J. L., Bloch, J. R., Hawkins, K. C., & Thomas, T. S. (2014). Barriers to optimal social support in the postpartum period. *Journal of Obstetric, Gynecologic, & Neonatal Nursing, 43*(4), 445-454. doi:10.1111/1552-6909.12463

Bidart, C., & Lavenu, D. (2005). Evolutions of personal networks and life events. *Social Networks, 27*(4), 359-376. doi:10.1016/j.socnet.2004.11.003

Bost, K. K., Cox, M. J., Burchinal, M. R., & Payne, C. (2002). Structural and supportive changes in couples' family and friendship networks across the transition to parenthood. *Journal of Marriage and Family, 64,* 517-531. doi:10.1111/j.1741-3737.2002.00517.x

Bowlby, J. (1969). *Attachment and loss: Vol. 1. Attachment.* New York: Basic Books.

Bowlby, J. (1980). *Attachment and loss: Vol. 3. Sadness and depression.* New York: Basic Books.

Bowlby, J. (1988). *A secure base: Clinical applications of attachment theory.* London: Routledge.

Brennan, K. A., Clark, C. L., & Shaver, P. R. (1998). Self-report measurement of adult attachment: An integrative overview. In J. A. Simpson & W. S. Rholes

(Eds.), *Attachment theory and close relationships* (pp. 46-76). New York: Guilford Press.

Britton, J. R. (2005). Pre-discharge anxiety among mothers of well newborns. Prevalence and correlates. *Acta Paediatrica, 94*(12), 1771-1776). doi:10.1080/08035250500192664

Britton, J. R. (2008). Maternal anxiety: Course and antecedents during the early postpartum period. *Depression and Anxiety, 25,* 793-800. doi:10.1002/da.20325

Calvo, V., Palmieri, A., Codato, M., Testoni, I., & Sambin, M. (2012). Composition and function of women's attachment network in adulthood. *Interdisciplinary Journal of Family Studies, 17*(2), 101-110.

Cicirelli, V. G. (1993). Attachment and obligation as daughters' motives for caregiving behaviour and subsequent effect on subjective burden. *Psychology and Aging, 8,* 144-155. doi:10.1037/0882-7974.8.2.144

Clout, D., & Brown, R. (2015). Marital relationship and attachment predictors of stress, anxiety, and depression symptoms and postpartum depression. *Journal of Social and Clinical Psychology, 35*(4), 322-341.

Dennis, C-L. E., Janssen, P. A., & Singer, A. (2004). Identifying women at-risk for postpartum depression in the immediate postpartum period. *Acta Psychiatric Scandinavica, 110,* 338-346. doi:10.1111/j.1600-0447.2004.00337.x

Doherty, N. A., & Feeney, J. A. (2004). The composition of attachment networks throughout the adult years. *Personal Relationships, 11,* 469-488. doi:10.1111/j.1475-6811.2004.00093.x

Feeney, J. A. (1999). Adult romantic attachment and couple relationships. In J. Cassidy & P. R. Shaver (Eds.), *Handbook of attachment: Theory, research, and clinical applications* (pp. 355-377. New York: Guilford Press.

Feeney, J. A., Alexander, R., Noller, P., & Hohaus, L. (2003). Attachment insecurity, depression, and the transition to parenthood. *Personal Relationships, 10,* 475-493. doi:10.1046/j.1475-6811.2003.00061.x

Feeney, J. A., Hohaus, L., Noller, P., & Alexander, R. P. (2001). *Becoming parents: Exploring the bonds between mothers, fathers, and their infants.* Cambridge, England: Cambridge University Press. doi:10.1017/CBO9781139164511

Fraley, R. C., & Davis, K. E. (1997). Attachment formation and transfer in young adults' close friendships and romantic relationships. *Personal Relationships, 4,* 131-144. doi:10.1111/j.1475-6811.1997.tb00135.x

Fraley, C. R., Heffernan, M . E., Vicary, A. M., & Brumbaugh, C. C. (2011). The experiences in close relationships – relationship structures questionnaire: A method for assessing attachment orientations across relationships. *Psychological Assessment, 23*(3), 615-625. doi:10.1037/a0022898

Freeman, H., & Brown, B. B. (2001). Primary attachment to parents and peers during adolescence: Differences by attachment style. *Journal of Youth and Adolescence, 30*(6), 653-674. doi:10.1023/A:1012200511045

Freeman, H., Newland, L. A., & Coyl, D. D. (2010). New directions in father attachment. *Early Child Development and Care, 180*(1-2), 1-8. doi:10.1080/03004430903414646

Gaillard, A., Le Strat, Y., Mandelbrot, L., Keïta, H., Dubertret, C. (2014). Predictors of postpartum depression: Prospective study of 264 women followed during

pregnancy and postpartum. *Psychiatry Research, 215*(2), 341-346. doi:10.1016/j.psychres.2013.10.003

Gameiro, S., Moura-Ramos, M., Canavarro, M. C., & Soares, I. (2011). Network support and parenting in mothers and fathers who conceived spontaneously or through assisted reproduction. *Journal of Reproductive and Infant Psychology, 29*(2), 170-182. doi:10.1080/02646838.2011.553950

Goldstein, L. H., Diener, M. L., & Mangelsdorf, S. C. (1996). Maternal characteristics and social support across the transition to motherhood: Associations with maternal behaviour. *Journal of Family Psychology, 10*(1), 60-71. doi:10.1037/0893-3200.10.1.60

Kalmijn, M. (2012). Longitudinal analyses of the effects of age, marriage, and parenthood on social contacts and supports. *Advances in Life Course Research, 17,* 177-190. doi:10.1016/j.alcr.2012.08.002

Leinonen, J. A., Solantaus, T. S., & Punamäki, R-L. (2003). Social support and the quality of parenting under economic pressure and workload in Finland. The role of family structure and parental gender. *Journal of Family Psychology, 17*(3), 409-418. doi:10.1037/0893-3200.17.3.409

Le Strat, Y.L., Dubertret, C., & Le Foll, B. (2011). Prevalence and correlates of major depressive episode in pregnant and postpartum women in the United States. *Journal of Affective Disorders, 135*(1), 128-138. doi:10.1016/j.jad.2011.07.004

Logsdon, M. C., Wisner, K. L., & Pinto-Foltz, M. D. (2006). The impact of postpartum depression on mothering. *Journal of Obstetric, Gynecologic, & Neonatal Nursing, 35*(5), 652-658. doi:10.1111/j.1552-6909.2006.00087.x

Lovibond, S.H., Lovibond, P. F. (1995). *Manual for the depression anxiety stress scales 2nd Edition.* Psychology Foundation of Australia: Sydney.

Lovibond, P. F., & Lovibond, S. H. (1995). The structure of negative emotional states: Comparison of the Depression Anxiety Stress Scales (DASS) with the Beck Depression and Anxiety Inventories. *Behaviour Research and Therapy, 33*(3), 335-343. doi:10.1016/0005-7967(94)00075-U

McCannell, K. (1987). Social networks and the transition to motherhood. In R. Milardo (Ed.), *Families and social networks.* Beverly Hills, CA: Sage.

McMahon, C., Barnett, B., Kowalenko, N., & Tennant, C. (2005). Psychological factors associated with persistent postnatal depression: Past and current relationships, defence styles and the mediating role of insecure attachment style. *Journal of Affective Disorders, 84,* 15-24. doi:10.1016/j.jad.2004.05.005

Miller, R. L., Pallant, J. F., & Negri, L. M. (2006). Anxiety and stress in the postpartum: Is there more to postnatal distress than depression. *BMC Psychiatry, 6,* 12-22. doi:10.1186/1471-244X-6-12

Negron, R., Martin, A., Almog, M., Balbierz, A., & Howell, E. A. (2013). Social support during the postpartum period: Mothers' views on needs, expectations, and mobilisation of support. *Maternal and Child Health Journal, 17*(4), 616-623. doi:10.1007/s10995-012-1037-4

O'hara, M. W., & Swain, A. M. (1996). Rates and risk of postpartum depression – a meta-analysis. *International Review of Psychiatry, 8*(1), 37-54. doi:10.3109/09540269609037816

Rallis, S., Skouteris, H., McCabe, M., & Milgrom. J. (2014). The transition to motherhood: Towards a broader understanding of perinatal distress. *Women and Birth, 27*(1), 68-71. doi:10.1016/j.wombi.2013.12.004

Rowe, A. C., & Carnelley, K. B. (2005). Preliminary support for the use of a hierarchical mapping technique to examine attachment networks. *Personal Relationships, 12*(4), 499-519. doi:10.1111/j.1475-6811.2005.00128.x

Shaver, P. R., & Mikulincer, M. (2002). Attachment-related psychodynamics. *Attachment and Human Development, 4*(2), 133-161. doi:10.1080/14616730210154171

Simpson, J. A. (1990). Influence of attachment styles on romantic relationships. *Journal of Personality and Social Psychology, 59*(5), 971-980. doi:10.1037/0022-3514.59.5.971

Simpson, J. A., Rholes, W. S., Campbell, L., Tran, S., & Wilson, L. (2003). Adult attachment, the transition to parenthood, and depressive symptoms. *Journal of Personality and Social Psychology, 84*(6), 1172-1187. doi:10.1037/0022-3514.84.6.1172

Trinke, S. J., & Bartholomew, K. (1997). Hierarchies of attachment relationships in young adulthood. *Journal of Social and Personal Relationships, 14,* 603-625. doi:10.1177/0265407597145002

Webb, D. A., Bloch, J. R., Coyne, J. C., Chung, E. K., Bennett, I. M., & Culhane, J. F. (2008). Postpartum physical symptoms in new mothers: Their relationship to functional limitations and emotional well-being. *Birth, 35*(3), 179-187. doi:10.1111/j.1523-536X.2008.00238.x

Weiss, R. S. (1982). Attachment in adult life. In C. M. Parkes & J. Stevenson-Hinde (Eds.), *The place of attachment in human behaviour* (pp. 171-184). New York: Basic Books.

Weiss, R. S. (1991). The attachment bond in childhood and adulthood. In C. M. Parkes, J. Stevenson-Hinde, & P. Marris (Eds.), *Attachment across the life cycle* (pp. 66-75). New York: Routledge.

Wenzel, A., Haugen, E. N., Jackson, L. C., & Robinson, K. (2003). Prevalence of generalised anxiety at eight weeks postpartum. *Archive of Womens Mental Health, 6,* 43-49. doi:10.1007/s00737-002-0154-2

Wilkinson, R. B., & Mulcahy, R. (2010). Attachment and interpersonal relationships in postnatal depression. *Journal of Reproductive and Infant Psychology, 28*(3), 252-265. doi:10.1080/02646831003587353

Paper 3: Functions of Social Support as Predictors of Stress, Anxiety, and Depression Symptoms in Expectant and New Mothers

Danielle Clout (BSc(hons)[1] and Rhonda Brown [BSc(hons), PhD][1]

Article submitted for publication

1. Australian National University, Australia

Abstract

Objective: The study evaluated different aspects or functions of social support during the third trimester as predictors of depression, anxiety, and stress levels during pregnancy and at 4-6 months postpartum. **Method:** One-hundred-thirty-nine women completed a short questionnaire asking about their recent experiences of social support, and stress, anxiety, and depression symptoms during the third trimester of pregnancy (approximately 32-36 weeks gestation), and 105 of them completed the follow-up questionnaire assessing their symptoms of depression, anxiety, and stress at 4-6 months postpartum. **Results:** The perceived unavailability of esteem support (the ability to positively compare oneself to others) was associated with higher depression levels in the third trimester, whereas low appraisal support (the availability of someone to talk to about one's problems) was associated with higher stress and anxiety levels during pregnancy. Only total social support score was associated with higher stress and depression levels postpartum, but none of the social support variables were associated with postpartum anxiety symptoms. **Discussion:** The study results suggest that the provision of social support in its entirety may help to protect new mothers from experiencing high stress and psychological distress. In contrast, emotional forms of social support (i.e. esteem- and appraisal-support) may help to buffer against the potential to experience psychological stress and distress during pregnancy. Alternately, the latter results may simply reflect that low levels of social support are highly comorbid with high maternal stress and distress.

The postpartum period can be a time of significant stress for new mothers including the birth of their child and adjusting to the demands and expectations of motherhood (Britton, 2008; Razurel, Kaiser, Sellenet, & Epiney, 2013; Yelland, Sutherland, & Brown, 2010). For example, new mothers will have to perform new tasks in their maternal role (Hung & Chung, 2001), may experience financial stress (Braveman et al., 2010), or have to deal with changes in their partner and family relationships (Bost, Cox, Burchinal, & Payne, 2002; Levy-Shiff, 1994). These and other stresses of parenthood can potentially lead to decreases in psychological wellbeing, even for new parents in generally stable relationships (Salmela-Aro, Aunola, Saisto, Halmesmaki, & Nurmi, 2006).

Postpartum depression (PPD) is the most common psychological consequence of childbirth in women (Milgrom et al, 2008), especially in the first 3-months postpartum (Cox, Murray, & Chapman, 1993). PPD is characterised by dysphoria, emotional lability, insomnia, guilt and suicidal ideation (Dennis, Janssen, & Singer, 2004), and it can adversely impact on mother-infant interactions (Martins & Gaffan, 2000) and development in the child (Beck, 1998). A large meta-analysis has reported that the overall prevalence rate of PPD is about 13% (O'Hara & Swain, 1996), although other research suggests that a similar percentage of women experience clinically significant PPD but have no diagnosis (Bernazzani, Saucier, David & Borgeat, 1997). *Anxiety* over the perinatal period has received much less attention, despite a high postpartum anxiety prevalence rate of 25-45% (Britton, 2005, Faisal-Curry & Menzes, 2007), making it more common than PPD. Thus, anxiety symptoms are frequently co-morbid with depression symptoms (Heron, O'Connor, Evans, Golding, & Glover, 2004; Moss, Skouteris, Wertheim, Paxton, & Milgrom, 2009), and the anxiety is thought to also pose a risk to child development (Barnett, Schaafsma, Guzman, & Parker, 1991).

No single risk factor has been found to predict psychological distress in the perinatal period, although adequate social support provision is considered to be vital for maternal wellbeing (Van Lerberghe, Manuel, Matthews, & Cathy, 2005). *Social support* or the nature and magnitude of the resources provided to a person by their social network has previously been linked to less parental stress (Gameiro, Moura-Ramos, Canavarro, & Soares (2011), lower depression levels (Hahn-Holbrook, Schetter, Arora, & Hobel, 2013; Spoozak, Gotman, Smith, Belanger, & Yonkers, 2009), better quality of life (Emmanuel, St John, & Sun, 2012; Webster, Nicholas, Velacott, Cridland, & Fawcett, 2011), and better quality of care provided to the infants (Bradley, Whiteside, Mansell, & Brisby, 1997; Crockenberg, 1981).

However, a recent comprehensive review of twenty-five studies evaluating the relationship between social support and maternal psychological health indicated that although most studies evaluated depression, only three evaluated anxiety, and none evaluated maternal stress (Glazier, Elgar, Goel, & Holzapfel, 2004; Hildingsson, Tingvall, & Rubertsson, 2008; Hung, 2007; Razurel et al., 2013). Thus, few prior studies have examined social support in relation to maternal stress and anxiety levels, despite Rallis, Skouteris, McCabe, and Milgrom (2014) asserting that maternal stress must be viewed as a distinct affective state that should be examined as part of perinatal distress. Thus, in this study, we examined predictors of stress, anxiety, and depression levels in the prenatal (i.e. third trimester) and postnatal periods (i.e. 4-6 months postpartum).

Of the available PPD studies, all reported a significant association between social support and PPD, except the study by Castle, Slade, Barranco-Wadlow and Rogers (2008), which reported a non-significant association between social support and postnatal depression, after controlling for prenatal depression levels. Few prior studies

have evaluated the relationship between social support and postpartum anxiety, but Glazier et al. (2004) showed that less social support was linked to worse anxiety and depression during pregnancy, and Hung (2007) showed that more social support was linked to less anxiety 1- and 5-weeks postpartum. Further, Hildingsson et al. (2008) found that women who were dissatisfied with partner support early in the pregnancy showed greater anxiety and depression levels postpartum. However, in contrast, Britton (2008) showed that social support did not predict anxiety 1-month postpartum, suggesting that the relationship between anxiety, depression and social support lacks clarity.

Furthermore, most of the above studies operationalized social support as the number of available supports and/or satisfaction with the supports. Thus, few studies have evaluated which *aspects* of support best predict psychological distress in expectant and new mothers (Xie, He, Koszycki, Walker, & Wen, 2009). Prior focus-group interviews suggest that social support is a key component of functioning, with encouragement support (Barkin, Bloch, Hawkins, & Thomas, 2014) and appraisal support being especially valued (Brugha et al., 1998; Romito, Saurel-Cubizolles, & Lelong, 1999), although emotional forms of support generally may be helpful for new mothers with PPD (Tammentie, Paavilainen, Astedt-Kurki & Tarkka, 2004). In contrast, Xie et al. (2009) found that less objectively rated practical support (e.g. assistance with childcare & household tasks) was most strongly linked to PPD, suggesting that many different aspects of social support may be important.

Nonetheless, a large longitudinal study has recently examined appraisal-, emotional-, instrumental- and informational-support as predictors of PPD at 6- and 12-weeks postpartum. They found that reduced PPD symptoms in the first 12-weeks postpartum were predicted by all four of the social support dimensions, although only

total social support predicted later PPD (Leahy-Warren, McCarthy & Corcoran, 2011). Taken together, the results suggest that a broad range of social supports may contribute to maternal wellbeing in the early postpartum period, although such a conclusion requires verification using a longitudinal study, which also evaluates social support as a predictor of maternal stress and anxiety.

Regarding the *study measures*, we used a well-accepted measure of stress and psychological distress that has previously been used to assess these states in new mothers (i.e. Depression, Anxiety Stress Scales; Lovibond & Lovibond, 1995a; Miller, Pallant, & Negri, 2006). In addition, we used the well-accepted Interpersonal Support Evaluation List (ISEL) (Cohen & Hoberman, 1983) to assess the perceived availability of four different functions of social support including: tangible support (i.e. material aid and support), appraisal support (i.e. person(s) to talk to about one's problems), self-esteem support (i.e. being positively compared to others), and belonging support (i.e. people one can do things with).

In *summary*, little is known about the relationship between different functions of social support and maternal stress and anxiety during the perinatal period, although PPD is more extensively studied. Further, the small literature is somewhat conflicting or the studies relied on general measures of social support (e.g. number of supports). Thus, there is a lack of clarity as to the likely contributions of different aspects of social support to women's mental health in the perinatal period. Thus, in this study, we evaluated the different functions of social support (i.e. tangible, appraisal, self-esteem and belonging) as predictors of stress, anxiety, and depression symptom levels in expectant (i.e. third trimester) and new mothers (i.e. 4-6 months postpartum). Consistent with the small available literature, it was hypothesised that:

1. Depression in pregnancy will be associated with the four functions of support, whereas postpartum depression will be associated with total social support only;
2. Anxiety in pregnancy will be associated with appraisal support, whereas postpartum anxiety will be associated with total social support.
3. Stress in the postpartum period will be associated with total social support.

Method

Participants:

This study was conducted with full ethics approval from the Australian National University (ANU) Human Research Ethics Committee (Protocol Number 2010/650). Potential participants were indirectly recruited to the study via advertisements placed on a number of online platforms including parenting forums and social media sites (e.g. essentialbaby.com.au/forums, facebook.com.au, bubhub.com.au) and via email snowballing. Study inclusion criteria were an age of 18 years or older, female gender, being in cohabiting or marital relationship with the father of the expectant infant, and in the third-trimester of pregnancy, either as a primiparous or multiparous expectant mother. No reimbursements were provided to the participants.

An *a priori* power analysis indicated that at least 91 participants were required, assuming a small to medium effect size (f^2=.15), and with alpha set at .05, power of .8, and up to 5 predictors when analysing the continuous DASS-21 score. As few research studies have used the DASS-21 for longitudinal research into perinatal distress, a small to medium effect size was assumed based on Yelland et al. (2010) reporting medium effect sizes in similar research. One-hundred-seventy-five women emailed the

researcher (DC) and 139 completed the study questionnaire (response rate=79.4%). Most women (*N*=105) completed the follow-up questionnaire at 4-6 months postpartum (retention rate=75%). Women who did not complete the follow-up questionnaire did not differ on demographic or psychological variables compared with those who completed both questionnaires. All women were in a marital or cohabiting relationship with the father of the child at both time points. The mean age of women was 31.6 years (*SD*=4.35, range 20-43 years). Forty-percent of the women (*N*=56) were multiparous and the remainder (*N*=83) were preparing to give birth to their first child. Most women (*N*=111, 79.9%) were married and the rest were in a de facto relationship, with a mean relationship length of 6.8 years (*SD*=3.48, range; 11 months–19 years). Most women (*N*=130, 93.5%) identified as Caucasian, 3 identified as Asian, two as South-East Asian, one as Indigenous, and 3 as other. More than one-half of the women (*N*=83, 59.7%) had completed university, 30 (21.6%) had completed TAFE, 23 had graduated from Year 12, and 3 had left school in Year 10. Less than one-half (N=59, 42.4%) were employed full-time, one-quarter (*N*=35, 25.2%) were in casual or part-time employment, one-quarter (*N*=40, 28.8%) undertook home duties, and five were unemployed. The mean gross income of the couples was A$120,381 (*SD*=$67,595, range: $27,000 – $500,000).

Measures

Depression, anxiety, and stress over the past week were assessed using the *Depression Anxiety, and Stress Scales (DASS-21)* (Lovibond & Lovibond, 1995a), at time 1 (i.e. third trimester) and time 2 (4-6 months postpartum). The authors of the scale have attempted to reduce the degree of symptom overlap between the three subscales, so that they measure unique symptoms of each state. There is also Australian normative data for the scale. The scale asks participants to rate the presence and severity of the states, using 4-point scales ranging from 0 (*did not apply to me at all*) to 3 (*applied to*

me very much/most of the time), with high scores indicating worse symptoms. The DASS depression scale shows high convergent validity with the Beck Depression Inventory-II (r=.74), and the DASS anxiety scale is correlated with the Beck Anxiety Inventory (r=.81) (Lovibond & Lovibond, 1995a, b). DASS-21 subscales are reported to show high internal consistency, with Cronbach's alphas of .9 for depression, .73 for anxiety and .81 for stress (Lovibond & Lovibond, 1995a). In this study, the internal consistencies at Time 1 were .91 for depression, .84 for anxiety, and .88 for stress, and at time 2, they were .86 for depression, .79 for anxiety and .76 for stress.

Social support was assessed at time 1 using the *Interpersonal Support Evaluation List* (*ISEL*, 48-item) (Cohen & Hoberman, 1983). This scale is designed to assess the perceived availability of different functions of social support. Scale items ask the participants to rate their social support resources using 4-point Likert type scales, ranging from 1 (*definitely false*) to 4 (*definitely true*), across the four subscales of tangible support, appraisal support, self-esteem support, and belonging support. The scale is reported to show adequate internal consistency, with Cronbach's alphas of .77 for the total score, .71 for tangible, .75 for belonging, .60 for self-esteem, and .77 for appraisal. In this study, internal consistencies of the subscales at time 1 were .76 for tangible support, .83 for belonging support, .78 for self-esteem support, .89 for appraisal support, and .94 for total social support.

Procedure

Interested individuals contacted the researcher by email if they wished to participate in the study. Women who were in their third trimester of pregnancy (approximately. 32-36 weeks gestation) were sent an email with an individual study ID number and link to the online survey (*mean at completion* = 33.9 weeks*, SD* = 2.9, range: 29-39 weeks)

(https://anupsych.co1.qualtrics.com/SE/?SID=SV_b2AcZtbcYiWjZl2). If they were in an earlier stage of pregnancy, permission was sought to contact them at the third trimester, and if granted, they were emailed in the same manner as detailed above. The women were contacted again by email 4-months postpartum, asked if they still consented to participate in the study, and if they did, they were emailed the study ID code and link to the online questionnaire (https://anupsych.co1.qualtrics.com/SE/?SID=SV_ eSazN4fdTc3azYM). The mean time to follow-up was 21.5 weeks (*SD*=2.8, range: 17-28 weeks).

Statistical Analyses

All statistical analyses were performed using IBM SPSS statistical software (Version 22). Descriptive analyses and Pearson's correlation coefficients were conducted on all key study variables. Multiple regression analyses were conducted to identify the time 1 social support variables were associated with depression, anxiety, and stress levels at time 1. Hierarchical multiple regression analyses were conducted to identify time 1 social support variables that were associated with depression, anxiety and stress levels at 4-6 months post-partum, controlling time 1 dependent variables (i.e. emotional state) at step 1 of the analyses.

Results

A number of univariate outliers were detected in depression, anxiety, stress and social support scores (except tangible support). None of the cases was excluded as they represented clinically significant experiences of psychological distress and social support, and the 5% trimmed means were similar to the original means. Aside from total social support, all study variables were skewed and the Kolmogorov-Smirnov and Shapiro-Wilk normality tests were significant ($p<.001$), indicating the variables had non-normal distributions. Data transformation did not normalise the score distributions,

and the same profile of results was obtained using square-root-transformed and untransformed data (results not shown). Thus, only the untransformed data is presented here. Non-normal distribution of data is typical in social sciences research, and violation of this assumption is not considered to cause issues with using parametric statistical analysis techniques when sample size is adequate (over 30), with parametric techniques also having the advantage of better statistical power (Pallant, 2007). Furthermore, the use of non-parametric statistics is most appropriate when the area of study is best represented by the mean score (Pallant, 2007), which is not the case for these research questions. Therefore, parametric statistics have been selected for use in this paper. Multicollinearity was evident between total social support score and two of the subscale scores. Thus, two sets of hierarchical multiple regression analyses were run for the longitudinal analysis, one including the four ISEL subscales, and the other including total social support score.

Means and standard deviations of the key study variables and Pearson product-moment correlation coefficients between time 1 social support variables (independent variables, IV), and time 1 and 2 depression, anxiety and stress symptom scores (dependent variables, DV) are provided in Table 1. Depression, anxiety, and stress scores were strongly inter-correlated and time 1 social support variables were moderately correlated with depression, anxiety, and stress scores cross-sectionally and longitudinally. See Paper 1 (Clout & Brown, 2016) for an outline and discussion of DASS-21 prevalence data.

Table 1

Means, Standard Deviations, and Correlations for the Key Study Variables[a]

	M	*(SD)*	DEP1	ANX1	STR1	DEP2	ANX2	STR2	TS	AS	SES	BS	TSS
DEP1	6.25	7.2		.66**	,66**	.62**	.46**	.50**	-.43**	-.56**	-.60**	-.58**	-.51**
ANX1	6.38	6.9			.70**	.43**	.56**	.59**	-.32**	-.44**	-.37**	-.36**	-.29**
STR1	12.38	9.17				.39**	.39**	.57**	-.31**	-.45**	-.37**	-.38**	-.28*
DEP2	6.36	7.7					.62**	.70**	-.43**	-.45**	-.48**	-.48**	-.47**
ANX2	4.15	6.24						.66**	-.31**	-.33**	.25*	-.26**	-.24*
STR2	11.7	8.7							-.39**	-.41**	-.37**	-.38**	-.34**
TS	16.12	4.67								.76**	.60**	.81**	.85**
AS	34.24	5.13									.65**	.83**	.59**
SES	19.47	3.92										.72**	.83**
BS	19.10	4.68											.86**
TSS	88.89	8.17											

Note. N = 105. DEP1 = Time 1 DASS-21 total depression score, ANX1 = Time 1 DASS-21 total anxiety score, STR1 = Time 1 DASS-21 total stress score, DEP2 = Time 2 DASS-21 total depression score, ANX2 = Time 2 DASS-21 total anxiety score, STR2 = Time 2 DASS-21 total stress score, TS = Time 1 ISEL tangible support, AS = Time 1 ISEL appraisal support, SES = Time 1 ISEL self-esteem support, BS = Time 1 ISEL belonging support.
[a]2-Tailed Pearson Correlation in SPSS, * $p < .05$. ** $p < .01$

Standard multiple regression analyses evaluated tangible, belonging, self-esteem and appraisal support as predictors of depression, anxiety and stress levels, see Table 2. In the analyses of *depression*, time 1 social support variables predicted 17.8% (adjusted R^2) of the variance in time 1 depression levels, but time 1 depression was only predicted by self-esteem support. In the analysis of *anxiety*, time 1 social support variables predicted 13.2% (adjusted R^2) of the variance in time 1 anxiety, but time 1 anxiety was only predicted by appraisal support. In the analysis of *stress*, time 1 social support variables predicted 17.8% (adjusted R^2) of the variance in time 1 stress levels, but it was only predicted by appraisal support.

Table 2

Summary of Regressions Predicting Time 1 Depression, Anxiety and Stress

Variable		B	SE B	β	t
Depression	Belonging Support	-.15	.10	-.21	-1.32
	Tangible Support	.05	.08	.07	.60
	Self-Esteem Support	-.30	.09	-.34	-3.56**
	Appraisal Support	-.12	.09	-.18	-1.43
Anxiety	Belonging Support	.62	.12	.09	.54
	Tangible Support	-.04	.09	-.06	-.45
	Self-Esteem Support	-.13	.10	-.15	-1.33
	Appraisal Support	-.20	.10	-.31	-2.11*
Stress	Belonging Support	-.05	.15	-.05	-.30
	Tangible Support	.04	.12	.05	.37
	Self-Esteem Support	-.20	.13	-.17	-1.57
	Appraisal Support	-.27	.13	-.32	-2.20*

Note. N=105

[a]2-Tailed Pearson Correlation in SPSS, * p < .05. ** p < .01

Hierarchical multiple regression analyses evaluated time 1 social support predictors of time 2 depression, anxiety, and stress levels. In these analyses, the time 1 dependent variable was entered at step 1, and the social support variables were entered at step 2, see Table 3. At step 1, time 1 *depression* predicted 37.6% (adjusted R^2) of the variance in time 2 depression, and at step 2, the social support variables predicted an

additional 1.5% of its variance, increasing it to 39.1% (R^2 change=.04, $F_{4,99}$=1.34, *p*=.17), but none of the social support variables predicted time 2 depression levels. At step 1, time 1 *anxiety* predicted 31.2% (adjusted R^2) of the variance in time 2 anxiety, and at step 2, social support variables predicted no additional variance (30.7%, R^2 change=.02, $F_{4,99}$=.83, *p*=.51), but no social support variable predicted time 2 anxiety levels. At step 1, time 1 *stress* predicted 31.8% (adjusted R^2) of the variance in time 2 stress, and at step 2, social support variables predicted an additional 2.7% of its variance, increasing it to 34.5% (R^2 change=.05, $F_{4,99}$=2.04, *p* = .09), but no social support variable predicted time 2 stress levels.

Table 3

Summary of Hierarchical Multiple Regression Analyses Predicting Depression, Anxiety, and Stress (Postnatal) with Social Support Subscales

Variable			B	SE B	β	t
Depression	Step 1	Depression Time 1	.65	.08	.62	7.98**
	Step 2	Depression Time 1	.53	0.11	.50	4.99**
		Belonging Support	-.01	.14	-.01	-.51
		Tangible Support	-.16	.11	-.19	-1.39
		Self-Esteem Support	-.08	.11	-.80	-.69
		Appraisal Support	.03	.11	.03	.23
Anxiety	Step 1	Anxiety Time 1	.51	.07	.56	6.93**
	Step 2	Anxiety Time 1	.48	.08	.52	5.72**
		Belonging Support	.10	.12	.15	.81
		Tangible Support	-.14	.10	-.21	-1.48
		Self-Esteem Support	.001	.10	.001	.01
		Appraisal Support	-.04	.10	-.06	-.37
Stress	Step 1	Stress Time 1	.53	.08	.57	7.04**
	Step 2	Stress Time 1	.46	.08	.49	5.46**
		Belonging Support	.01	.17	.01	1.00
		Tangible Support	-.21	0.13	.22	-1.58
		Self-Esteem Support	-.20	0.13	-.02	.16
		Appraisal Support	-.01	0.13	-0.02	-0.10

Note. N=105

[a]2-Tailed Pearson Correlation in SPSS, * p < .05. ** p < .01

Hierarchical multiple regression analyses then evaluated total social support as a predictor of depression, anxiety, and stress levels at time 2, see Table 4. In these analyses, the time 1 dependent variable was entered at step 1, and total social support was entered at step 2. At step 1, time 1 *depression* predicted 37.6% (adjusted R^2) of the variance in time 2 depression, and at step 2, total social support predicted an additional 2.7% of its variance, increasing it to 40.3% (R^2 change=.03, $F_{4,99}$=5.67, *p*=.019). Time 1 depression and total social support score predicted time 2 depression levels. At step 1, time 1 *anxiety* predicted 31.2% (adjusted R^2) of the variance in time 2 anxiety, but at step 2, the variance predicted did not change (31.1%, R^2 change=.006, $F_{4,99}$=.93, *p*=.37), and only time 1 anxiety predicted time 2 anxiety levels. At step 1, time 1 *stress* predicted 31.8% (adjusted R^2) of the variance in time 2 stress, and at step 2, total social support predicted an additional 3.1% of its variance, increasing it to 34.9% (R^2 change=.04, $F_{4,99}$=5.89, *p*=.017). Time 1 stress and total social support predicted time 2 stress levels.

Table 4

Summary of Hierarchical Multiple Regressions using Total Social Support to Predict Depression, Anxiety and Stress (Postnatal)

Variable			B	SE B	β	t
Depression	Step 1	Depression Time 1	.65	.08	.62	7.98**
	Step 2	Depression Time 1	.54	.09	.51	5.78**
		Total Social Support	-.10	.04	-.21	-2.38*
Anxiety	Step 1	Anxiety Time 1	.51	.07	.56	6.93**
	Step 2	Anxiety Time 1	.49	.08	.54	6.37**
		Total Social Support	-.03	.03	-.08	-.10
Stress	Step 1	Stress Time 1	.53	.08	.57	7.04**
	Step 2	Stress Time 1	.48	.08	.51	6.24**
		Total Social Support	-.11	.04	-.20	-2.43*

Note. N=105

[a]2-Tailed Pearson Correlation in SPSS, * p < .05. ** p < .01

Discussion

Little is known about the relationship between the functions of social support and maternal stress and anxiety levels during the perinatal period, although PPD has been more extensively studied (Leahy-Warren et al., 2011; Webster et al., 2011). Thus, in this study, we evaluated the different functions of social support (i.e. tangible, appraisal, self-esteem and belonging) as predictors of stress, anxiety, and depression symptom levels, in expectant and new mothers. One-quarter of the women reported significant depressive symptoms in the third-trimester and at 4-6 months postpartum, and one-third had significant stress and/or anxiety during pregnancy, but slightly fewer were affected postpartum. These findings are consistent with prior study results indicating that perinatal anxiety may be equally or more common than depression in the perinatal period (Britton, 2008; Wenzel, Haugen, Jackson, & Robinson, 2003), and that psychological stress is a distinct affective state that should be observed during the transition (Rallis et al., 2014).

Somewhat consistent with *hypothesis 1, depression* in the third trimester was shown to be related to less available esteem support (i.e. being positively compared to others). This result is consistent with prior study results indicating that poor self-esteem may play a role in the development of depression in the perinatal period (Fontaine & Jones, 1997). However, other forms of social support were not found to be related to high depression levels, contrary to prior research indicating that appraisal and tangible support are important in this regard (Brugha et al., 1998; Romito et al., 1999; Xie et al., 2009). It is possible that the high SES of women in this study reduced their requirements for tangible support, as they were able to pay for assistance such as childcare or house-cleaning themselves. Nonetheless, we did find that baseline total social support predicted depression symptoms at 4-6 months postpartum, after

controlling for baseline depression levels. This latter result is consistent with prior research indicating that social support is implicated in the aetiology of PPD (Hahn-Holbrook et al., 2013; Spoozak et al., 2009), in particular, *total* social support (Leahy-Warren et al., 2011). Taken together, the study results suggest that it is the full repertoire of social support, from tangible to more emotional forms of support, that are likely to buffer against the potential to experience depression symptoms postpartum, rather than any particular aspect of the support.

Somewhat consistent with *hypothesis 2, anxiety* in the third trimester was shown to be related to less available appraisal support (i.e. person(s) to talk about problems with), but no social support variable predicted postpartum anxiety levels. Few prior studies have longitudinally evaluated these relationships, although less social support has previously been linked to worse anxiety during pregnancy (Glazier et al., 2004), especially a lack of emotional social support (e.g. appraisal support) (Romito et al., 1999; Tammentine et al., 2004). In contrast, Xie et al. (2009) showed that less tangible support was related to worse psychological distress during pregnancy and the postpartum. However, similar to the results of this study, Britton (2008) did not find that social support predict anxiety levels postpartum, unlike depression. Finally, consistent with *hypothesis 3,* maternal *stress* in the third trimester was related to less available appraisal support, but only less total social support predicted high postpartum stress levels, similar to the results obtained for depression. Taken together, the results suggest that women who were highly stressed during pregnancy were less likely to report the availability of appraisal support, but it may be only the full repertoire of social support, which buffers against the potential to experience high psychological stress.

In summary, the study results suggest that the perceived availability of emotional forms of social support may help to protect women from the experience of psychological distress in the third trimester of pregnancy. However, only total social support, which encapsulates a broad range of different functions, predicted postnatal stress and depression levels, suggesting that social support in its entirety may help to protect new mothers from experiencing stress and psychological distress. However, alternately, the results may simply reflect that the women's affective symptoms caused them to withdraw from their social support network.

Thus, the study results should be interpreted in light of several *study limitations.* First, most of the women were Caucasian, well educated, in a stable cohabiting relationship with the father of the child, and with an above average household income. Thus, they may not have needed to rely on other people for tangible support (e.g. financial support), due to their high mean household income. Therefore, the results may be less generalizable to single mothers, those from other cultures and less affluent backgrounds, since the latter in particular is a known risk factor for PPD and anxiety (Britton, 2008; Pope, 2000). Second, stress, anxiety and depression symptoms were assessed using self-report measures rather than a clinical interview, although the DASS-21 has previously been used to evaluate perinatal distress (Miller, Pallant, & Negri, 2006). Third, other potentially important social support parameters (e.g. individual support provided by partner and mother) were not examined in this study. Finally, the study results cannot be used to make inferences about causality in relation to the functions of social support and emotional state variables.

In *conclusion,* less available esteem support was shown to predict high depression levels in the third trimester of pregnancy, and less available appraisal support predicted higher anxiety and stress levels prenatally. However, only low total

social support predicted high stress and depression levels postpartum. Taken together, the results suggest that the entire repertoire of social support may help to protect new mothers from experiencing high stress and depression symptoms, rather than any particular aspect of social support. Nonetheless, the perceived availability of emotional forms of support may help to protect women in the third trimester of pregnancy, or low levels of support may simply be comorbid with high maternal stress and distress. Clinically, the results suggest that assessment of the social support networks of expectant mothers should be better integrated into the primary perinatal healthcare setting. Due to constraints on clinician time in these settings, and the demand on resources, it is most likely this would take the form of brief verbal assessment during second trimester hospital intake and/or the postpartum check-up. If women present reporting social isolation or a lack of social support, referrals to appropriate health professionals and services that can assist expectant and new mothers to build their social support networks, and improve their relationships with loved ones may help to protect them against feeling overly stressed or depressed early in the postpartum.

References

Barkin, J. L., Bloch, J. R., Hawkins, K. C., & Thomas, T. S. (2014). Barriers to optimal social support in the postpartum period. *Journal of Obstetric, Gynecologic, & Neonatal Nursing, 43*(4), 445-454. doi:10.1111/1552-6909.12463

Barnett, B., Schaafsma, M. F., Guzman, A.-M., & Parker, G. B. (1991). Maternal anxiety: A 5-year review of an intervention study. *Journal of Child Psychology and Psychiatry, 32*(3), 423-438. doi:10.1111/j.1469-7610.1991.tb00321.x

Beck, C. T. (1998). The effects of postpartum depression on child development: A meta-analysis. *Archives of Psychiatric Nursing, 12*(1), 12-20. doi:10.1016/S0883-9417(98)80004-6

Bernazzani, O., Saucier, J-F., David, H., & Borgeat, F. (1997). Psychosocial predictors of depressive symptomatology level in postpartum women. *Journal of Affective Disorders, 46*(1), 39-49. doi:10.1016/S0165-0327(97)00077-3

Bost, K. K., Cox, M. J., Burchinal, M. R., & Payne, C. (2002). Structural and supportive changes in couples' family and friendship networks across the transition to parenthood. *Journal of Marriage and Family, 64,* 517-531. doi:10.1111/j.1741-3737.2002.00517.x

Bradley, R. H., Whiteside-Mansell, L., Brisby, J. A., & Caldwell, B. M. (1997). Parents' socioemotional investment in children. *Journal of Marriage and the Family*, 77-90. doi:10.2307/353663

Braveman, P., Marchi, K., Egerter, S., Kim, S., Metzler, M., Stancil, T., & Libet, M. (2010). Poverty, Near-Poverty, and Hardship Around the Time of Pregnancy. *Maternal and Child Health Journal, 14*(1), 20-35. doi:10.1007/s10995-008-0427-0

Britton, J. R. (2005). Pre-discharge anxiety among mothers of well newborns. Prevalence and correlates. *Acta Paediatrica, 94*(12), 1771-1776). doi:10.1080/08035250500192664

Britton, J. R. (2008). Maternal anxiety: Course and antecedents during the early postpartum period. *Depression and Anxiety, 25,* 793-800. doi:10.1002/da.20325

Brugha, T. S., Sharp, H. M., Cooper, S. A., Weisender, C., Britto, D., Shinkwin, R., Sherrif, T., & Kirwan, P. H. (1998). The Leicester 500 project. Social support and the development of postnatal depressive symptoms, a prospective cohort survey. *Psychological Medicine, 28*(01), 63-79. doi:10.1017/S0033291797005655

Castle, H., Slade, P., Barranco-Wadlow, M., & Rogers, M. (2008). Attitudes to emotional expression, social support and postnatal adjustment in new parents. *Journal of Reproductive and Infant Psychology*, *26*(3), 180-194. doi:10.1080/02646830701691319

Cohen, S., & Hoberman, H. M. (1983). Positive events and social supports as buffers of life change stress. *Journal of Applied Social Psychology*, *13*(2), 99-125. doi:10.1111/j.1559-1816.1983.tb02325.x

Cox, J. L., Murray, D., & Chapman, G. (1993). A controlled study of the onset, duration and prevalence of postnatal depression. *British Journal of Psychiatry, 163,* 27-31. doi:10.1192/bjp.163.1.27

Crockenberg, S. B. (1981). Infant irritability, mother responsiveness, and social support influences on the security of infant-mother attachment. *Child Development*, 857-865. doi:10.2307/1129087

Dennis, C-L. E., Janssen, P. A., & Singer, A. (2004). Identifying women at-risk for postpartum depression in the immediate postpartum period. *Acta Psychiatrica Scandinavica, 110,* 338-346. doi:10.1111/j.1600-0447.2004.00337.x

Emmanuel, E., St John, W., & Sun, J. (2012). Relationship between social support and quality of life in childbearing women during the perinatal period. *Journal of Obstetric, Gynecologic, & Neonatal Nursing*, *41*(6), E62-E70. doi:6909. 2012.01400.x

Faisal-Curry, A., & Menezes, R. P. (2007). Prevalence of anxiety and depression during pregnancy in a private setting sample. *Archives of Women's Mental Health, 10,* 25-32. doi:10.1007/s00737-006-0164-6

Fontaine, K. R., & Jones, L. C. (1997). Self-esteem, optimism, and postpartum depression. *Journal of clinical psychology*, *53*(1), 59-63. doi:10.1002/(SICI) 10974679(199701) 53:1<59::AID-JCLP8>3.0.CO;2-Q

Gameiro, S., Moura-Ramos, M., Canavarro, M. C., & Soares, I. (2011). Network support and parenting in mothers and fathers who conceived spontaneously or through assisted reproduction. *Journal of Reproductive and Infant Psychology, 29*(2), 170-182. doi:10.1080/02646838.2011.553950

Glazier, R. H., Elgar, F. J., Goel, V., & Holzapfel, S. (2004). Stress, social support, and emotional distress in a community sample of pregnant women. *Journal of Psychosomatic Obstetrics & Gynecology*, *25*(3-4), 247-255. doi:10.1080/ 01674820400024406

Hahn-Holbrook, J., Schetter, C. D., Arora, C., & Hobel, C. J. (2013). Placental corticotropin-releasing hormone mediates the association between prenatal social support and postpartum depression. *Clinical Psychological Science*, *1*(3), 253-265. doi:10.1177/2167702612470646

Heron, J., O'Connor, T. G., Evans, J., Golding, J., & Glover, V. (2004). The course of anxiety and depression through pregnancy and the postpartum in a community sample. *Journal of Affective Disorders, 80*(1), 65-73. doi:10.1016/j.jad.2003.08.004

Hildingsson, I., Tingvall, M., & Rubertsson, C. (2008). Partner support in the childbearing period—A follow up study. *Women and Birth*, *21*(4), 141-148. doi:10.1016/ j.wombi.2008.07.003

Hung, C. H. (2007). Postpartum stress as a predictor of women's minor psychiatric morbidity. *Community Mental Health Journal, 43,* 1-12. doi:10.1007/s10597-006-9066-3

Hung, C-H, & Chung, H-H. (2001). The effects of postpartum stress and social support on postpartum women's health status. *Journal of Advanced Nursing, 36*(5), 676-684.doi:10.1046/j.1365-2648.2001.02032.x

Leahy-Warren, P., McCarthy, G., & Corcoran, P. (2011). Postnatal depression in first-time mothers: prevalence and relationships between functional and structural social support at 6 and 12 weeks postpartum. *Archives of Psychiatric Nursing*, *25*(3), 174-184. doi:10.1016/j.apnu.2010.08.005

Levy-Shiff, R. (1994). Individual and contextual correlates of marital change across the transition to parenthood. *Developmental Psychology, 30,* 591-601. doi:10.1037/ 0012-1649.30.4.591

Lovibond, S.H., Lovibond, P. F. (1995). *Manual for the depression anxiety stress scales 2nd Edition.* Psychology Foundation of Australia: Sydney.

Lovibond, P. F., & Lovibond, S. H. (1995). The structure of negative emotional states: Comparison of the Depression Anxiety Stress Scales (DASS) with the Beck

Depression and Anxiety Inventories. *Behaviour Research and Therapy, 33*(3), 335-343. doi:10.1016/0005-7967(94)00075-U

Martins, C., & Gaffan, E. A. (2000). Effects of early maternal depression on patterns of infant-mother attachment: A meta-analytic investigation. *Journal of Child Psychology and Psychiatry, 41*(6), 737-746. doi:10.1111/1469-7610.00661

Milgrom, J., Gemmill, A. W., Bilszta, J. L., Hayes, B., Barnett, B., Brooks, J., Ericksen, J., Ellwood, D., & Buist, A. (2008). Antenatal risk factors for postnatal depression. A large prospective study. *Journal of Affective Disorders, 108,* 147-157. doi:10.1016/j.jad.2007.10.014

Miller, R. L., Pallant, J. F., & Negri, L. M. (2006). Anxiety and stress in the postpartum: Is there more to postnatal distress than depression. *BMC Psychiatry, 6,* 12-22. doi:10.1186 /1471-244X-6-12

Moss, K. M., Skouteris, H., Wertheim, E. H., Paxton, S. J., & Milgrom, J. (2009). Depressive and anxiety symptoms through late pregnancy and the first year post birth: an examination of prospective relationships. *Archives of Women's Mental Health, 12*(5), 345-349. doi:10.1007/s00737-009-0086-1

O'hara, M. W., & Swain, A. M. (1996). Rates and risk of postpartum depression – a meta- analysis. *International Review of Psychiatry, 8*(1), 37-54. doi:10.3109/ 09540269609037816

Pope, S. (2000). *Postnatal depression: A systematic review of published scientific literature to 1999.* National Health and Medical Research Council, Australia.

Rallis, S., Skouteris, H., McCabe, M., & Milgrom. J. (2014). The transition to motherhood: Towards a broader understanding of perinatal distress. *Women and Birth, 27*(1), 68-71. doi:10.1016/j.wombi.2013.12.004

Razurel, C., Kaiser, B., Sellenet, C., & Epiney, M. (2013). Relation between perceived stress, social support, and coping strategies and maternal well-being: A review of the literature. *Women and Health, 53,* 74-90. doi:10.1080/03630242.2012.732681

Romito, P., Saurel-Cubizolles, M. J., & Lelong, N. (1999). What makes new mothers unhappy: psychological distress one year after birth in Italy and France. *Social Science & Medicine*, *49*(12), 1651-1661. doi:10.1016/S0277-9536(99)00238-5

Salmela-Aro, K., Aunola, K., Saisto, T., Halmesmaki, E., & Nurmi, J. (2006). Couples share similar changes in depressive symptoms and marital satisfaction anticipating the birth of a child. *Journal of Social and Personal Relationships, 23,* 781-803. doi:10.1177/0265407506068263

Spoozak., Gotman, N., Smith, M. V., Belanger, K., & Yonkers, K. A. (2009). Evaluation of a social support measure that may indicate risk of depression during pregnancy. *Journal of Affective Disorders, 114*(1-3), 216-223. doi:10.1016/j.jad.2008.07.015

Tammentie, T., Paavilainen, E., Åstedt-Kurki, P., & Tarkka, M. T. (2004). Family dynamics of postnatally depressed mothers–discrepancy between expectations and reality. *Journal of Clinical Nursing*, *13*(1), 65-74. doi:10.1046/j.1365-2702.2003.00824.x

Van Lerberghe, W., Manuel, A., Matthews, M. A., & Cathy, W. (2005). *The World Health Report 2005 - Make Every Mother and Child Count.* World Health Organisation.

Webster, J., Nicholas, C., Velacott, C., Cridland, N., & Fawcett, L. (2011). Quality of life and depression following childbirth: impact of social support. *Midwifery*, *27*(5), 745-749.doi:10.1016/j.midw.2010.05.014

Wenzel, A., Haugen, E. N., Jackson, L. C., & Robinson, K. (2003). Prevalence of generalized anxiety at eight weeks postpartum. *Archives of Women's Mental Health*, *6*(1), 43-49. doi:10.1007/s00737-002-0154-2

Xie, R. H., He, G., Koszycki, D., Walker, M., & Wen, S. W. (2009). Prenatal social support, postnatal social support, and postpartum depression. *Annals of Epidemiology*, *19*(9), 637-643. doi:10.1016/j.annepidem.2009.03.008

Yelland, J., Sutherland, G., & Brown, S. (2010). Postpartum anxiety, depression, and social health: findings from a population-based survey of Australian Women. *BMC Public Health, 10,* 771-777. doi:10.1186/1471-2458-10-771

Paper 4: Sociodemographic, Pregnancy, Obstetric, and Postnatal Predictors of Postpartum Stress, Anxiety and Depression in New Mothers

Danielle Clout (BSc(hons)[1] and Rhonda Brown [BSc(hons), PhD][1]

Journal of Affective Disorders

Published in 2015, Volume 188, pages 60-67

doi:10.1016/j.jad.2015.08.054

1. Australian National University, Australia

Abstract

Background: The purpose of this paper was to evaluate relationships between sociodemographic, pregnancy, obstetric, and postnatal variables and postpartum depression (PPD), anxiety and stress levels in new mothers. **Method:** One-hundred-thirty-nine women completed the baseline questionnaire and 105 completed the follow-up questionnaire at 4-6 months postpartum. Sociodemographic and pregnancy factors were assessed at baseline, birth and postnatal factors were assessed at time 2, and depression, anxiety, and stress were assessed at both time points. **Results:** Caesarean delivery was associated with high postpartum depression, anxiety, and stress levels. Child sleep problems were related to depression, child health problems were related to anxiety, more stressful life events (SLE) related to high stress, and maternal sleep problems were related to PPD. However, all results became non-significant after controlling for prenatal distress levels. Finally, women who underwent caesarean delivery had higher prenatal stress, anxiety, and depression levels, relative to women who did not undergo the procedure. **Conclusion:** Psychological stress and distress tended to persist in the women from the third-trimester of pregnancy to 4-6 months postpartum. It tended to occur in the context of caesarean delivery, maternal sleep problems, child's health and sleep problems, and stressful life-events.

Postpartum depression (PPD) is second only to caesarean delivery as the most common complication related to childbirth (Gregoire, 1995). A meta-analysis has reported that the prevalence rate for PPD is approximately 13% of new mothers (O'Hara & Swain, 1996), although estimates range from 3 to more than 25% of new mothers in the first 12-months postpartum (Dennis, Janssen, & Singer, 2004). PPD prevalence estimates also vary depending on the sample characteristics, screening instruments, and statistical methods used (Gaillard, Le Strat, Mandelbrot, Keïta, & Dubertret 2014; Le Strat, Dubertret, & Le Foll, 2011). Many women also experience significant postpartum *anxiety* (Don, Chong, Biehle, Gordon, & Mickelson, 2014), which is a distinct clinical problem despite its high comorbidity with depression (Matthey, Barnett, Howie, & Kavanagh, 2003; Miller, Pallant, & Negri, 2006). Maternal anxiety is reported to affect about 25-45% of new mothers (Britton, 2005; Faisal-Curry & Menezes, 2007), making it more common than depression in the perinatal period (Britton, 2008; Wenzel, Haugen, Jackson, & Robinson, 2003). Furthermore, Rallis, Skouteris, McCabe and Milgrom (2014) argue that maternal *stress* should be viewed as a distinct affective state, but few studies have examined perinatal stress in new mothers. Thus, there is a need to comprehensively examine the psychological health of new mothers in the perinatal period, including factors that predict the three affective states.

Many studies have previously evaluated the risk factors for PPD (O'Hara & McCabe, 2013), including at least three meta-analyses (Beck, 2001; O'Hara & Swain, 1996; Robertson, Grace, Wallington, & Stewart, 2004) and one systematic review (Pope, 2000). Currently, the best-established risk factors for PPD are a past history of depression, depression during pregnancy (Beck, 2001), poor marital relationship, and a lack of social support (Buist & Biltza, 2005; O'Hara & Swain, 1996; Pope, 2000). However, research evaluating the risk factors for anxiety is in its infancy, although the

factors are reported to include prior psychiatric history, low socioeconomic status (SES), multiparous status, and stressful life-events (SLE) (Britton, 2008; Dipietro, Costigan, & Sipsma, 2008; Wenzel, Haugen, Jackson, & Brendle, 2005).

Many other risk factors have been examined for PPD and to a limited extent postpartum anxiety, including sociodemographics (e.g. income), obstetric risk factors (e.g. use of assisted reproductive technologies), and postpartum variables (e.g. feeding method) (Beck, 2001; Britton, 2008; McMahon et al., 2011; Fisher et al., 2012; Ystrom, 2012). However, as detailed below, the research has tended to yield conflicting results, and the risk factors for maternal anxiety and stress have rarely been elucidated. Thus, in this study, we examined sociodemographic, pregnancy, birth, and postnatal variables as potential risk factors of maternal depression, anxiety, and stress postpartum.

Sociodemographics have inconsistently been shown to be related to maternal distress. For example, younger age is related to worse PPD in some studies (Petrosyan, Armenian, & Arzoumanian, 2011; Reck et al., 2008), whereas anecdotal reports suggest that older mothers are at greater risk (Carolan, 2005), and others studies report no significant relationship between age and PPD (McMahon et al., 2011; Smith & Howard, 2008). Similarly, lower SES (e.g. financial distress, low income, education) (Rich-Edwards et al., 2006) was shown to be related to higher levels of PPD (Beck, 2001; Fisher et al., 2012) and anxiety in some studies (Britton, 2008; Wenzel et al., 2005), but in others, it was unrelated to maternal distress (Smith & Howard, 2008).

Of *pregnancy* factors, parity has been explored as a risk factor for maternal mental health. Some studies reported that primiparous women were at greatest risk, especially if they were over 30-years of age (Brown & Lumley, 1994), whereas others reported that multiparity was related to high anxiety (Dipietro et al., 2008), and others failed to find any relationship between parity and PPD (Cox, Connor, & Kendall, 1982;

Bågedahl-Strindlund, & Monsen Börjesson, 1998). However, women who had an unintended or unwanted pregnancy were shown to be at an increased risk of PPD (Cheng, Schwarz, Douglas, & Horon, 2009; Warner, Appleby, Whitton, & Faragher, 1996), possibly due to their high perceived stress and lack of social support, relative to those with planned pregnancies (Chou, Avant, Kuo, & Fetzer, 2008).

Obstetric and *birth* variables have previously been studied in relation to PPD. Assisted reproductive technologies (ART) including IVF were shown to be related to depression during pregnancy and the early postpartum, relative to women who conceived spontaneously (Monti, Agostini, Fagandini, La Sala, & Blickstein, 2009). However, in a larger study, McMahon et al. (2011) found no increased risk of PPD in women who conceived using ART, supporting the results of a recent meta-analysis which failed to find a significant link between ART and PPD (Ross et al., 2011). ART has also been linked to postpartum anxiety such that women who used ART showed greater latent anxiety at 3-months postpartum and more manifest anxiety during the third trimester of pregnancy and 1-week after birth, relative to non-ART women (Monti, Agostini, Fagandini, Paterlini, La Sala & Blickstein, 2008). Furthermore, the relationship between type of delivery and PPD is not clear. Several studies have reported that caesarean delivery and assisted vaginal delivery were related to high PPD risk (Blom et al., 2010; Xie, Lei, Wang, Xie, Walker, & Wen, 2011; Yang, Shen, Ping, Wang, & Chien, 2011), whereas others including a large meta-analysis failed to find any support for the relationship (Adams, Eberhard-Gran, Sandvik, & Eskild, 2012; Carter, Frampton & Mulder, 2006).

Postnatal factors such as SLE, feeding method, sleep quality (infant & mother), and the baby's health have been evaluated as risk factors for PPD, of which perinatal SLE is reported to be the most robust indicator of PPD and anxiety (Boyce, 2003;

Britton, 2008; Pope, 2000). However, the results for breast-feeding are inconsistent, with some studies finding that PPD is related to early cessation of or never breastfeeding (Turner & Papinczack, 2000; Ystrom, 2012), whereas others failed to find support for the relationship (Chaudron, Klein, Remington, Palta, Allen, & Essex, 2001; Wilkinson & Scherl, 2006). Similarly, breastfeeding cessation predicted an increase in postpartum anxiety in some studies (Ystrom, 2012), whereas others failed to find a difference in anxiety scores based on infant feeding method (Wenzel et al., 2005). Nonetheless, maternal sleep is known to be strongly linked to maternal mental health, especially regular continuous sleep between midnight and 6am (Goyal, Gay, & Lee, 2009). Similarly, infant sleep problems are known to be related to maternal PPD (Armstrong, Van Haeringen, Dadds, & Cash, 1998), although the direction of the relationship is unclear as some studies examined PPD as a risk factor for infant sleep difficulties (Armitage, Flynn, Hofferman, Vazquez, Lopez, & Marcus, 2009).

Finally, several studies have examined the relationship between infant health and PPD. In a recent study of over 107,000 women, Ban, Gibson, West, and Tata (2010) found that perinatal depression was related to higher rates of gastrointestinal and lower-respiratory-tract infection in the infants. Similarly, maternal depression was shown to predict later infant health concerns (Gress-Smith, Luecken, Lemery-Chalfant, & Howe, 2012), although the reverse association was not explored. Thus, in this study, we evaluated the child's current health using a 5-point scale ranging from excellent to poor, along with similar measures of infant sleep (4-point scale, large problem to no problem at all) and maternal sleep (5-point scale, very good to very bad) over the past month.

In summary, many factors have been examined as risk factors for PPD including sociodemographic, pregnancy, obstetric, and postnatal factors, although the

results are mostly conflicting, and only a few studies have evaluated risk factors for postpartum anxiety and stress. In this study, we used a retrospective longitudinal design to examine relationships between a range of sociodemographic, pregnancy, obstetric, and postnatal variables and maternal depression, anxiety, and stress levels at 4-6 months postpartum. A retrospective longitudinal design was selected as many of the obstetric and postnatal variables assessed were measured at Time 2, but were related to factors occurring at birth and then recalled retrospectively. Consistent with the small available literature, we expected that:

1) Unplanned pregnancy, SLE, and infant and maternal sleep difficulties will be related to high depression levels; low income, multiparity, SLE, and ART will be related to high anxiety levels; and, more SLE will be related to higher stress levels in the new mothers.

Method

Participants

This study was conducted with full ethics approval from the Australian National University (ANU) Human Research Ethics Committee (Protocol Number 2010/650). Potential participants were indirectly recruited to the study via advertisements placed on a number of online parenting forums and social media sites (e.g. www.essentialbaby.com.au/forums/, www.facebook.com, www.bubhub.com.au/community/forums/forum.php), and using email snowballing. Study inclusion criteria were an age of 18 years or older, female gender, being in cohabiting or marital relationship with the father of the expectant infant, and in the third-trimester of pregnancy, either as a primiparous or multiparous expectant mother. No reimbursements were provided to the participants.

An *a priori* power analysis indicated that at least 103 participants were required, assuming a medium effect size (f^2=.15), with alpha set at .05, power of .8, and up to 7

predictors when analysing the continuous DASS-21 score. As few research studies have used the DASS-21 for longitudinal research into perinatal distress, a small to medium effect size was assumed based on Yelland et al. (2010) reporting medium effect sizes in similar research. One-hundred-seventy-five women emailed the researcher (DC) and 139 completed the baseline questionnaire (response rate=79.4%). Most of the women (*N*=105) completed the follow-up questionnaire at 4-6 months postpartum (retention rate=75%). Women who did not complete the follow-up questionnaire did not differ on demographic or psychological variables compared with those who completed both questionnaires. All women were in a marital or cohabiting relationship with the father of the expectant child at both time points.

Measures

Expectant mothers were asked *sociodemographic* questions including their age, education level, employment status, and household income. *Pregnancy* questions included parity, planned vs. unplanned pregnancy, fertility assistance, including fertility drugs, IVF, or other medical intervention (yes/no), and the gender of the infant. *Obstetric* questions included whether the delivery was induced (yes/no), and the mode of delivery (vaginal/vacuum extraction/forceps delivery/emergency vs. planned caesarean). Due to sample size and low numbers in individual categories, the vacuum extraction and forceps items were combined to give an assisted vaginal delivery score, and emergency and planned caesareans were combined to give a caesarean score (0/1). Other birth items included the use of specialist nursery or neonatal intensive care (yes/no) and the gestation age at delivery (<33-weeks, 34-36-weeks, 37-41-weeks, or >41-weeks).

Postpartum variables included breastfeeding (initial & at follow-up, yes/no), ratings of the child's current health (5-point scale, excellent to poor), extent to which the child's sleeping patterns or habits were a problem (4-point scale, large problem to no

problem at all), and maternal sleep quality over the past month (5-point scale, very good to very bad). The total number of *stressful life-events* (SLE) experienced by women in the past 12-months was computed from a list of 15 stressful situations and events such as severe illness, injury or assault (self or close relative); death of parent, partner or child; death of close relative or friend; serious problem with close friend or relative; moved interstate; moved within state; crisis at work or in career; lost job; unsuccessful job seeking >1-month; major financial crisis; problems with police or law; something of value lost or stolen; alcohol problem (self/someone in household); and, drug problem (self/someone in household).

Symptoms of depression, anxiety, and stress over the past week were assessed using the *Depression Anxiety, and Stress Scales (DASS-21).* The authors of the scale have reduced the symptom overlap between the subscales so as to measure the unique symptoms of each state. There is Australian normative data for the scale (Lovibond & Lovibond, 1995). The scale asks participants to rate the presence and severity of negative emotions, using 4-point scales ranging from 0 (*did not apply to me at all*) to 3 (*applied to me very much/most of the time*), with high scores indicating worse symptoms. The DASS depression scale shows high convergent validity with the Beck Depression Inventory (r=.74), and the anxiety scale is convergent with the Beck Anxiety Inventory (r=.81) (Lovibond & Lovibond 1995a;b). The subscales have high internal consistency, with Cronbach's alpha of .81 for depression, .73 for anxiety, and .81 for stress (Lovibond & Lovibond, 1995a). In this study, internal consistencies of the subscales were adequate to high at time 2, with Cronbach's alphas of .86 for depression, .79 for anxiety, and .76 for stress.

Postnatal depression symptoms over the past week were assessed using the *Edinburgh Postnatal Depression Scale (EPDS)* (Cox, Holden, & Sagovsky, 1987). This

10-item scale asks participants to rate the intensity of their depressive symptoms using 4-point Likert type scales ranging from 0 to 3, with high scores indicating worse depression. A score greater than 12 was considered to indicate elevated depression levels in this study, consistent with the recommendation of Pope (2000). The EPDS has well documented reliability and validity including high internal consistency, with a Cronbach's alpha of .87 (Affonso, Horowitz, & Mayberry, 2000). In this study, the EPDS showed high internal consistency, with a Cronbach's alpha of .89 at Time 2.

Procedure

Interested individuals contacted the researcher by email if they wished to participate in the study. Women in the third trimester of pregnancy were sent a return email with an individual study ID number and link to the online survey at about 32-36 weeks gestation (*mean at completion* = 33.9 weeks*, SD* = 2.9, range: 29-39 weeks): https://anupsych.co1.qualtrics.com/SE/?SID=SV_b2AcZtbcYiWjZl2. If they were at an earlier stage of pregnancy, their permission was sought to contact them when they reached the third trimester, and if granted, they were emailed the same link. They were emailed again at 4-months postpartum and asked if they still consented to participate, and if they did, they were sent a study ID code and link to the follow-up questionnaire: https://anupsych.co1.qualtrics.com/ SE/?SID=SV_eSazN4fdT c3azYM. The mean time to follow-up was 21.5 weeks (5-months; *SD*=2.8, range: 17-28 weeks).

Statistical Analyses

The dependent variables (DV) of stress, anxiety, and depression were assessed at times 1 and 2, and PPD was assessed at time 2. Sociodemographic and pregnancy variables were assessed at time 1, and birth and postnatal variables were assessed at time 2. All statistical analyses were performed using IBM SPSS statistical software (Version 22). Multiple regression analyses identified the socio-demographic, pregnancy, birth, and

postnatal variables that predicted depression, anxiety, stress, and EPDS levels at time 2. IVs that were significantly correlated with depression, stress and EPDS levels were included in the respective analyses and IVs that were correlated with anxiety at $p<.1$ were included in the analysis of anxiety due to an insufficient number of predictors significant at the $p<.05$ level. Hierarchical multiple regression analyses were then conducted to reevaluate the relationships, after controlling for time 1 DVs. *Post-hoc* independent-samples *t*-tests then compared the stress, anxiety, and depression scores of women who did/did not undergo caesarian delivery.

Results

Univariate outliers were detected on all IVs including sociodemographics, but none were excluded as they represented clinically-relevant maternal circumstances, and the 5% trimmed means were similar to the original means. All variables except age were skewed, with significant ($p<.001$) Kolmogorov-Smirnov and Shapiro-Wilk normality tests, indicating the variables had non-normal distributions. Data transformations did not normalise the score distributions, and the same profile of results was obtained using square-root transformed and untransformed data (results not shown), thus, only the untransformed data is presented here. Non-normal distribution of data is typical in social sciences research, and violation of this assumption is not considered to cause issues with using parametric statistical analysis techniques when sample size is adequate (over 30), with parametric techniques also having the advantage of better statistical power (Pallant, 2007). Furthermore, the use of non-parametric statistics is most appropriate when the area of study is best represented by the mean score (Pallant, 2007), which is not the case for these research questions. Therefore, parametric statistics have been selected for use in this paper.

Means, standard deviations, and correlational coefficients of the key study variables are provided in Table 1. On the EPDS, 19.3% of women were shown to have elevated depression levels (*M*=7.5, *SD*=5). The proportion of women in each DASS severity group at time 2 is also shown in Table 1. The EPDS detected only one additional case of depression that was not identified by DASS-21 scores. Greater than one-third of women (*N*=41, 39%) had elevated levels of psychological symptoms on the DASS-21, of whom 11 (26.8%) had elevated levels of all three states, and 12 had elevated levels of two affective states. Overall, 15 women (14.3% of the total sample) endorsed symptoms of anxiety and stress, without comorbid depression. Depression, anxiety, stress, and PPD were strongly intercorrelated, and correlated with maternal sleep and baby's sleep and health problems. All the states except PPD were correlated with caesarean delivery. Finally, anxiety was correlated with SLE, stress was correlated with SLE and younger gestation age at delivery, and PPD was correlated with SLE, younger gestation age at delivery, and an unplanned pregnancy.

Regarding *sociodemographic and pregnancy variables,* at baseline, the mean age of participants was 31.8 years (*SD*=4.37, range: 20-43 years). One-third of the women (36.0%, *N*=38) were multiparous and the rest were preparing to give birth to their first child. Of the multiparous women, 27 (71.1%) had one child, 7 (18.4%) had two children, and 4 had three other children. Most women (*N*=80.9%) were married and the rest were in a de facto relationship, with a mean relationship length of 6.95 years (*SD*=3.3, range: 11 months–17.4 years). Most women (*N*=96, 91.4%) identified themselves as Caucasian, 3 identified as Asian, two as South-East Asian, one as Indigenous, and 3 as other. Nearly two-thirds (*N*=65, 61.9%) had completed university, 22 (21%) had completed TAFE, 16 had graduated from Year 12, and 2 left school at Year 10. Less than one-half (*N*=50, 47.6%) were in full-time employment, one-quarter (*N*=28, 26.7%) were employed part-

time/casual, one-quarter (*N*=24, 22.9%) undertook home duties, and 3 were unemployed. The mean income of couples was A$122,876 (*SD*=$63,728, range: $27,000 – $450,000).

Regarding *pregnancy* and *birth*, three-quarters (*N*=81, 77.1%) of the women reported the pregnancy as planned and few (*N*=13, 12.4%) required the assistance of fertility drugs, IVF, or other fertility treatment. One-third of women (*N*=34, 32.4%) had their labour induced. Two babies were born prior to 37-weeks, 90 (85.7%) were born between 37-41-weeks, and 13 were born after 41-weeks, of whom 51 (48.6%) were male and 54 were female. One-half of women (*N*=58, 55.2%) reported a normal vaginal delivery, 17 (16.2%) had an assisted vaginal delivery, and 30 (28.6%) had a caesarean delivery. Few babies (*N*=16, 15.2%) required an admission to neonatal intensive care or a special care nursery unit. Almost all babies (*N*=103, 98.1%) were breastfed from birth, and three-quarters (N=79, 75.2%) were still breastfed at follow-up.

Regarding the *postpartum*, most women (*N*=99, 94.2%) reported their child's health as very good to excellent, and the rest rated it as fair to good. Forty-one women (39%) reported no problems with their child's sleep, 36 (34.3%) reported a small problem, and 28 (26.7%) reported a moderate to large problem. Similarly, some women (*N*=10, 9.5%) rated their own sleep as very good, 53 (50.5%) rated it as fairly good, 38 (36.2%) rated it as fairly bad, and 4 (3.8%) rated it as very bad. One-third of women (*N*=36, 34.3%) reported experiencing one SLE in the prior 12-months, 19 (18.1%) reported two SLE, 7 (6.8%) reported three or more SLE, and 43 (41%) had no SLE in the prior 12-months. The most common SLE was a serious illness or injury (self or close relative), death of a friend or close family member, or they moved house.

Standard multiple regression analyses evaluated the sociodemographic, pregnancy, birth, and postnatal variables as predictors of the three states, see Table 2. In the analysis of *depression*, the IVs predicted 17.3% (adjusted R^2) of the variance in

depression, but only caesarean delivery and child's sleep problems were associated with higher depression levels postpartum. In the analysis of *anxiety,* the IVs predicted 12.4% of the variance in anxiety, and caesarean delivery and poorer child health ratings were associated with higher anxiety levels. In the analysis of *stress,* the IVs predicted 19% of the variance in stress, and caesarean delivery, child's health and SLE were associated with higher stress levels. In the analyses of *PPD,* the IVs predicted 24% of the variance in PPD, and poorer maternal sleep quality was associated with higher PPD levels.

Table 1

Means, standard deviations and correlations of study variables, and proportion of women in each DASS-21 severity group

	M	*SD*	N	M	Mod	S	ES	ANX	STR	PPD	AGE	INC	ED	ES	PAR	PE	ART	GEN	IND	AVD	CS	GES	NEO	IBF	SBF	CH	CS	MS	SLE
DEP	6.36	7.7	75.2	7.6	6.8	5.8	2	.62**	.70**	.73**	-.05	-.08	-.12	.13	.11	.17	-.08	-.05	.02	-.004	.22*	-.18	.07	-.12	-.006	.214*	-.35**	.29*	.1
ANX	4.15	6.2	78.1	4.8	11.4	2.9	3		.66**	.63**	-.01	-.08	.1	.06	.07	.15	-.14	-.15	.06	.03	.18[a]	-.15	.09	-.07	.05	.26**	-.19[a]	.2*	.19[a]
STR	11.7	8.7	72.4	6.7	12.5	4.8	3.9			.70**	-.03	-.02	.08	-.001	.14	.1	.05	-.19	.08	-.1	.2*	-.21*	.09	-.06	-.01	.24*	-.33**	.32**	.23*
PND	7.5	5									.06	.11	.13	.03	.14	.22*	-.04	-.1	.06	.04	.16	-.26**	.11	-.04	.05	.32**	-.4**	.38**	.24*
AGE	31.8	4.4										-.36**	-.24**	-.08	-.3**	.1	.05	-.1	.02	.14	-.18	.08	.12	.12	.05	-.02	.03	-.24*	.24*
INC	122	64											.17	.27**	-.13	-.17	-.08	-.13	.033	-.11	-.07	-.07	-.14	.04	.03	.02	-.22*	.06	-.15
ED														.06	-.07	-.01	-.09	-.21*	-.04	-.1	.11	.02	-.04	-.07	-.06	.04	-.03	-.01	-.08
ES															-.44**	-.09	-.17	.01	-.25*	.15	-.05	-.11	-.07	.03	.1	.1	-.17	-.05	.02
PAR																.004	.13	.04	.16	-.18	.16	.12	-.03	-.001	-.03	-.12	.19*	.1	-.13
PE																	.07	.08	-.06	.01	-.04	-.22*	.11	.09	.06	.14	.06	-.04	.31**
ART																		-.08	-.14	.09	.05	-.11	.08	.05	-.002	-.1	.18	.07	.06
GEN																			.18	.07	-.15	.03	.22*	-.14	-.02	-.08	.16	-.04	-.02
IND																				-.14	.17	.19*	.1	-.2*	.02	-.09	.14	-.1	-.01
AVD																					-.28*	-.09	.11	.13	-.01	.2*	-.06	-.07	.03
CS																						-.11	-.26*	-.09	.13	-.14	.1	-.01	-.08
GES																							.1	-.15	.04	-.24*	.25*	-.16	-.15
NEO																								.06	.13	.04	-.03	.02	.13
IBF																									.24*	.04	.07	-.17	.06
SBF																										.04	.15	-.09	.06
CH																											-.41**	.29**.	.14
CS																												-.57**	-.18
MS																													.05
SLE																													

Notes. N = 105. Dep = T2 DASS-21 total depression score, ANX = T2 DASS-21 total anxiety score, STR = T2 DASS-21 total stress score, PPD = T2total EPDS score, AGE=Age, INC=Income, ED=Education Level, ES= Employment Status, PAR=Parity, PE = Pregnancy Intention, ART = Fertility Assistance, GEN= Gender of Infant, IND = Induction, AVD = Assisted Vaginal Delivery, CS = Caesarean Section, GES= Gestation at Birth, NEO= Neonatal Intensive Care or Special Care Nursery Stay, IBF= Breastfeeding Initiation, SBF= Still Breastfed, CH=Child's Current Health, CS=Child Sleep Problems, MS= Maternal Sleep Quality, SLE=Stressful Life Events Total. N=normal DASS-21 severity, M=mild DASS-21 severity, Mod=moderate DASS-21 severity, S=severe DASS-21 severity, ES=extremely severe DASS-21 severity.
[a]Two-tailed Pearson Correlation in SPSS, * $p < .05$. ** $p < .01$

Table 2

Summary of Multiple Regressions Predicting Postpartum Symptoms of Depression, Anxiety, Stress, and PPD

Variable		B	SE B	β	t
Depression	C-Section	2.23	.76	.27	2.9**
	Child Health	.70	.61	.11	1.15
	Child Sleep	-.11	.48	-.27	-2.4*
	Mother Sleep	.57	.60	.10	.95
Anxiety	C-Section	1.57	.64	.23	2.46*
	Child Health	1.13	.51	.23	2.22*
	Child Sleep	-.06	.41	-.02	-.15
	Mother Sleep	.52	.50	.12	1.04
	SLE	.51	.26	.18	1.95
Stress	C-Section	2.26	.87	.23	2.25*
	Child Health	.88	.70	.12	1.2
	Child Sleep	-.65	.69	-.14	-1.16
	Mother Sleep	1.2	.68	.19	1.72
	SLE	.7	.35	.19	2.06*
	Gestation	-758	1.12	-.06	-.70
PND	Child Health	.87	.78	.11	1.12
	Child Sleep	-1.1	.64	-.19	-1.69
	Mother Sleep	1.56	.75	.22	2.07*
	SLE	.59	.41	.12	1.35
	Gestation	-1.3	1.26	-.10	-10
	Planned pregnancy	2.01	1.12	.17	1.78

Note. N=105

[a]2-Tailed Pearson Correlation in SPSS, * p < .05. ** p < .01

Hierarchical multiple regression analyses then evaluated these relationships, after controlling for *pre*natal distress levels. In the analyses, time 1 DV was entered at step 1 and the IVs were entered at step 2, see Table 3 (R^2 change data not published). At step 1, time 1 depression predicted 37.6% (adjusted R^2) of the variance in time 2 *depression*, and at step 2, the IVs predicted an additional 5.2% of its variance, increasing it to 42.8% (R^2 change=.07, $F_{4,99}$=3.34, *p*=.013), but none of the IVs predicted time 2 depression levels. At step 1, time 1 anxiety predicted 31.2% of the variance in time 2 *anxiety*, and at step 2, the IVs slightly increased the variance (R^2=33%, R^2 change=.05, $F_{5,98}$= 1.56, *p*=.18), but

none of the IV's predicted time 2 anxiety levels. At step 1, time 1 stress predicted 31.8% of the variance in time 2 *stress*, and at step 2, the IVs predicted an additional 9% of its variance, increasing it to 40.8% (R^2 change=.12, $F_{6,97}$=4.12, p=.002), but none of the IVs predicted time 2 stress levels.

Table 3

Summary of Hierarchical Multiple Regressions Predicting Depression, Anxiety, and Stress Levels Postpartum

Variable			B	SE B	β	t
Depression	Step 1	Depression Time 1	.65	.08	.62	7.98**
	Step 2	Depression Time 1	.59	.09	.56	6.76**
		C-Section	.37	.69	.04	.79
		Child Health	.4	.51	.07	.79
		Child Sleep	-.62	.41	-.15	-1.53
		Mother Sleep	.7	.50	.13	1.42
Anxiety	Step 1	Anxiety Time 1	.51	.07	.56	6.9**
	Step 2	Anxiety Time 1	.44	.08	.49	5.61**
		C-Section	.61	.59	.09	1.04
		Child Health	.80	.45	.16	1.77
		Child Sleep	-.03	.36	-.01	-.93
		Mother Sleep	.25	.44	.06	.56
		SLE	.32	.23	.16	1.4
Stress	Step 1	Stress Time 1	.53	.08	.57	7.04**
	Step 2	Stress Time 1	.45	.08	.49	6.1**
		C-Section	.95	.77	.10	1.24
		Child Health	.48	.60	.07	.81
		Child Sleep	-.58	.47	-.12	-1.22
		Mother Sleep	1.07	.58	.17	1.86
		SLE	.58	.30	.13	1.9
		Gestation	-.63	.97	-.05	-.66

Note. N=105

[a]2-Tailed Pearson Correlation in SPSS, * p < .05. ** p < .01

Finally, *post-hoc* independent-samples *t*-tests compared the *pre*natal affective states of women who did/did not undergo caesarean delivery. Prenatal *depression* levels were significantly higher in women who had a caesarean delivery (M=12.2, SD=4.83), relative to those who did not (M=9.3, SD=2.64; $t(103)$=-3.14, p=.003, two-tailed; mean difference=-2.93, 95% CI: -4.82 to -1.04), with a medium effect size (eta squared=.08). Prenatal *anxiety* levels were higher in women who had a caesarean delivery (M=11.6, SD=3.9), relative to those who did not (M=9.6, SD=3.09; $t(103)$=-2.69, p=.008, two-tailed; mean difference=-1.94, 95% CI: -3.37 to -.51), with a medium effect size (eta squared=.06). Prenatal *stress* levels were higher in women who had a caesarean delivery (M=15.1, SD=5.44), relative to those who did not (M=12.4, SD= 4.11; $t(103)$=-2.76, p=.007, two-tailed; mean difference= 2.69, 95% CI: -4.63 to -.76), with a medium effect size (eta squared=.07).

Discussion

Many prior studies have examined the relationships between PPD and socio-demographic, pregnancy, obstetric, and postnatal factors, although the results are largely inconsistent. In addition, few prior studies have examined the risk factors for maternal anxiety and stress, despite the need to examine these states in addition to depression (Matthey et al., 2003; Rallis et al., 2014; Wardrop & Popadiuk, 2013). Thus, in this study, we examined sociodemographic, pregnancy, birth, and postnatal variables as predictors of maternal depression, anxiety, and stress, at 4-6 months postpartum.

No *sociodemographics* including age, education, and income were shown to be related to depression, anxiety, and stress postpartum, somewhat consistent with *Hypothesis 1*. Several prior studies have reported no significant association between age (McMahon et al., 2011), education (Smith & Howard, 2008) and PPD, but the relationship between low income, PPD (Beck, 2001; Fisher et al., 2012), and postpartum anxiety

(Britton, 2008; Wenzel et al., 2005) is generally well-established. Due to the above average household incomes for participants in this study, it is possible that few participants were experiencing the challenges and financial stressors associated with a low income level, and as a result income level was less likely to influence affective symptoms in this sample.

No *pregnancy* factors were related to depression, anxiety, and stress postpartum including planned pregnancy, multiparous birth, and use of ART, inconsistent with *Hypothesis 1*, except that depression during pregnancy predicted high depression levels postpartum. Several prior studies have reported that unplanned pregnancy is related to postpartum distress (Cheng et al., 2009; Chou et al., 2008; Warner et al., 1996), although parity and PPD are not consistently related (Bågedahl- Strindlund, & Monsen Börjesson, 1998; Cox et al., 1982). However, most of the pregnancy items were only binary (yes/no), thus, the above non-significant relationships may be due to the limited variability in these measures.

Only one *obstetric* variable (i.e. caesarean delivery; emergency & elective) was related to high stress, anxiety, and depression levels in the first set of analyses, but the relationships became non-significant after controlling for prenatal distress levels. The results are somewhat consistent with prior results, although we did not find that prematurity of the infant was related to PPD (Davis, Edwards, Mohay, & Wollin, 2003) since only two babies were born prior to 37-weeks. ART use was also unrelated to stress, anxiety, and depression levels, although ART has previously been linked to postnatal anxiety and depression (Monti et al., 2008; Monti et al., 2009), but larger studies tend to find no consistent association between it and postpartum distress (McMahon et al., 2011; Ross, McQueen, Vigod, & Dennis, 2011). Similarly, caesarean delivery was shown to be related to postpartum distress in some studies (Blom et al., 2010; Kuo et al., 2014; Yang et

al., 2011), but most studies have failed to find a significant association between the variables (Adams et al., 2012; Carter et al., 2006; Gailard et al., 2014).

To further evaluate the latter relationship, post-hoc *t*-tests examined *pre*natal distress levels in the women who did/did not undergo caesarean delivery. The women who underwent caesarean delivery reported higher stress, anxiety, and depression levels in the third-trimester of pregnancy, relative to those who did not undergo the procedure. The results are consistent with prior study results indicating that high prenatal anxiety and depression are related to later caesarean delivery (Kringeland, Daltveit, & Moller, 2010; Rauh et al., 2012), and that a substantial proportion of mothers undergoing caesarean delivery have high to very high anxiety in the third trimester of pregnancy and at multiple points to 6-months postpartum (Kuo, Chen, & Tzeng, 2014). Taken together, the results suggest that women who experienced psychological distress during pregnancy were more likely to undergo caesarean delivery, and this distress tended to persist in the women postnatally. However, we grouped the emergency and caesarean deliveries together in our analyses, so it is unclear whether the doctor prescribed the procedure or the prenatally distressed women requested it.

Several *postnatal* variables were shown to be related to high stress, anxiety and depression levels in the first set of analyses. Somewhat consistent with *Hypothesis 1*, child sleep problems were related to high depression levels, maternal sleep problems were related to PPD, child health problems were related to high anxiety levels, and more SLE and child health problems were related to high stress levels, although the results became non-significant after controlling for prenatal distress levels. The findings are inconsistent with prior results indicating that SLE are related to postnatal anxiety (Britton, 2008) and depression (Beck, 2001; Pope, 2000), although we did find that SLE was related to high maternal stress. Nonetheless, sleep problems in the child and mother are known to be

related to PPD (Armstrong et al., 1998; Goyal et al., 2009), although given the apparent bidirectional relationship between the variables (Armitage et al., 2009), it is difficult to disentangle the likely complex relationships between maternal and infant sleep and maternal mental health. Finally, few studies have evaluated the baby's health in relation to PPD (Ban et al., 2010; Gress-Smith et al., 2012), and none has evaluated it in regards to maternal anxiety and stress. Finally, breastfeeding status (initial & follow-up) was not shown to be related to the three states in this study, consistent with the small literature (Chaudron et al., 2001; Wilkinson & Scherl, 2006).

In summary, the results indicate that maternal stress, anxiety, and depression tended to persist in women from the third trimester of pregnancy to 4-6 months post-partum. The affective symptoms tended to occur in the context of caesarean delivery and salient postnatal factors such as SLE, poor maternal sleep, and infant sleep and health problems, although the relationships became non-significant after controlling for prenatal maternal distress. Alternately, the results may simply reflect that the distressed mothers were more likely to interpret their baby's health and sleep as sub-optimal, rather than these problems leading to high maternal distress. Finally, the women who underwent caesarean delivery experienced higher stress, anxiety, and depression levels *pre*natally, suggesting that they either asked for or were offered the procedure more often than non-distressed women. Thus, further longitudinal assessment is required to more thoroughly evaluate the temporal relationship between prenatal mental health, type of birth, and postpartum mental health.

Further, the results should be interpreted in light of several *study limitations*. First, most of the sample was Caucasian, well-educated, married, primiparous or with one other child, and with an above average income. Australian population data shows that approximately 35% of 21-35 year olds and 21% of 35-50 year olds are tertiary educatied,

compared with almost 60% of the current sample (Australian Bureau of Statistics, 2012). In addition, the mean Australian household income was approximately $106,000AUD, with a median of $80,000 in 2014 (ABS, 2014), compared with $122,000AUD in this sample. Thus, the results are likely to be less generalizable to single mothers and women from other cultures or less affluent backgrounds, since the latter is a risk factor for PPD and anxiety (Britton, 2008; Pope, 2000). Second, stress, anxiety, and depression were assessed using self-report measures rather than a clinical interview, although the DASS-21 and EPDS have been used by other researchers to examine perinatal distress in new mothers (Miller, Pallant, & Negri, 2006; O'Hara & McCabe, Boyce, Stubbs, & Todd, 1993). Third, many of the pregnancy, birth, and postnatal variables were binary, thus, reducing the complexity of the relationships that could be explored. In addition, SLE was measured by number of stressors, rather than weighting the the nature and severity of the individual stressors. Finally, the study results cannot be used to make inferences about causality in relation to the functions of birth, postnatal, and emotional state variables.

In *conclusion,* high stress, anxiety, and depression levels tended to persist in the women from the third-trimester of pregnancy to 4-6 months postpartum. This distress tended to occur in the context of caesarean delivery, maternal sleep and child health and sleep problems, and stressful life-events, although the relationships became non-significant after controlling for prenatal distress levels. In addition, the women who underwent caesarean delivery had higher prenatal stress, anxiety, and depression levels, relative to those who did not undergo the procedure. Taken together, the results suggest that women who were psychologically distressed during pregnancy were more likely to be offered or ask for a caesarean section. Clinically, the results suggest that the women who request or are offered a caesarean delivery may be more likely to be experiencing prenatal psychological distress, and may benefit from concurrent

assessment of any mental health concerns, to allow for the provision of additional support, in the event their depression, anxiety, or stress levels are elevated.

References

Adams, S. S., Eberhard-Gran, M., Sandvik, Å. R., & Eskild, A. (2012). Mode of delivery and postpartum emotional distress: a cohort study of 55 814 women. *BJOG: An International Journal of Obstetrics & Gynaecology*, *119*(3), 298-305. doi:10.1111/j.1471-0528.2011.03188.x

Armitage, R., Flynn, H. A., Hoffman, R., Vazquez, D., Lopez, J., & Marcus, S. M. (2009). Developmental changes in sleep in infants: The impact of maternal depression. *Sleep, 32*(5), 693-696.

Armstrong, K. L., Van Haeringen, A. R., Dadds, M. R., & Cash, R. (1998). Sleep deprivation or postnatal depression in later infancy. Separating the chicken from the egg. *Journal of Paediatric Child Health, 34,* 260-262. doi:10.1046/j.1440-1754.1998.00213.x

Australian Bureau of Statistics (2012). *Year Book Australia.* 1301.0-2012.

Australian Bureau of Statistics (2014). *Household Income and Wealth, Australia.* 6523.0, 2013-2014.

Bågedahl-Strindlund, M., & Monsen Börjesson, K. (1998). Postnatal depression: A hidden illness. *Acta Psychiatrica Scandinavica, 9,* 272-275. doi:10.1111/j.1600-0447.1998.tb10083.x

Ban, L., Gibson, J. E., West, J., & Tata, L. J. (2010). Association between perinatal depression in mothers and the risk of childhood infections in offspring: a population-based cohort study. *BMC public health*, *10*(1), 799-806. doi:10.1186/1471-2458-10-799

Beck, C. T. (2001). Predictors of postpartum depression: An update. *Nursing Research, 50*(5), 275-285. doi:10.1097/00006199-200109000-00004

Blom, E. A., Jansen, P. W., Verhulst, F. C., Hofman, A., Raat, H., Jaddoe, V. W. V., ... & Tiemeier, H. (2010). Perinatal complications increase the risk of postpartum depression. The Generation R Study. *BJOG: An International Journal of Obstetrics & Gynaecology*, *117*(11), 1390-1398. doi:10.1111/j.1471-0528.2010.02660.x

Boyce, P. (2003). Risk factors for postnatal depression: a review and risk factors in Australian populations. *Archives of Women's Mental Health, 6*(S2), S43-S50. doi:10.1007/s00737-003-0005-9

Boyce, P., Stubbs, J., & Todd, A. (1993). The Edinburgh postnatal depression scale: validation for an Australian sample. *Australian and New Zealand Journal of Psychiatry, 27*(3), 472-476. doi:10.3109/00048679309075805

Bradley, R. H., & Corwyn, R. F. (2002). Socioeconomic status and child development. *Annual Review of Psychology*, *53*(1), 371-399. doi:10.1146/annurev.psych.53.100901.135233

Britton, J. R. (2005). Pre-discharge anxiety among mothers of well newborns. Prevalence and correlates. *Acta Paediatrica, 94*(12), 1771-1776). doi:10.1080/08035250500192664

Britton, J. R. (2008). Maternal anxiety: Course and antecedents during the early postpartum period. *Depression and Anxiety, 25,* 793-800. doi:10.1002/da.20325

Brown, S., & Lumley, J. (1994). Satisfaction with care in labor and birth: a survey of 790 Australian women. *Birth*, *21*(1), 4-13. doi:10.1111/j.1523-536X.1994.tb00909.x

Buist, A., & Bilszta, J. (2005). *Beyondblue National Postnatal Depression Program, Volume 1: National screening program* – Retrieved from www.beyondblue.org.au

Carolan, M. (2005). "Doing it properly": The experience of first mothering over 35 years. *Health Care for Women International*, *26*(9), 764-787. doi:10.1080/ 07399330500230 987

Carter, F. A., Frampton, C. M., & Mulder, R. T. (2006). Cesarean section and postpartum depression: a review of the evidence examining the link. *Psychosomatic Medicine*, *68*(2), 321-330. doi:10.1097/01.psy.0000204787. 83768.0c

Chaudron, L. H., Klein, M. H., Remington, P., Palta, M., Allen, C., & Essex, M. J. (2001). Predictors, prodromes and incidence of postpartum depression. *Journal of Psychosomatic Obstetrics & Gynecology*, *22*(2), 103-112. doi:10.3109/ 01674820109049960

Cheng, D., Schwarz, E. B., Douglas, E., & Horon, I. (2009). Unintended pregnancy and associated maternal preconception, prenatal and postpartum behaviors. *Contraception*, *79*(3), 194-198. doi:10.1016/j.contraception.2008.09.009

Chou, F. H., Avant, K. C., Kuo, S. H., & Fetzer, S. J. (2008). Relationships between nausea and vomiting, perceived stress, social support, pregnancy planning, and psychosocial adaptation in a sample of mothers: a questionnaire survey. *International Journal of Nursing Studies*, *45*(8), 1185-1191. doi:10.1016/ j.ijnurstu.2007.08.004

Cox, J. L., Connor, Y., & Kendell, R. E. (1982). Prospective study of the psychiatric disorders of childbirth. *The British Journal of Psychiatry*, *140*(2), 111-117. doi:10.1192/bjp.140.2.111

Cox, J. L., Holden, J. M., & Sagovsky, R. (1987). Detection of postnatal depression. Development of the 10-item Edinburgh postnatal depression scale. *British Journal of Psychiatry, 150,* 782-786. doi:10.1192/bjp.150.6.782

Cuijpers, P., Brannmark, J. G., & van Straten, A. (2008). Psychological treatment of postpartum depression: A meta-analysis. *Journal of Clinical Psychiatry, 64,* 103-118. doi:10.1002/jclp.20432

Davis, L., Edwards, H., Mohay, H., & Wollin, J. (2003). The impact of very premature birth on the psychological health of mothers. *Early Human Development*, *73*(1), 61-70. doi:10.1016/S0378-3782(03)00073-2

Dennis, C-L., & Hodnett, E. (2007). Psychosocial and psychological interventions for treating postpartum depression. *Cochrane Database of Systematic Reviews, 4,* CD006116. doi:10.1002/14651858.cd006116.pub2

Dennis, C-L. E., Janssen, P. A., & Singer, A. (2004). Identifying women at-risk for postpartum depression in the immediate postpartum period. *Acta Psychiatrica Scandinavica, 110,* 338-346. doi:10.1111/j.1600-0447.2004.00337.x

Dipietro, J. A., Costigan, K. A., & Sipsma, H. L. (2008). Continuity in self-report measures of maternal anxiety, stress, and depressive symptoms from pregnancy through two years postpartum. *Journal of Psychosomatic Obstetrics and Gynecology, 29*(2), 115-124. doi:10.1080/01674820701701546

Don, B. P., Chong, A., Biehle, S. N., Gordon, A., & Mickelson, K. D. (2014). Anxiety across the transition to parenthood: Change trajectories among low-risk parents. *Anxiety, Stress, & Coping, 27*(6), 633-649. doi:10.1080/10615806.2014.903473

Faisal-Curry, A., & Menezes, R. P. (2007). Prevalence of anxiety and depression during pregnancy in a private setting sample. *Archives of Women's Mental Health, 10,* 25-32. doi:10.1007/s00737-006-0164-6

Fisher, J., Mello, M. C. D., Patel, V., Rahman, A., Tran, T., Holton, S., & Holmes, W. (2012). Prevalence and determinants of common perinatal mental disorders in women in low-and lower-middle-income countries: a systematic review. *Bulletin of the World Health Organization*, *90*(2), 139-149. doi:10.2471/ BLT.11.091850

Gaillard, A., Le Strat, Y., Mandelbrot, L., Keita, H., Dubertret, C. (2014). Predictors of postpartum depression: Prospective study of 264 women followed during pregnancy and postpartum. *Psychiatry Research, 215*(2), 341-346. doi:10.1016 /j.psychres.2013. 10.003

Goyal, D., Gay, C., & Lee, K. (2009). Fragmented maternal sleep is more strongly correlated with depressive symptoms than infant temperament at three months postpartum. *Archives of women's mental health*, *12*(4), 229-237. doi:10.1007/ s00737-009-0070-9

Gregoire, A. (1995). Hormones and postnatal depression. *British Journal of Midwifery, 3,* 99-105.

Gress-Smith, J. L., Luecken, L. J., Lemery-Chalfant, K., & Howe, R. (2012). Postpartum depression prevalence and impact on infant health, weight, and sleep in low-income and ethnic minority women and infants. *Maternal and Child Health Journal*, *16*(4), 887-893. doi:10.1007/s10995-011-0812-y

Kottmel, A., Hoesli, I., Traub, R., Urech, C., Huang, D., Leeners, B., & Tschudin, S. (2012). Maternal request: a reason for rising rates of cesarean section? *Archives of Gynecology and Obstetrics*, *286*(1), 93-98. doi:10.1007/s00404-012-2273-y

Kringeland, T., Daltveit, A. K., & Miller, A. (2010). How does preference for natural childbirth relate to the actual mode of delivery? A population-based cohort study from Norway. *Birth, 37,* 21-27. doi:10.1111/j.1523-536X.2009.00374.x

Kuo, S. Y., Chen, S. R., & Tzeng, Y. L. (2014). Depression and anxiety trajectories among women who undergo an elective cesarean section. *PloS one*, *9*(1), e86653. doi:10.1371/journal.pone.0086653

Le Strat, Y.L., Dubertret, C., & Le Foll, B. (2011). Prevalence and correlates of major depressive episode in pregnant and postpartum women in the United States. *Journal of Affective Disorders, 135*(1), 128-138. doi:10.1016/j.jad.2011.07.004

Lovibond, S.H., Lovibond, P. F. (1995). *Manual for the depression anxiety stress scales 2nd Edition.* Psychology Foundation of Australia: Sydney.

Lovibond, P. F., & Lovibond, S. H. (1995). The structure of negative emotional states: Comparison of the Depression Anxiety Stress Scales (DASS) with the Beck Depression and Anxiety Inventories. *Behaviour Research and Therapy, 33*(3), 335-343. doi:10.1016/0005-7967(94)00075-U

Matthey, S., Barnett, B., Howie, P., & Kavanagh, D. J. (2003). Diagnosing postpartum depression in mothers and fathers: Whatever happened to anxiety? *Journal of Affective Disorders, 74,* 139-147. doi:10.1016/S0165-0327(02)00012-5

McMahon, C. A., Boivin, J., Gibson, F. L., Hammarberg, K., Wynter, K., Saunders, D., & Fisher, J. (2011). Age at first birth, mode of conception and psychological wellbeing in pregnancy: findings from the parental age and transition to parenthood Australia (PATPA) study. *Human Reproduction*, *26*(6), 1389-1398. doi:10.1093/humrep/ der076

Miller, R. L., Pallant, J. F., & Negri, L. M. (2006). Anxiety and stress in the postpartum: Is there more to postnatal distress than depression. *BMC Psychiatry, 6,* 12-22. doi:10.1186/1471-244X-6-12

Monti, F., Agostini, F., Fagandini, P., Paterlini, M., La Sala, G. B., & Blickstein, I. (2008). Anxiety symptoms during late pregnancy and early parenthood following assisted reproductive technology. *Journal of Perinatal Medicine*, *36*(5), 425-432. doi:10.1515/JPM.2008.074

Monti, F., Agostini, F., Fagandini, P., La Sala, G. B., & Blickstein, I. (2009). Depressive symptoms during late pregnancy and early parenthood following assisted reproductive technology. *Fertility and Sterility*, *91*(3), 851-857. doi:10.1016/ j.fertnstert.2008.01.021

O'Hara, M. W., & McCabe, J. E. (2013). Postpartum depression: current status and future directions. *Annual Review of Clinical Psychology*, *9*, 379-407. doi:10.1146/ annurev-clinpsy-050212-185612

O'hara, M. W., & Swain, A. M. (1996). Rates and risk of postpartum depression – a meta-analysis. *International Review of Psychiatry, 8*(1), 37-54. doi:10.3109/ 0954026960 9037816

Petrosyan, D., Armenian, H. K., & Arzoumanian, K. (2011). Interaction of maternal age and mode of delivery in the development of postpartum depression in Yerevan, Armenia. *Journal of Affective Disorders*, *135*(1), 77-81. doi:10.1016/j.jad. 2011.06.061

Pope, S. (2000). *Postnatal depression: A systematic review of published scientific literature to 1999.* National Health and Medical Research Council, Australia.

Rallis, S., Skouteris, H., McCabe, M., & Milgrom. J. (2014). The transition to motherhood: Towards a broader understanding of perinatal distress. *Women and Birth, 27*(1), 68-71. doi:10.1016/j.wombi.2013.12.004

Rauh, C., Beetz, A., Burger, P., Engel, A., Häberle, L., Fasching, P. A., ... & Faschingbauer, F. (2012). Delivery mode and the course of pre-and postpartum depression. *Archives of Gynecology and Obstetrics*, *286*(6), 1407-1412. doi:10.1007/s00404-012-2470-8

Reck, C., Struben, K., Backenstrass, M., Stefenelli, U., Reinig, K., Fuchs, T., Sohn, C., & Mundt, C. (2008). Prevalence, onset and comorbidity of postpartum anxiety and depressive disorders. *Acta Psychiatrica Scandinavica*, *118*(6), 459-468. doi:10.1111/j.1600-0447.2008.01264.x

Rich-Edwards, J. W., Kleinman, K., Abrams, A., Harlow, B. L., McLaughlin, T. J., Joffe, H., & Gillman, M. W. (2006). Sociodemographic predictors of antenatal and postpartum depressive symptoms among women in a medical group practice. *Journal of Epidemiology and Community Health*, *60*(3), 221-227. doi:10.1136/jech.2005.039370

Robertson, E., Grace, S., Wallington, T., & Stewart, D. E. (2004). Antenatal risk factors for postpartum depression: a synthesis of recent literature. *General Hospital Psychiatry*, *26*(4), 289-295. doi:10.1016/j.genhosppsych.2004.02.006

Ross, L. E., McQueen, K., Vigod, S., & Dennis, C. L. (2011). Risk for postpartum depression associated with assisted reproductive technologies and multiple births: a systematic review. *Human Reproduction Update*, *17*(1), 96-106. doi:10.1093/humupd/dmq025

Smith, L. E., & Howard, K. S. (2008). Continuity of paternal social support and depressive symptoms among new mothers. *Journal of Family Psychology*, *22*(5), 763. doi:10.1037/a0013581

Turner, C. T., & Papinczak, T. A. (2000). An analysis of personal and social factors influencing initiation and duration of breastfeeding in a large Queensland maternity hospital. *Breastfeeding Review*, *8*(1), 25-33.

Wardrop, A. A., & Popadiuk, N. E. (2013). Women's experiences with postpartum anxiety: Expectations, relationships and sociocultural influences. *The Qualitative Report, 18,* 1-24.

Warner, R., Appleby, L., Whitton, A. B. S. C., & Faragher, B. (1996). Demographic and obstetric risk factors for postnatal psychiatric morbidity. *The British Journal of Psychiatry*, *168*(5), 607-611. doi:10.1192/bjp.168.5.607

Wenzel, A., Haugen, E. N., Jackson. L. C., & Brendle, J. R. (2005). Anxiety symptoms and disorders at eight weeks postpartum. *Anxiety Disorders, 19,* 295-311. doi:10.1016/ j.janxdis.2004.04.001

Wenzel, A., Haugen, E. N., Jackson, L. C., & Robinson, K. (2003). Prevalence of generalised anxiety at eight weeks postpartum. *Archive of Womens Mental Health, 6,* 43-49. doi:10.1007/s00737-002-0154-2

Wilkinson, R. B., & Scherl, F. B. (2006). Psychological health, maternal attachment and attachment style in breast-and formula-feeding mothers: a preliminary study. *Journal of Reproductive and Infant Psychology, 24*(1), 5-19. doi:10.1080/0264 6830500475153

Xie, R. H., Lei, J., Wang, S., Xie, H., Walker, M., & Wen, S. W. (2011). Cesarean section and postpartum depression in a cohort of Chinese women with a high

cesarean delivery rate. *Journal of Women's Health*, *20*(12), 1881-1886. doi:10.1089/jwh.2011.2842

Yang, S. N., Shen, L. J., Ping, T., Wang, Y. C., & Chien, C. W. (2011). The delivery mode and seasonal variation are associated with the development of postpartum depression. *Journal of Affective Disorders*, *132*(1), 158-164. doi:10.1016/j.jad.2011.02.009

Ystrom, E. (2012). Breastfeeding cessation and symptoms of anxiety and depression: a longitudinal cohort study. *BMC Pregnancy and Childbirth*, *12*(1), 36. doi:10.1186/1471-2393-12-36

General Discussion

Introduction

Perinatal depression, in particular, postpartum depression (PPD) has received substantial clinical and research attention. Adverse outcomes associated with PPD are known to occur in new mothers, and their relationships, including with the infant (O'Hara & McCabe, 2013). Thus, there is a compelling rationale for continued research examining this debilitating condition. However, the intense focus of research on PPD has meant that other distressing psychological symptoms have tended to be overlooked, including symptoms of maternal anxiety and stress (Miller et al., 2006; Rallis et al., 2014; Wardrop & Popadiuk, 2013). Given the importance of early detection and intervention, this comparative lack of recognition of the affective states may lead to some distressed expectant and new mothers being overlooked, and potentially left unsupported and untreated.

Despite the increasing recognition that perinatal anxiety can occur independently of depression, and is perhaps more common than PPD (Reck et al., 2008), little is currently known about the aetiology of anxiety during pregnancy and the postpartum period. Further, the factors that may increase a woman's vulnerability to experience perinatal anxiety have not been confirmed. Similarly, maternal stress is a distinct affective state that has received little research attention or recognition, and few studies have examined the prevalence of maternal stress, either in combination with or independent of depression and anxiety. Furthermore, little is known about the risk factors that are implicated in a woman's vulnerability to experience stress.

Several of the major risk factors for PPD are interpersonal or social in nature (e.g. relationship with partner, social support), and an emerging literature has suggested that the same factors may also be important in the aetiology of perinatal anxiety. Thus,

it is vital that prospective longitudinal research examines the potential role of these factors in the broader conceptualisation of perinatal psychological distress, which should include the examination of perinatal stress and anxiety, in addition to PPD. In addition, there is a lack of clarity as to which non-psychological risk factors can predict PPD, since many of the studies have yielded mixed results, and research examining these risk factors in regards to maternal anxiety and stress is in its infancy. Therefore, a broad range of possible predictors, including interpersonal, social, and non-psychological factors, need to be considered to gain a more comprehensive understanding of the factors that are likely to influence psychological distress in the transition to parenthood.

The above rationale provided the impetus for the following four research papers presented in this thesis. The main objectives of this project were therefore to:

1. Broaden the current conceptualisation of psychological distress in the perinatal period to include the affective state of psychological stress, in addition to perinatal depression and anxiety;
2. Examine a broad range of factors that have previously been identified as risk factors for PPD, to assess their potential role in the aetiology of perinatal anxiety and stress;
3. Explore the relationships between working models of attachment, marital relationship quality, and postpartum symptoms of stress, anxiety, and depression;
4. Examine the potential contribution of women's relationships with their parents and close peers to their experiences of psychological distress during pregnancy and the postpartum period;

5. Study the structural changes occurring in the women's attachment networks during the transition to parenthood;
6. Explore the relationships between different aspects or functions of social support and the experience of anxiety, stress, and depression in expectant and new mothers; and,
7. Examine the potential role of a range of non-psychological factors in the aetiology of postnatal stress, anxiety, and depression.

Summary of Findings Addressing the Research Objectives

In regards to *objective 1*, all four papers analysed the broader conceptualisation of psychological distress during the perinatal period, including symptoms of anxiety and stress in addition to depression. Papers 1 and 4 examined postpartum stress, anxiety, and depression using the EPDS and DASS-21, whereas papers 2 and 3 examined the states in pregnancy and in the postpartum using the DASS-21.

Prevalence estimates for stress, anxiety, and depression in the study sample support the proposition that psychological distress in the perinatal period is not limited to depression, and that a broader range of psychological symptoms needs to be examined. During the third- trimester of pregnancy, one-third of women experienced some degree of stress and/or anxiety, including moderate to extremely severe stress and anxiety, relative to only one-quarter of women who experienced depression. At 4 to 6-months postpartum, the number of women who reported depression symptoms remained stable, but fewer women reported anxiety or stress, falling to about one-quarter of women postpartum. This result demonstrates the importance of targeting psychological distress in women during pregnancy.

Approximately 22% of the women reported comorbid psychological symptoms in the postpartum, equating to just over one-half of the total women with postpartum

psychological distress. In particular, 14% of the women (or about two-thirds of those with postpartum distress) reported high levels of stress and/or anxiety, independent of depression, indicating the need to screen women for anxiety and stress symptoms perinatally.

In comparison to the DASS-21, the EPDS identified only one additional woman with significant psychological distress, but it failed to detect most of the women with anxiety and stress symptoms (without depression), even when they had relatively severe psychological symptoms. Furthermore, the EPDS did not detect some of the women identified as experiencing depression symptoms, although they were detected using the DASS-21. In this analysis, a conservative EPDS cut-off score >12 was used in line with published scoring recommendations (Pope, 2000), although the use of a less conservative cut-off score >9 (Miller et al., 2006) would have resulted in the detection of more depression cases. Taken together, these study results indicate that perinatal anxiety and stress can occur independent of depression, and routine screening via the EPDS may fail to detect many cases of this distress. Thus, the findings support the notion that screening for a broader range of psychological symptoms is necessary in the perinatal period.

In regards to *objective 2,* all four papers examined factors that have previously been identified as confirmed or possible risk factors for PPD, and assessed their potential role in the aetiology of perinatal anxiety and stress. Papers 1-3 focused on interpersonal or social risk factors, whereas paper 4 examined the potential role of non-psychological factors. The specific objectives relating to each paper are outlined below.

Objective 3 (examined in paper 1) was related to working models of attachment and marital quality as they pertain to this broader conceptualisation of psychological distress. Attachment style was chosen as a framework for interpreting the behaviour of

women in their close relationships, as it is known to become activated when a person is highly stressed, their sense of security is threatened, and they are in a transitional period (Mikulincer & Florian, 1998). As previously described, the perinatal period is an important life transition that can be very stressful for women to deal with. In addition, this transitional period is also a time of change in key relationships, thus, we examined marital relationship quality as a potential mediator of the relationships between attachment style and psychological distress in the perinatal period.

The results of paper 1 did not accord with expectations, since no significant predictive relationships were found between women's working models of attachment-anxiety and -avoidance and their experience of postpartum depression, anxiety, or stress, after controlling for prenatal distress levels. No prior studies have examined working models of attachment in relation to perinatal anxiety and stress, although a reasonable body of literature has previously established a relationship between attachment-anxiety and PPD. However, antenatal general- and marital-specific attachment-avoidance was more strongly correlated with postpartum anxiety, whereas attachment-anxiety was more strongly correlated with symptoms of depression. Thus, the results suggest that a negative model of self may be more depressogenic, whereas a negative model of others may increase women's vulnerability to experience anxiety.

Paper 1 also examined marital relationship quality in relation to postpartum psychological distress. It was expected that low dyadic satisfaction (or high relationship tension or discord) would predict stress, anxiety, and postpartum depression levels, and the study findings partially supported this hypothesis. That is, low prenatal dyadic satisfaction and affectional-expression (i.e. emotional affection) predicted postpartum depression, as measured by the DASS-21, and low dyadic satisfaction also predicted postpartum anxiety. However, none of the dyadic factors predicted maternal stress, or

depression as measured by the EPDS. Taken together, the results suggest that emotional aspects of the partner relationship, including low affection or high relationship discord may either protect against or increase the vulnerability of women to experience psychological distress. However, neither level of disagreement nor the tendency to engage in activities together predicted postpartum distress in women, although it is possible the factors may become more salient after the birth of the child, since marital disagreements tend to increase in frequency in the postpartum, and couples report spending less time together in shared activities (Feeney et al., 2001).

Finally, paper 1 examined whether dyadic satisfaction and affectional expression mediated the relationship between women's working models of attachment and perinatal depression and anxiety. Results indicated that dyadic satisfaction mediated the relationship between attachment-anxiety and –avoidance to postpartum depression and anxiety. The results suggest that when the women with anxious or avoidant working models of attachment perceived tension or discord in their relationship, they were more likely to experience postpartum depression and anxiety. Thus, it is possible that the combined stress of poor marital relationship quality (e.g. tension or discord) and giving birth may activate working models of attachment-anxiety and –avoidance in some women, thereby increasing the likelihood of them experiencing postpartum psychological distress.

Taken together, the results of paper 1 suggest that marital relationship dissatisfaction rather than a woman's working model of attachment-anxiety and -avoidance is most likely to inform the experience of postpartum depression and anxiety, after controlling for prenatal distress levels. In particular, low emotional affection and dyadic dissatisfaction may be depressogenic, whereas low dyadic satisfaction may be anxiogenic. Further, the mediational results suggest that relationship dissatisfaction in

pregnancy may predispose a woman with high attachment-avoidance or -anxiety to experience postpartum depression or anxiety. Thus, the preeminent role of marital relationship quality in the aetiology of postpartum depression and anxiety is unsurprising given that the transition to parenthood is typically undertaken as a couple. Therefore, navigating the numerous demands and challenges of the postpartum period will likely be more distressing if the relationship is characterised by marital dissatisfaction and marital tension and discord. Further cross-sectional and longitudinal research in this area could address the contribution of postpartum marital relationship quality on postpartum symptoms of psychological distress, as the marital relationship may become more salient for women after the birth of their child.

Objective 4 (addressed in paper 2) addressed the potential contribution of women's attachment relationships to their parents and close peers to their experience of perinatal distress. Due to the paucity of research in this area, it was only expected that the quality of women's attachment relationships to their mother would be inversely related to prenatal and postnatal depression symptoms. All other potential relationships between the quality of women's attachment to their parents and peers and perinatal distress were explored making no *a priori* assertions.

The results of paper 2 supported the above study hypothesis. High attachment-anxiety in women's relationships to their mother predicted depression levels in the third-trimester of pregnancy and 4-6 months postpartum, even after controlling for prenatal depression levels. In addition, high attachment-anxiety in relationships with close friends was associated with high depression levels during pregnancy, anxious-attachment to mothers and avoidant-attachment to close friends during pregnancy was related to high anxiety levels, and anxious- attachment to mothers was related to high stress levels during pregnancy.

Taken together, the results suggest that expectant mothers who were anxiously-attached to their own mother were more likely to experience psychological distress during pregnancy. In addition, women who were anxiously-attached to their mothers were more likely to report PPD, even after controlling for prenatal distress. These results may indicate that a woman's relationship with her mother may predispose her to experience perinatal distress, especially depression. Thus, it is possible that a problematic relationship with one's mother may impact on women's self-esteem, self-worth or self-image as mothers, resulting in an increased risk of experiencing depression, or alternately, it may result in the tendency to derive less than optimal support from one's mother.

In contrast, the quality of women's attachment to their fathers was unrelated to psychological distress in women during pregnancy or the postpartum period. This result suggests that women's relationships with their fathers did not appear to impact on their psychological wellbeing in the transition to parenthood. Thus, attachment to one's parents is believed to continue across the lifespan, but after adolescence, few young women are reported to label their father as a key attachment figure (Doherty & Feeney, 2004), and this appears to persist into women's child-rearing years.

Finally, the quality of women's attachment relationships to their close friends was shown to be related to depression and anxiety during pregnancy, although the results became non-significant after controlling for prenatal distress levels. This result suggests that close friends play an important role in women's psychological adjustment during pregnancy, although the relationships may be less important in the postpartum.

Objective 5 was also explored in paper 2, addressing the structural changes that occur in women's attachment networks in the transition to parenthood. Little prior research has examined these changes, although there is some evidence that women's

reliance on their attachment figures can change over the transition to parenthood (Doherty & Feeney, 2004). The results of paper 2 showed that the number of significant attachment figures listed by women was stable from the third-trimester of pregnancy to 4-6 months postpartum, and at both time-points, marital partners were the key attachment figure for all four attachment functions. Nonetheless, women's reliance on their partners tended to diminish from pregnancy to the postpartum period. Similarly, the women's reliance on friends decreased over this time, whereas the reliance on mothers was increased, although this latter finding was marginally non-significant. The results therefore reflect that a woman's reliance on her partner tends to decrease in the transition to parenthood, which is unsurprising, given the well-recognised support that a woman's own mother can provide in the perinatal period (Bost et al., 2002), and the decline in relationship quality and satisfaction in the marital relationship (Mitnick et al., 2009)

Taken together, the results of paper 2 suggest that other key relationships including a woman's relationship with her own mother and friends is likely to be important during pregnancy. In particular, anxious-attachment to the mother was associated with all three of the affective states during pregnancy, and it also predicted PPD. In addition, the quality of women's attachment relationships with their close friends was related to prenatal distress levels, although this was not significant in the postpartum, perhaps due to the women's decreased reliance on them in the postpartum period. Thus, the results may reflect the reduced importance of close friend relationships in the early postpartum.

Finally, the women's reduced reliance on their partner and close friends as attachment figures in the postpartum, may be concerning, especially in light of the fact that their reliance on other figures did not increase during this time. However,

alternately, the results may simply reflect that the women's mothers had already begun to provide them with optimal support by the third-trimester of pregnancy, and that this support level did not change in the early postpartum. Finally, the results could reflect that the women tended to rely on key attachment figures less often after the birth of their child, despite an increase in their demands and challenges. Such a situation could adversely impact on the women's perinatal psychological adjustment, although additional longitudinal assessment is required to further explore this relationship. Overall, these study findings suggest that the health professionals who are in contact with expectant and new mothers should pay attention to their relationships with their parents and friends, in addition to their marital relationship.

Objective 6 (addressed in paper 3) addressed the relationship between the functions of social support and stress, anxiety, and depression in expectant and new mothers, including appraisal, self-esteem, tangible, and belonging support, and total social support. Somewhat as expected, self-esteem support was shown to be associated with prenatal depression levels, whereas appraisal support was related to prenatal stress and anxiety levels. However, the relationships became non-significant in the postpartum, after controlling for prenatal distress levels. Nonetheless, total social support score was shown to predict postpartum depression and stress levels, but not postnatal anxiety.

Few prior studies have examined the contribution of individual functions of social support to the experience of psychological health in women in the perinatal period, and they have tended to yield contradictory results (i.e. Barkin et al., 2014; Xie et al., 2009). Nonetheless, the results of paper 3 provide support for the key role of emotional social support (i.e. appraisal & self-esteem support) in supporting the psychological wellbeing of expectant mothers. However, in contrast, tangible and

belonging social support were unrelated to the three affective states during pregnancy or in the postpartum. It is possible that the high SES of women in this study reduced their requirements for tangible support, as they were able to pay for assistance such as childcare or house-cleaning themselves. In addition, prior reports attesting to the importance of tangible support have tended to utilise predominantly Asian samples, in which practical support after the birth is the norm and highly valued (Xie et al., 2009). Thus, culture and SES may influence the desirability of and provision of various functions of social support to expectant and new mothers.

In addition, total social support score was found to predict postpartum depression and stress, even after controlling for prenatal distress. This result suggests that it may be the full repertoire of social support that buffers against the experience of postnatal stress and depression, rather than any individual component. However, the directionality of these results must be interpreted with care, since psychological distress, especially depression, is recognised to impact on a person's perception of their social support network (Stice, Ragan, & Randall, 2004). Thus, the results of paper 3 are generally in line with the results of paper 2 in providing support for the important role played by interpersonal relationships and social support networks in the aetiology of psychological distress in the transition to parenthood. Further research addressing relationships with family and friends, and sources of social support, could also seek to analyse the geographic dispersion of a woman's social support network, as there may be differences in the utilisation and impact of their support network depending on women's physical proximity to their supports.

Lastly, *objective 7* (explored in paper 4) addressed a range of potential non-psychological risk factors for postnatal stress, anxiety, and depression levels in new mothers. The factors included sociodemographics (i.e. age, income, educational

attainment, and employment status), pregnancy (i.e. parity, pregnancy intention, use of assisted reproductive technologies), obstetric (i.e. infant gender, induced labour, mode of delivery, gestation age at delivery, and need for neonatal care), and postnatal variables (i.e. feeding method, child health, child & maternal sleep, and recent stressful life-events [SLE]). The study results were somewhat consistent with the study hypotheses, as detailed below. Using the DASS-21, postpartum depression levels were shown to be predicted by caesarean delivery and problematic child sleep, whereas depression measured using the EPDS was related to maternal sleep quality. In addition, postpartum anxiety was predicted by caesarean delivery and poorer perceived child health ratings, whereas maternal stress was predicted by caesarean delivery and the experience of recent SLE. However, none of the relationships remained significant after controlling for prenatal distress levels, although the model still explained a reasonable portion of the variance in postpartum distress, suggesting that the factors may still be implicated in the aetiology of postpartum distress, as detailed below.

However, in contrast, no sociodemographic or pregnancy variables were shown to be correlated with postpartum psychological distress in the women, although the women predominately came from high SES backgrounds, and this may have reduced the ability of the analyses to detect a relationship between factors such as low income and education level to symptoms of distress. The high SES of women may also have assisted them in coping with certain pressures and stressors (e.g. financial stress) that arose as a result of an unintended pregnancy or multiparous status.

Nonetheless, a significant relationship was shown between delivery via caesarean section and all three of the maternal affective states, using the DASS-21. *Post-hoc* testing was conducted to explore whether the relationship between caesarean delivery and postpartum distress was influenced by prenatal distress levels. The results

indicated that the pregnant women who experienced higher stress, anxiety, and depression levels were significantly more likely to later deliver via caesarean section, and the effect sizes of the results was medium to large. These results therefore suggest that the relationship between caesarean delivery and perinatal distress is likely to be complex and bidirectional. In particular, the women who were highly distressed during pregnancy were more likely to request or be prescribed a caesarean section, and they were likely to still be psychologically distressed at 4-6 months postpartum. Thus, there is a need to screen pregnant women for psychological distress since this distress is likely to persist and it may predispose women to undertake surgical intervention during the birth. This finding is consistent with previous research demonstrating a link between prenatal psychological distress and delivery via caesarean section (Hildingsson et al., 2002; Kringeland et al., 2010).

Taken together, the results of paper 4 suggest that obstetric and postnatal factors including delivery mode, perceived child health, maternal and child sleep, and recent SLE may be implicated in the development of postpartum distress, even in women from a high SES background. In particular, poor maternal and infant sleep was associated with greater PPD, whereas poor child health predicted higher maternal anxiety, and SLE predicted higher maternal stress. However, the direction of these results needs to be interpreted with care, since the study had a partly retrospective longitudinal design such that the sociodemographic and pregnancy factors were measured in the third-trimester of pregnancy, and the birth and postnatal factors were measured at the same time, at 4-6 months postpartum, in relation to maternal stress, anxiety, and depression. Thus, it is possible that women's depression may have adversely impacted her sleep quality, as well as poor sleep quality potentially impacting her mental health, and similarly high maternal anxiety may have impacted their assessments of the infant's health.

In *summary*, the results of papers 1 – 4 support the idea that a broader range of psychological distress symptoms should be examined in research studies examining mood states in women in the perinatal period. In particular, anxiety and stress states tended to occur in conjunction with and independent of perinatal depression. In addition, the study results suggest that there may be some difference in the risk factors for the three affective states. For example, depression in pregnancy or postpartum was predicted by marital relationship quality (i.e. emotional affection and marital satisfaction), other key relationships (i.e. attachment-anxiety in women's relationship with mothers and close friends), social support (i.e. self-esteem support and total social support), caesarean delivery, and maternal and child sleep problems.

Similarly to depression, perinatal anxiety was predicted by marital relationship dissatisfaction, other key relationships (i.e. attachment-anxiety in women's relationship with mother), and delivery via caesarean section. However, in contrast, perinatal anxiety was predicted by avoidance of close friends, less appraisal support, and poor perceived child's health, but not total social support. Finally, perinatal stress was predicted by key relationships (i.e. attachment-anxiety in women's relationship with mother), less appraisal support, recent SLE, and delivery via caesarean section, but it was not predicted by marital relationship quality. In addition, the profile of results for depression was different using the EPDS in papers 1 and 4. In particular, only one factor predicted postpartum EPDS levels in women, that is, the quality of the mother's sleep, suggesting that this measure may be sub-optimal in detecting the variance attributable to possible risk factors of depression. In contrast, the DASS-21, which measures stress, anxiety, and depression, may have greater utility and be more sensitive in detecting a broader range of perinatal distress symptoms.

Interestingly, when examining the risk factors found to be significantly associated with psychological distress during the perinatal period, the majority of these risk factors could be considered potentially modifiable, for example marital relationship quality, social support, relationships with close friends, and child and maternal sleep. This higlights the importance of appropriate screening and referral pathways for women experiencing perinatal distress, to ensure that potentially modifiable variables contributing to their distress can be targeted. Of those variables that are arguably not modifiable (i.e. age, attachment, parity, use of ART, infant gender, delivery mode), only delivery via caesarean section was significantly associated with the three affective states. The greater role for modifiable variables in the aetiology of perinatal distress is considered promising.

Taken together, the present study results confirm the results of prior studies in finding that interpersonal risk factors such as aspects of marital relationship quality and social support are more robust confirmed risk factors of perinatal anxiety and depression, although they may be less relevant to perinatal stress. Further, perinatal depression was shown to be predicted by a greater number of factors than perinatal anxiety and stress. These results may indicate that the causation of perinatal depression is more complex, or it is associated with a greater number of vulnerabilities than other types of perinatal distress. However, alternately, there may be other unexamined factors that predispose women to experience perinatal stress and anxiety, for example, a past history of high perceived stress and anxiety. Nonetheless, more research is required to elucidate the risk factors for these affective states in order to gain a greater understanding of the psychological experiences of expectant and new mothers, and the factors that are likely to increase their susceptibility to experience this form of distress.

Implications for the Prior Literature and Theory, and Directions for Future Research

In this study, the prevalence of PPD using the Edinburgh Postnatal Depression Scale was 19%, which is slightly higher than the results of large-scale meta-analysis (O'Hara & Swain, 1996), which generally estimate that significant PPD exists in approximately 13-15% of new mothers. However, the results are in line with the results of Gavin et al. (2005) who used an interview format to detect major and minor depression, and reported a prevalence estimate of 20%. According to published recommendations, we utilized a conservative cut-off score >12 for the EPDS (Pope, 2000), suggesting that many women who experienced depression symptoms in this study were not detected as possible depression cases, using the EPDS.

The study results indicating the comorbidity of maternal anxiety and stress with PPD, and the independent occurrence of the states is in line with previous research findings (Miller et al., 2006; Rallis et al., 2008 cited in Rallis et al., 2014), which indicated that about 10% of women were anxious and/or stressed without showing symptoms of depression. The figure was slightly higher in the present study, with about 14% of the sample reporting these symptoms independent of depression. However, the finding that the EPDS detected only one additional case of distress that was not detected using the DASS-21, and the failure of the EPDS to detect most cases of maternal stress and anxiety and some depression cases is a concern, although it is at variance to the results of one other study (Ross et al., 2003). Thus, the study results suggest that the EPDS is not sensitive in the detection of postnatal anxiety, and it does not examine perinatal stress. Thus, there may be some merit in using and validating the DASS-21 in perinatal populations, as it may provide a better and more comprehensive measure of perinatal psychological distress, including the detection of women who had their

condition missed by EPDS screening. Given the documented consequences of high maternal distress in the perinatal period, further research is required to improve the early identification of women with these affective disorders. In addition, is vital to treat the disorders if necessary, and minimise the consequences of the disorders in women, their families, and the infants.

An interesting finding in paper 1 was the lack of significant association between women's attachment style or their attachment to the marital partner, and their experience of postpartum psychological distress. This finding contrasts with the majority of the existing literature, which has typically reported a significant association between attachment-anxiety and PPD (Feeney et al., 2003, McMahon et al., 2005; Meredith & Noller, 2003; Warfa et al., 2014; Wilkinson & Mulcahy, 2010). However, most of these studies were only cross-sectional, rather than the longitudinal approach used in this study. In addition, the high SES of the women may have protected them against the activation of their working models of attachment during this transitional period, and the potential adverse effects on maternal mental health. Consistent with this interpretation, the results of paper 1 showed that anxiously attached women who experienced marital dissatisfaction were at an increased risk of experiencing depression at 4-6 months postpartum. This result is similar to those of Simpson et al. (2003) who found that anxiously attached women who perceived greater anger or less support from their husband reported higher PPD levels, than the women with less marital problems. Another explanation of the incongruence between our study results and those reported in the literature, is that marital-specific and general measures of attachment were examined together in the regression analyses, due to the lack of multicollinearity between the variables. The lack of multicollinearity between these variables provides support for research proposing that an adult's working models of attachment can differ

between relationships (Fraley et al., 2011), and that generalised and relationship specific attachment may be similar yet distinct constructs.

In paper 1, the aspects of marital relationship quality that best predicted postpartum psychological distress were marital dissatisfaction, low emotional affection, and high discord, which is consistent with the results of other studies (Bernazzani et al., 2004; Matthey et al., 2000; McMahon et al., 2005; Milgrom et al., 2008). However, unlike some prior research (Johnstone et al., 2001; Kluwer & Johnson, 2007), marital disagreement was not found to predict high postpartum distress. Although Johnstone et al. (2001) used a cross-sectional design, Kluwer and Johnson (2007) also conducted a longitudinal analysis. The difference in the findings may be due to differences regarding the measurement of marital disagreement. While Kluwer and Johnson (2007) assessed conflict frequency, the current study looked at the level of agreement or disagreement across a range of topics. Therefore, given the extensive research indicating a link between marital relationship quality and postpartum depression and anxiety, the development of interventions that are targeted at improving marital relationship quality during pregnancy and in the transition to parenthood would appear to be vital.

Little prior research has examined the relationship between working models of attachment and maternal anxiety, although the existing research has tended to posit that attachment-avoidance is more heavily implicated in the development of anxiety in general (Safford et al., 2004; Williams and Riskind, 2004), although not specifically in new mothers. In contrast, in the perinatal literature, prior studies have tended to fail to find an association between attachment-avoidance and PPD (Wilkinson & Mulcahy, 2010). Similarly, the results of paper 1 showed that attachment-avoidance (general and marital-specific) was more strongly correlated with maternal anxiety than the measures

of attachment-anxiety, suggesting there is some agreement that high attachment-avoidance may predispose women to experience postpartum anxiety.

Similarly, the results of paper 2 indicated that the quality of an expectant mother's attachment to her own mother predicted all three affective states during pregnancy, although longitudinally, it was only related to PPD. This finding supports previous research indicating that a woman's relationship with her mother is important into adulthood (Calvo et al., 2012; Feeney & Doherty, 2004), and that recollection of the relationship with her mother in childhood predicted high PPD levels (Matthey et al., 2000; McMahon et al., 2005). It is likely that a woman's interactions with her mother is relatively consistent across the lifespan (Akiyama, Antonucci, Takahashi, & Langfahl, 2003), thus, it is possible that the attachment measures were simply proxy measures of the long-term support patterns between daughters and their mothers, rather than a hard-wired tendency to respond to relationships in particular way. Nonetheless, the quality of women's attachment relationships to their close friends also predicted anxiety and depression levels during pregnancy, although this result was not significant in the postpartum, after controlling for prenatal distress levels. Taken together, the study results suggest that there may be some benefit in health care professionals more broadly examining a woman's significant relationships in the transition to parenthood, not just the marital relationship. Further, additional research is required to examine whether psychological interventions can improve the quality of these relationships or the maternal perceptions of these relationships, and whether or not this improves psychological health in expectant and new mothers.

In addition, the results of paper 3 suggest that social resources and social support may be especially important in protecting women's mental health in the transition to parenthood. Four different dimensions of social support were examined in this study,

and in support of prior relevant research (Barkin et al., 2014; Habif & Lahey, 1980, Paykel et al., 1980), only the emotional forms of social support, including self-esteem and appraisal support, were shown to be associated with distress during pregnancy. That is, emotional forms of social support may be especially helpful in protecting pregnant women from the experience of psychological distress. However, the results are contrasted with the research of another study in which practical social support was most strongly predictive of PPD (Xie et al., 2009), although this study examined mood in Asian women. Thus, most or the prior research examining mood in Caucasian women has supported the usefulness of emotional forms of social support, whereas the studies utilising a Chinese sample, have tended to show that tangible support is more important (Xie et al., 2009). However, alternately, it is possible that the high SES women in this study had the financial resources to help pay for tangible support, possibly requiring them to less often rely on this form of support from their network.

The study finding that only total social support score predicted postpartum stresss and depression levels, after controlling for prenatal distress levels is similar to the results of a large-scale longitudinal study by Leahy-Warren et al. (2011). They found that the four dimensions of social support were all associated with low PPD levels, but only total social support score independently predicted PPD levels at 6- and 12-weeks postpartum. Thus, the results of Leahy-Warren (2011) and this study both support the view that it is the totality of social support that informs the quality of maternal mental health rather than any particular aspect of it. However, due to the paucity of data, further research is required to explore the relationships between social support in relation to perinatal anxiety and stress, and also bidirectional associations between prenatal distress and the reduced ability of women to elicit, facilitate or identify support from their social networks.

Furthermore, the results of papers 1 – 3 support prior research findings indicating the importance of interpersonal and psychological risk factors in the aetiology of PPD (Beck, 2001; Buist & Biltza, 2005; Warfa et al., 2014), and possibly also postnatal anxiety (Vythilingum, 2008). Similarly, the present research study demonstrated the likely significant role played by some of these factors in the aetiology of high perinatal stress. In addition, the findings point to the need to further examine the factors that increase a woman's vulnerability to experience perinatal stress and anxiety, in addition to PPD, and to develop psychological interventions and prevention programs that target this broader conceptualisation of maternal distress and focus on the role played by the above interpersonal factors.

Finally, paper 4 examined the role of non-psychological risk factors in predicting postpartum stress, anxiety, and depression. Aside from the experience of recent SLE, which is considered to be a confirmed risk factor for PPD (O'Hara & Swain, 1996; Pope, 2000), prior research on the sociodemographic, pregnancy, obstetric, and postnatal risk factors has tended to yield conflicting results. However, in contrast with some other studies (Fellenzer & Cibula, 2014; Goyal et al., 2010), sociodemographic and pregnancy factors including age, income, parity, and intendendness of the pregnancy did not predict the three states in new mothers. Rather, postpartum maternal distress was predicted by caesarean delivery, perceived health problems in the child, child and maternal sleep problems, and the presence of recent SLE.

Interestingly, delivery via caesarean section was associated with all three affective states, as measured by the DASS-21, in contrast with the majority of larger studies which found a non-significant relationship between caesarean section and PPD (Carter et al., 2006). Nonetheless, post-hoc testing indicated that the women who were

most stressed, anxious, and/or depressed during the third-trimester of pregnancy were more likely to deliver via caesarean section, which is consistent with study results indicating that prenatal depression levels predict later caesarean delivery (Hildingsson et al., 2002; Kringeland et al., 2010). Taken together, the results indicate that there was considerable stability in the women's mood between pregnancy and the postpartum, and distressed pregnant women were more likely to request or be offered a caesarean section, perhaps to assist them in dealing with the uncertainty of a vaginal birth, which may be more difficult to manage in distressed women. Alternatively, it is possible that high prenatal distress interfered with the birthing process, thereby, increasing the chances of delivery via caesarean section. Irrespective of the interpretation, the results indicate that the relationship between prenatal distress, delivery via caesarean section, and postnatal mental health is complex, and it requires further longitudinal examination.

In *summary*, the results of papers 1 – 4 support the recent push in the perinatal health literature to examine a broader conceptualisation of psychological distress, including stress and anxiety, instead of solely focusing on PPD. Nonetheless, further research is needed to more thoroughly examine the predictors of maternal stress and anxiety, and determine whether the states are problematic or are on the normal continuum of what might be expected in the transition to motherhood. This research identified some similarities in the risk factors for all three affective states, but also some important differences. In addition, due to the high level of comorbid mental health problems in the women, further research is required to explore the course and relationship between the three affective states in the transition to parenthood. Furthermore, since little is known about the aetiology of perinatal anxiety and stress, additional research is required to report on the prevalence, trajectory, and risk factors

for the states so as to ensure that the women experiencing the states are detected and offered appropriate support and intervention.

Clinical and Healthcare Implications

Pregnancy and the postpartum generally provide a unique opportunity to screen and assess women for psychological distress due to the regular medical contact they are typically afforded during this time. The results of papers 1 – 4 have important implications for this psychological screening, since the current focus on PPD as measured by the EPDS will likely lead to a failure to detect many of the women who experience perinatal anxiety and stress (Miller et al., 2006; Rallis et al., 2014; Wardrop & Popadiuk, 2013). Given the high potential for such distress to lead to deleterious effects in woman, their partner, other relationships, and the child, there is a need to accurately screen and detect these states in expectant and new mothers. In addition, the results point to the utility of the DASS-21 in addressing perinatal distress, in addition to using the EPDS, especially in the women who report high distress, but score below the EPDS cut-off score.

However, little research has examined maternal stress as a distinct affective state. Increasing our understanding of stress during the perinatal period may have important clinical implications since the presence of significant stress may impact on the strategies and resources utilised by health professionals when treating women experiencing psychological distress over the perinatal period (Rallis et al., 2014), as the presence of stress may impact on a woman's clinical presentation, and treatment needs. In addition, high maternal stress may itself potentially result in postpartum anxiety and depression if it is not resolved (Beck, 1996; Britton, 2008). Thus, although the treatment of PPD is generally considered to take precedence (Miller et al., 2006), the psychological wellbeing of new mothers is likely to be optimised by tailoring the

treatments to their comorbid maternal stress and anxiety symptoms, if present, as they might be expected to interact with each other to worsen the three states (Molfesem Bricker, Manion, Beadnell, Yaple, & Moires, 1987).

The study results in paper 1 indicated that marital dissatisfaction during pregnancy was a predictor of postpartum depression and anxiety. Marital satisfaction is generally shown to decrease after childbirth (Mitnick et al., 2009), thus, the results point to the importance of developing specialised interventions, to be delivered by mental health professionals, or relationship counsellors, which target relationship problems and marital discord prior to the birth. For example, working with expectant parents to help combat relationship problems and tensions, increase marital satisfaction, and an emotional connection may help to prevent relationship distress and maternal distress during the postpartum period.

One challenge for primary health care providers in identifying relationship distress, and facilitating further referrals, is the tendency for them to predominantly consult with mothers alone, particularly in the postnatal period. Possibilities for increasing awareness of the partner relationship during the perinatal period include highlighting the importance of the partnership during the second trimester hospital intake, and during antenatal classes where both partners are often in attendance. As there is some evidence that couple interventions are successful in improving relationship quality and reducing distress (Matthey et al., 2004), clinicians and healthcare providers working with expectant and new mothers who do report relationship distress, should consider whether referrals to relationship programs and counselling may be appropriate.

In addition, healthcare providers should appreciate that relationships beyond the marital relationship, including women's relationships with their mother and close

friends may help to buffer against the potential to experience maternal psychological distress. Therefore, it is important that prenatal assessments look beyond the marital relationship, and consider the other key relationships in a woman's life, and the types of social support they have access to. In particular, emotional forms of social support (e.g. appraisal and emotional support) may help to protect women from the experience of distress during pregnancy, whereas the totality of social support may protect them in the postpartum. Thus, examining this early in a woman's pregnancy may permit them to take steps to increase their available supports and hopefully maximise the benefits of these interactions prior to giving birth.

Further, the link between prenatal distress, caesarean delivery, and postpartum distress has important healthcare implications. The study results indicated that the women who experienced depression, anxiety, and/or high stress during pregnancy were at greatest risk of undergoing a later caesarean section, although we did not assess whether the procedure was offered in response to maternal request or healthcare prescription. In the absence of other medical indicators, it may be beneficial to screen pregnant women who are scheduled for a caesarean delivery and explore the possible reasons for the caesarean section. In addition, it may be prudent to offer additional psychological support to women who are distressed in the third-trimester of pregnancy to maximise their chances of having a natural birth.

In regards to postnatal factors, the significant relationship between infant and maternal sleep problems and PPD suggests the need for healthcare professionals to screen for these problems early in the postpartum. Many intervention programs have been developed to improve infant sleep quality (Armstrong et al., 1998), and these may also be a suitable referral point for distressed new mothers who report problematic sleep. In addition, the significant association between the child's current health and

postpartum maternal anxiety indicates the need for health professionals to take the issue of perceived infant health problems seriously, as the failure to resolve the problems may lead to postnatal distress. Further, clinicians are well placed to screen, detect, and make appropriate referrals for anxious new mothers.

Thus, the regular medical contact that women are afforded by their primary healthcare providers during pregnancy represents an opportunity for the early intervention and treatment of many of the difficulties that occur prior to the birth of the baby, before the arrival of the added demands and challenges of caring for a newborn. As detailed above, it is important for healthcare professionals to appreciate that maternal anxiety and stress may represent a serious health concern, in addition to PPD, that can lead to significant consequences and impair maternal psychosocial adaptation. In addition, adequate screening that covers a broader range of psychological distress symptoms will enable healthcare providers to detect and treat a broader range of psychological symptoms in women.

As the ability to engage in comprehensive screening and the provision of multiple assessment tools in primary care settings can be limited by practitioner time and service demands, one option is for clinicians to consider utilising the DASS-21 as an initial screening tool, rather than the EPDS. The DASS-21 has the advantage of being a short and easily administered scale, and as demonstrated in this research, it is able to detect a greater number of women experiencing perinatal distress, than would be detected by the EPDS alone. If women are found to score highly on any mental health screening instrument, clinicians have multiple options, depending on the setting they are working within. Referral pathways could utilise a woman's GP to complete a Mental Health Care Plan and referral to a psychologist, with many GP's also able to recommend bulk-billing practitioners if required. Additionally, many hospital settings

have social work or psychology service departments available to women undergoing antenatal or early postnatal care, and referrals can be made by midwifery or obstetric staff, or women can be encouraged to self-refer. Lastly, for women reporting severe mental health concerns, adult mental health services may be an appropriate referral point, with many regions in Australia having a perinatal mental health service attached to them. Due to the potential for untreated mental health concerns to have deleterious effects on new mothers, their infants, and the wider community, developing clear screening and referral pathways is important for future research and clinical practice.

Study Limitations

Nonetheless, the study results should be interpreted with caution given several study limitations. First, the majority of the sample was Caucasian, well-educated, and with an above-average household income. Australian population data shows that approximately 35% of 21-35 year olds and 21% of 35-50 year olds are tertiary educatied, compared with almost 60% of the current sample (Australian Bureau of Statistics, 2012). In addition, the mean Australian household income was approximately $106,000AUD, with a median of $80,000 in 2014 (ABS, 2014), compared with $122,000AUD in this sample. This limits the generalizability of the results to lower SES women. This is problematic as low SES is a known risk factor for postpartum depression and anxiety (Britton, 2008; Pope, 2000), and one of the greatest gaps in the research literature is risk factors for postpartum distress that are specific to women from low SES backgrounds (Robertson et al., 2004). Thus, future research is required to examine the factors that increase vulnerability to experience stress and anxiety in low SES women.

Second, the psychological states and study variables were assessed using a convenience sample and self-report measures, and there is current debate over the use of

self-report measures for variables such as attachment (Shaver & Mikulincer, 2002). In addition, Cox et al. (1987) recommends that clinical interviews should be utilised alongside the EPDS. Third, the study results cannot be used to make causal inferences about the relationships between study variables, since psychological distress, especially depression, has been found to alter people's perceptions of attachment, relationship quality and satisfaction, and perceptions of the availability and utilisation of social support (Wilkinson & Mulcahy, 2010, Trillingsgaard, Baucom, & Heyman, 2014). In addition, non-psychological factors such as maternal and child sleep problems may bi-directionally be impacted by maternal mood (e.g. depression) (Armitage et al., 2009) and maternal anxiety may influence a new mother's perceptions and reporting of the child's perceived health status.

Finally, the independent variables (IVs) generally predicted little of the variance in self-reported symptoms of depression, anxiety, and stress, after prenatal distress levels were controlled. Symptoms of antenatal distress are considered to be established risk factors for PPD (Beck et al., 2001; Pope, 2000; Robertson et al., 2004). However, the little extra variance that was predicted by the IVs points to the likelihood that: (i) other factors not assessed in the study are important in the aetiology of postpartum depression, anxiety and stress, and/or (ii) interactions between the predictors (e.g. more SLE leading to poor maternal sleep leading to PPD) may predict additional variance. Thus, future research is required to examine a broader range of risk factors for perinatal distress, along with the predictive strength of indirect mediational and moderational relationships, especially where limited research has addressed the factors implicated in the vulnerability to these affective states.

Conclusion

The perinatal period is a time of major transition, where expectant and new mothers undergo many biological, social, and psychological changes. Due to the challenges inherent in the transition to parenthood, it is also a time when women may become increasingly vulnerable to experience psychological distress (Bener, Gerber, & Sheikh, 2012). Until recently, the clinical and research emphasis had almost exclusively been on women's experience of postpartum depression. However, researchers have recently started to recognise that anxiety and even high stress may be common in pregnancy and childbirth, and possibly occur independent of depression (Miller et al., 2006; Rallis et al., 2014).

Thus, in this research study, perinatal anxiety and stress were examined alongside depression, and the risk factors for the three affective states were examined. Overall, it was found that anxiety and stress symptoms were often comorbid with depression, although they also occurred independent of depression, supporting the proposition that research examining the states and their aetiology is important.

To gain a better and more comprehensive understanding of the risk factors for the three affective states, we examined a range of psychological and non-psychological factors. The study results demonstrated that the quality of women's marital relationship, in particular their dissatisfaction with or discord in the relationship, were implicated as risk factors for postpartum depression and anxiety. In addition, marital satisfaction was shown to mediate the relationships between the women's working models of attachment and their levels of postpartum anxiety and depression. Further, the quality of women's attachment relationships with their mother was implicated as a risk factor for pre- and postnatal depression, and prenatal anxiety and stress. Additionally, the totality of social support rather than any particular aspect of it was implicated in the aetiology of

postnatal maternal distress. Taken together, the results reiterate that interpersonal risk factors, specifically those relating to the women's closest relationships and their available social supports are likely to be most important in informing women's psychological adjustment in the transition to parenthood (O'Hara & Swain, 1996; Pope, 2000).

Furthermore, a broad range of non-psychological factors were assessed as risk factors of the three affective states. Delivery via caesarean section was implicated in all three affective states, whereas the child's and mother's sleep, the child's health, and the experience of SLE increased the women's vulnerability to experience postpartum depression, anxiety, and stress, respectively. A better understanding of the psychological and non-psychological risk factors for maternal psychological distress in the transition to parenthood is important in assisting the healthcare professionals who come into regular contact with expectant and new mothers to detect the women who are or are likely to become distressed, based on the analysis of probable risk factors.

Thus, the study results provide a strong rationale for screening and the early detection of women who experience anxiety and stress during the perinatal period, along with those who exhibit depression, and the need to further examine the risk factors that predict vulnerability to these states. Maternal psychological distress is well known to potentially exert an adverse impact on the mother and her infant, even into adolescence and adulthood (Brand et al., 2009; Grace et al., 2006). Thus, accurate detection of perinatal distress in women and the development of successful interventions to help target the problems that predispose to maternal mental health problems are vital in optimising the wellbeing of new generations.

References

Abbasi, S., Chuang, C. H., Dagher, R., Zhu, J., & Kjerulff, K. (2013). Unintended pregnancy and postpartum depression among first-time mothers. *Journal of Women's Health*, *22*(5), 412-416. doi:10.1089/jwh.2012.3926

Adewuya, A. O., Fatoye, F. O., Ola, B. A., Ijaodola, O. R., & Ibigbami, S. M. O. (2005). Sociodemographic and obstetric risk factors for postpartum depressive symptoms in Nigerian women. *Journal of Psychiatric Practice, 11*(5), 353-358. doi:10.1097/00131746-200509000-00009

Ainsworth, M. D. S. (1989). Attachments beyond infancy. *American Psychologist, 44,* 709-716. doi:10.1037/0003-066X.44.4.709

Ainsworth, M. D. S., Blehar, M. C., Waters, E., & Wall, S. (1978). *Patterns of attachment: A psychological study of the strange situation*. New Jersey: Erlbaum.

Akiyama, H., Antonucci, T., Takahashi, K., & Langfahl, E. S. (2003). Negative interactions in close relationships across the life span. *The Journals of Gerontology Series B: Psychological Sciences and Social Sciences*, *58*(2), 70-79. doi:10.1093/geronb/58.2.P70

Alder, J., Fink, N., Bitzer, J., Hösli, I., & Holzgreve, W. (2007). Depression and anxiety during pregnancy: a risk factor for obstetric, fetal and neonatal outcome? A critical review of the literature. *The Journal of Maternal-Fetal & Neonatal Medicine*, *20*(3), 189-209. doi:10.1080/14767050701209560

Alexander, R., Feeney, J., Hohaus, L., & Noller, P. (2001). Attachment style and coping resources as predictors of coping strategies in the transition to parenthood. *Personal Relationships*, *8*(2), 137-152. doi:10.1111/j.1475-6811.2001.tb00032.x

Alipour, Z., Lamyian, M., & Hajizadeh, E. (2012). Anxiety and fear of childbirth as predictors of postnatal depression in nulliparous women. *Women and Birth*, *25*(3), e37-e43. doi:10.1016/j.wombi.2011.09.002

American Psychiatric Association. (2013). *The diagnostic and statistical manual of mental disorders (5th ed.)*. Washington, D.C: Author

Andersson, L., Sundström-Poromaa, I., Bixo, M., Wulff, M., Bondestam, K., & Åström, M. (2003). Point prevalence of psychiatric disorders during the second trimester of pregnancy: a population-based study. *American Journal of Obstetrics and Gynecology*, *189*(1), 148-154. doi:10.1067/mob.2003.336

Andersson, L., Sundström-Poromaa, I., Wulff, M., Åström, M., & Bixo, M. (2006). Depression and anxiety during pregnancy and six months postpartum: A follow-up study. *Acta Obstetricia et Gynecologica Scandinavica*, *85*(8), 937-944. doi:10.1080/ 00016340600697652

Armitage, R., Flynn, H. A., Hoffman, R., Vazquez, D., Lopez, J., & Marcus, S. M. (2009). Developmental changes in sleep in infants: The impact of maternal depression. *Sleep, 32*(5), 693-696.

Armstrong, K. L., Haeringen, A. V., Dadds, M. R., & Cash, R. (1998). Sleep deprivation or postnatal depression in later infancy: separating the chicken from the egg. *Journal of Paediatrics and Child Health*, *34*(3), 260-262. doi:10.1046/ j.1440-1754.1998. 00213.x

Armstrong, K. L., Quinn, R. A., Dadds, M. (1993). The sleep patterns of normal children. *Medical Journal of Australia, 161*(3), 202-210.

Austin, M. P., & Lumley, J. (2003). Antenatal screening for postnatal depression: a systematic review. *Acta Psychiatrica Scandinavica*, *107*(1), 10-17. doi:10.1034/ j.1600-0447.2003.02024.x

Australian Bureau of Statistics (2012). *Year Book Australia.* 1301.0-2012.

Australian Bureau of Statistics (2014). *Household Income and Wealth, Australia.* 6523.0, 2013-2014.

Avant, K. C. (1981). Anxiety as a potential factor affecting maternal attachment. *Journal of Obstetric, Gynecologic, & Neonatal Nursing*, *10*(6), 416-419. doi:10.1111/j.1552-6909.1981.tb00984.x

Ayers, S. (2004). Delivery as a traumatic event: prevalence, risk factors, and treatment for postnatal posttraumatic stress disorder. *Clinical Obstetrics and Gynecology*, *47*(3), 552-567. doi:10.1097/01.grf.0000129919.00756.9c

Bågedahl-Strindlund, M., & Monsen Börjesson, K. (1998). Postnatal depression: A hidden illness. *Acta Psychiatrica Scandinavica, 9,* 272-275. doi:10.1111/ j.1600-0447.1998.tb10083.x

Ballard, C. G., Davis, R., Handy, S., & Mohan, R. N. C. (1993). Postpartum anxiety in mothers and fathers. *The European Journal of Psychiatry*, *7*(2), 117-121.

Ban, L., Gibson, J. E., West, J., & Tata, L. J. (2010). Association between perinatal depression in mothers and the risk of childhood infections in offspring: A population-based cohort study. *BMC Public Health*, *10*(1), 799-806. doi:10.1186 /1471-2458-10-799

Bandelow, B., Sojka, F., Broocks, A., Hajak, G., Bleich, S., & Rüther, E. (2006). Panic disorder during pregnancy and postpartum period. *European Psychiatry*, *21*(7), 495-500. doi:10.1016/j.eurpsy.2005.11.005

Barkin, J. L., Bloch, J. R., Hawkins, K. C., & Thomas, T. S. (2014). Barriers to optimal social support in the postpartum period. *Journal of Obstetric, Gynecologic, & Neonatal Nursing, 43*(4), 445-454. doi:10.1111/1552-6909.12463

Baron, R. M., & Kenny, D. A. (1986). The moderator–mediator variable distinction in social psychological research: Conceptual, strategic, and statistical considerations. *Journal of Personality and Social Psychology*, *51*(6), 1173-1182. doi:10.1037/0022-3514.51.6.1173

Bayer, J. K., Hiscock, H., Hampton, A., & Wake, M. (2007). Sleep problems in young infants and maternal mental and physical health. *Journal of Paediatrics and Child Health*, *43*(1-2), 66-73. doi:10.1111/j.1440-1754.2007.01005.x

Beck, C. T. (1996). A meta-analysis of predictors of postpartum depression. *Nursing Research*, *45*(5), 297-303. doi:10.1097/00006199-199609000-00008

Beck, C. T. (2001). Predictors of postpartum depression: an update. *Nursing Research*, *50*(5), 275-285. doi:10.1097/00006199-200109000-00004

Beebe, B., Jaffe, J., Buck, K., Chen, H., Cohen, P., Feldstein, S., & Andrews, H. (2008). Six-week postpartum maternal depressive symptoms and 4-month mother–infant self-and interactive contingency. *Infant Mental Health Journal*, *29*(5), 442-471. doi:10.1002/imhj.20191

Belsky, J., Lang, M. E., & Rovine, M. (1985). Stability and change in marriage across the transition to parenthood: A second study. *Journal of Marriage and the Family*, *47*(4), 855-865. doi:10.2307/352329

Belsky, J., & Rovine, M. (1990). Patterns of marital change across the transition to parenthood: Pregnancy to three years postpartum. *Journal of Marriage and the Family, 52*(1), 5-19. doi:10.2307/352833

Bener, A., Gerber, L . M., & Sheikh, J. (2012). Prevalence of psychiatric disorders and associated risk factors in women during their postpartum period: A major public health problem and global comparison. *International Journal of Women's Health,4,* 191-200. doi:10.2147/IJWH.S29380

Benjaminsen, S. (1981). Stressful life events preceding the onset of neurotic depression. *Psychological Medicine*, *11*(2), 369-378. doi:10.1017/S0033291700052181

Bernazzani, O., Saucier, J. F., David, H., & Borgeat, F. (1997). Psychosocial predictors of depressive symptomatology level in postpartum women. *Journal of Affective Disorders*, *46*(1), 39-49. doi:10.1016/S0165-0327(97)00077-3

Betts, K. S., Williams, G. M., Najman, J. M., & Alati, R. (2014). Maternal depressive, anxious, and stress symptoms during pregnancy predict internalizing problems in adolescence. *Depression and Anxiety*, *31*(1), 9-18. doi:10.1002/da.22210

Bidart, C., & Lavenu, D. (2005). Evolutions of personal networks and life events. *Social networks*, *27*(4), 359-376. doi:10.1016/j.socnet.2004.11.003

Blackmore, E. R., Jones, I., Doshi, M., Haque, S., Holder, R., Brockington, I., & Craddock, N. (2006). Obstetric variables associated with bipolar affective puerperal psychosis. *The British Journal of Psychiatry*, *188*(1), 32-36. doi:10.1192/bjp.188.1.32

Boath, E., Bradley, E., & Henshaw, C. (2005). The prevention of postnatal depression: A narrative systematic review. *Journal of Psychosomatic Obstetrics & Gynecology*, *26*(3), 185-192. doi:10.1080/01674820400028431

Boath, E., & Henshaw, C. (2001). The treatment of postnatal depression: A comprehensive literature review. *Journal of Reproductive and Infant Psychology*, *19*(3), 215-248. doi:10.1080/02646830120073224

Boivin, J., Bunting, L., Collins, J. A., & Nygren, K. G. (2007). International estimates of infertility prevalence and treatment-seeking: potential need and demand for infertility medical care. *Human Reproduction*, *22*(6), 1506-1512. doi:10.1093/humrep/dem046

Bost, K. K., Cox, M. J., Burchinal, M. R., & Payne, C. (2002). Structural and supportive changes in couples' family and friendship networks across the transition to parenthood. *Journal of Marriage and Family*, *64*(2), 517-531. doi:10.1111/j.1741-3737.2002.00517.x

Bottino, M. N., Nadanovsky, P., Moraes, C. L., Reichenheim, M. E., & Lobato, G. (2012). Reappraising the relationship between maternal age and postpartum depression according to the evolutionary theory: Empirical evidence from a survey in primary health services. *Journal of Affective Disorders*, *142*(1), 219-224. doi:10.1016/j.jad.2012.04.030

Bowlby, J. (1969). *Attachment and loss: Attachment* (Vol. I). London: The Hogarth Press.

Bowlby, J. (1973). *Attachment and loss: Separation, anxiety and anger* (Vol. II). London: The Hogarth Press.

Bowlby, J. (1977). The making and breaking of affectional bonds. II. Some principles of psychotherapy. The fiftieth Maudsley lecture. *The British Journal of Psychiatry, 130,* 421-431. doi:10.1192/bjp.130.5.421

Bowlby, J. (1979). *The making and breaking of aflectional bonds.* London: Tavistock.

Bowlby, J (1980). *Attachment and loss: Vol 3 Loss.* New York: Basic Books.

Bowlby, J. (1982). *Attachment and loss: Vol 1 Attachment* (2nd Ed.). New York: Basic Books.

Bowlby, J. (1988). *A secure base: Parent-Child Attachment and Healthy Human Development*. New York: Basic Books.

Boyce, P. M. (2003). Risk factors for postnatal depression: a review and risk factors in Australian populations. *Archives of Women's Mental Health*, *6*(2), s43-s50. doi:10.1007/s00737-003-0005-9

Boyce, P. M., Johnstone, S. J., Hickey, A. R., Morris-Yates, A. D., Harris, M. G., & Strachan, T. (2000). Functioning and well-being at 24 weeks postpartum of women with postnatal depression. *Archives of Women's Mental Health*, *3*(3), 91-97. doi:10.1007/s007370070002

Boyce, P., Stubbs, J., & Todd, A. (1993). The Edinburgh postnatal depression scale: validation for an Australian sample. *Australian and New Zealand Journal of Psychiatry*, *27*(3), 472-476. doi:10.3109/00048679309075805

Boyce, P. M., & Todd, A. L. (1992). Increased risk of postnatal depression after emergency caesarean. *The Medical Journal of Australia*, *157*, 172-174.

Bradley, R. H., & Corwyn, R. F. (2002). Socioeconomic status and child development. *Annual Review of Psychology*, *53*(1), 371-399. doi:10.1146/annurev.psych.53.100901.135233

Bradley, R. H., Whiteside-Mansell, L., Brisby, J. A., & Caldwell, B. M. (1997). Parents' socioemotional investment in children. *Journal of Marriage and the Family*, 77-90. doi:10.2307/353663

Brand, S. R., & Brennan, P. A. (2009). Impact of antenatal and postpartum maternal mental illness: how are the children? *Clinical Obstetrics and Gynecology*, *52*(3), 441-455. doi:10.1097/GRF.0b013e3181b52930

Brennan, K. A., Clark, C. L., & Shaver, P. R. (1998). Self-report measurement of adult attachment: An integrative overview. In J. A. Simpson & W. S. Rholes (Eds.), *Attachment theory and close relationships* (pp. 46-76). New York: Guilford Press.

Brennan, P. A., Hammen, C., Andersen, M. J., Bor, W., Najman, J. M., & Williams, G. M. (2000). Chronicity, severity, and timing of maternal depressive symptoms:

Relationships with child outcomes at age 5. *Developmental Psychology*, *36*(6), 759-766. doi:10.1037/0012-1649.36.6.759

Bretherton, I. (1985). Attachment theory: Retrospect and prospect. *Monographs of the Society for Research in Child Development, 50*(2), 3-35. doi:10.2307/3333824

Britton, J. R. (2005). Pre-discharge anxiety among mothers of well newborns: Prevalence and correlates. *Acta Paediatrica*, *94*(12), 1771-1776. doi:10.1080/08035250500192664

Britton, J. R. (2008). Maternal anxiety: course and antecedents during the early postpartum period. *Depression and Anxiety*, *25*(9), 793-800. doi:10.1002/da.20325

Brockington, I. F., Macdonald, E., & Wainscott, G. (2006). Anxiety, obsessions and morbid preoccupations in pregnancy and the puerperium. *Archives of Women's Mental Health*, *9*(5), 253-263. doi:10.1007/s00737-006-0134-z

Brockington, I. F., Winokur, G., & Dean, C. (1982). Puerperal psychosis. *Motherhood and Mental Illness*, *1*, 37-69.

Buist, A. (1996). *Psychiatric disorders associated with childbirth: A guide to management*. Sydney: McGraw-Hill.

Calvo, V., Palmieri, A., Codato, M., Testoni, I., & Sambin, M. (2012). Composition and function of women's attachment network in adulthood. *Interdisciplinary Journal of Family Studies, 17*(2), 101-110.

Carolan, M. (2005). "Doing it properly": The experience of first mothering over 35 years. *Health Care for Women International*, *26*(9), 764-787. doi:10.1080/07399330500230 987

Carro, M. G., Grant, K. E., Gotlib, I. H., & Compas, B. E. (1993). Postpartum depression and child development: An investigation of mothers and fathers as

sources of risk and resilience. *Development and Psychopathology*, *5*(04), 567-579. doi:10.1017/S0954579400006167

Carter, F. A., Frampton, C. M., & Mulder, R. T. (2006). Cesarean section and postpartum depression: A review of the evidence examining the link. *Psychosomatic Medicine*, *68*(2), 321-330. doi:10.1097/ 01.psy.0000204787.83768.0c

Cassel, J. (1974). Psychosocial processes and "stress": Theoretical formulation. *International Journal of Health Services*, *4*(3), 471-482. doi:10.2190/WF7X-Y1L0-BFKH-9QU2

Castle, H., Slade, P., Barranco-Wadlow, M., & Rogers, M. (2008). Attitudes to emotional expression, social support and postnatal adjustment in new parents. *Journal of Reproductive and Infant Psychology*, *26*(3), 180-194. doi:10.1080/02646830701691319

Chaudron, L. H., Klein, M. H., Remington, P., Palta, M., Allen, C., & Essex, M. J. (2001). Predictors, prodromes and incidence of postpartum depression. *Journal of Psychosomatic Obstetrics & Gynecology*, *22*(2), 103-112. doi:10.3109/01674820109049960

Choi, C., Yamashita, T., Wada, Y., Kohigashi, M., Mizuhara, Y., Nagahara, Y., Nishizawa, S., Tominaga, T., & Fukui, K. (2013). Predictors for exacerbation/improvement of postpartum depression – A focus on anxiety, the mothers' experiences of being cared for by their parents in childhood and borderline personality. A perspective study in Japan. *Journal of Affective Disorders, 150*(2), 507-512. doi:10.1016/j.jad.2013.04.051

Chou, F. H., Avant, K. C., Kuo, S. H., & Fetzer, S. J. (2008). Relationships between nausea and vomiting, perceived stress, social support, pregnancy planning, and

psychosocial adaptation in a sample of mothers: a questionnaire survey. *International Journal of Nursing Studies*, *45*(8), 1185-1191. doi:10.1016/j.ijnurstu.2007.08.004

Cicirelli, V. G. (1983). Adult children's attachment and helping behavior to elderly parents: A path model. *Journal of Marriage and the Family*, *45*(4), 815-825. doi:10.2307/351794

Cockshaw, W. D., Muscat, T., Obst, P. L., & Thorpe, K. (2014). Paternal postnatal depressive symptoms, infant sleeping and feeding behaviors, and rigid parental regulation: A correlational study. *Journal of Psychosomatic Obstetrics & Gynecology*, *35*(4), 124-131. doi:10.3109/0167482X.2014.959920

Cohen, S., & Hoberman, H. M. (1983). Positive events and social supports as buffers of life change stress. *Journal of Applied Social Psychology*, *13*(2), 99-125. doi:10.1111/j.1559-1816.1983.tb02325.x

Cohen, S., & Wills, T. A. (1985). Stress, social support, and the buffering hypothesis. *Psychological Bulletin*, *98*(2), 310-357. doi:10.1037/0033-2909.98.2.310

Cooper, P. J., & Murray, L. (1995). Course and recurrence of postnatal depression. Evidence for the specificity of the diagnostic concept. *The British Journal of Psychiatry*, *166*(2), 191-195. doi:10.1192/bjp.166.2.191

Cooper, M. L., Shaver, P. R., & Collins, N. L. (1998). Attachment styles, emotion regulation, and adjustment in adolescence. *Journal of Personality and Social Psychology*, *74*(5), 1380. doi:10.1037/0022-3514.74.5.1380

Cowan, C. P., & Cowan, P. A. (2000). *When partners become parents: The big life change for couples*. New Jersey: Lawrence Erlbaum Associates Publishers.

Cox, J. L., Connor, Y., & Kendell, R. E. (1982). Prospective study of the psychiatric disorders of childbirth. *The British Journal of Psychiatry*, *140*(2), 111-117. doi:10.1192/bjp.140.2.111

Cox, J. L., Holden, J. M., & Sagovsky, R. (1987). Detection of postnatal depression. Development of the 10-item Edinburgh Postnatal Depression Scale. *The British Journal of Psychiatry*, *150*(6), 782-786. doi:10.1192/bjp.150.6.782

Cox, M. J., Paley, B., Burchinal, M., & Payne, C. C. (1999). Marital perceptions and interactions across the transition to parenthood. *Journal of Marriage and the Family*, *61*(3), 611-625. doi:10.2307/353564

Crockenberg, S. B. (1981). Infant irritability, mother responsiveness, and social support influences on the security of infant-mother attachment. *Child Development*, *52*(3), 857-865. doi:10.2307/1129087

Crockenberg, S. C., & Leerkes, E. M. (2003). Parental acceptance, postpartum depression, and maternal sensitivity: Mediating and moderating processes. *Journal of Family Psychology*, *17*(1), 80-93. doi:10.1037/0893-3200.17.1.80

Cronbach, L. J. (1951). Coefficient alpha and the internal structure of tests. *Psychometrika*, *16*(3), 297-334. doi:10.1007/BF02310555

Da Costa, D., Larouche, J., Dritsa, M., & Brender, W. (2000). Psychosocial correlates of prepartum and postpartum depressed mood. *Journal of Affective Disorders*, *59*(1), 31-40. doi:10.1016/S0165-0327(99)00128-7

Dagher, R. K., Hofferth, S. L., & Lee, Y. (2014). Maternal depression, pregnancy intention, and return to paid work after childbirth. *Women's Health Issues*, *24*(3), e297-e303. doi:10.1016/j.whi.2014.03.002

Davé, S., Petersen, I., Sherr, L., & Nazareth, I. (2010). Incidence of maternal and paternal depression in primary care: A cohort study using a primary care

database. *Archives of Pediatrics & Adolescent Medicine*, *164*(11), 1038-1044. doi:10.1001/archpediatrics. 2010.184

Davis, L., Edwards, H., Mohay, H., & Wollin, J. (2003). The impact of very premature birth on the psychological health of mothers. *Early Human Development*, *73*(1), 61-70. doi:10.1016/S0378-3782(03)00073-2

DelRosario, G., Chang, C. A., & Lee, E. D. (2013). Postpartum depression: Symptoms, diagnosis, and treatment approaches. *Journal of the American Academy of Physician Assistants, 26*(2), 50-54. doi:10.1097/01720610-201302000-00009

Dennis, C. L. (2004). Treatment of postpartum depression, part 2: A critical review of nonbiological interventions. *The Journal of Clinical Psychiatry*, *65*(9), 1252-1265. doi:10.4088/JCP.v65n0915

Dennis, C. L., Janssen, P. A., & Singer, J. (2004). Identifying women at-risk for postpartum depression in the immediate postpartum period. *Acta Psychiatrica Scandinavica*, *110*(5), 338-346. doi:10.1111/j.1600-0447.2004.00337.x

Dennis, C. L., & Ross, L. (2005). Relationships among infant sleep patterns, maternal fatigue, and development of depressive symptomatology. *Birth*, *32*(3), 187-193. doi:10.1111/j.0730-7659.2005.00368.x

Diego, M. A., Field, T., Hernandez-Reif, M., Schanberg, S., Kuhn, C., & Gonzalez-Quintero, V. H. (2009). Prenatal depression restricts fetal growth. *Early Human Development*, *85*(1), 65-70. doi:10.1016/j.earlhumdev.2008.07.002

Dietz, L. J., Jennings, K. D., Kelley, S. A., & Marshal, M. (2009). Maternal depression, paternal psychopathology, and toddlers' behavior problems. *Journal of Clinical Child & Adolescent Psychology*, *38*(1), 48-61. doi:10.1080/15374410802575362

DiPietro, J. A. (2012). Maternal stress in pregnancy: considerations for fetal development. *Journal of Adolescent Health*, *51*(2), S3-S8. doi:10.1016/j.jadohealth.2012.04.008

DiPietro, J. A., Costigan, K., & Sipsma, H. (2008). Continuity in self-report measures of maternal anxiety, stress, and depressive symptoms from pregnancy through two years postpartum. *Journal of Psychosomatic Obstetrics and Gynecology*, *29,* 115-124. doi:10.1080/01674820701701546

Doherty, N. A., & Feeney, J. A. (2004). The composition of attachment networks throughout the adult years. *Personal Relationships*, *11*(4), 469-488. doi:10.1111/j.1475-6811.2004.00093.x

Don, B. P., Chong, A., Biehle, S. N., Gordon, A., & Mickelson, K. D. (2014). Anxiety across the transition to parenthood: change trajectories among low-risk parents. *Anxiety, Stress, & Coping*, *27*(6), 633-649. doi:10.1080/10615806.2014.903473

Dørheim, S. K., Bondevik, G. T., Eberhard-Gran, M., & Bjorvatn, B. (2009). Sleep and depression in postpartum women: A population-based study. *Sleep*, *32*(7), 847-855.

Dowlatshahi, D., & Paykel, E. S. (1990). Life events and social stress in puerperal psychoses: Absence of effect. *Psychological Medicine*, *20*(3), 655-662. doi:10.1017/S0033291700017177

Drewett, R., Blair, P., Emmett, P., & Emond, A. (2004). Failure to thrive in the term and preterm infants of mothers depressed in the postnatal period: A population-based birth cohort study. *Journal of Child Psychology and Psychiatry*, *45*(2), 359-366. doi:10.1111/j.1469-7610.2004.00226.x

Edhborg, M., Nasreen, H. E., & Kabir, Z. N. (2011). Impact of postpartum depressive and anxiety symptoms on mothers' emotional tie to their infants 2–3 months

postpartum: A population-based study from rural Bangladesh. *Archives of Women's Mental Health*, *14*(4), 307-316. doi:10.1007/s00737-011-0221-7

Emmanuel, E., St John, W., & Sun, J. (2012). Relationship between social support and quality of life in childbearing women during the perinatal period. *Journal of Obstetric, Gynecologic, & Neonatal Nursing*, *41*(6), e62-e70. doi:10.1111/j.1552-6909.2012.01400.x

Ertel, K. A., Koenen, K. C., Rich-Edwards, J. W., & Gillman, M. W. (2010). Antenatal and postpartum depressive symptoms are differentially associated with early childhood weight and adiposity. *Paediatric and Perinatal Epidemiology*, *24*(2), 179-189. doi:10.1111/j.1365-3016.2010.01098.x

Eugster, A., & Vingerhoets, A. J. J. M. (1999). Psychological aspects of in vitro fertilization: A review. *Social Science & Medicine*, *48*(5), 575-589. doi:10.1016/S0277-9536(98)00386-4

Evans, J., Heron, J., Francomb, H., Oke, S., & Golding, J. (2001). Cohort study of depressed mood during pregnancy and after childbirth. *BMJ*, *323*(7307), 257-260. doi:10.1136/bmj.323.7307.257

Evans, J., Melotti, R., Heron, J., Ramchandani, P., Wiles, N., Murray, L., & Stein, A. (2012). The timing of maternal depressive symptoms and child cognitive development: A longitudinal study. *Journal of Child Psychology and Psychiatry*, *53*(6), 632-640. doi:10.1111/j.1469-7610.2011.02513.x

Feeney, J. A. (1999). Adult romantic attachment and couple relationships. In J. Cassidy & P. R. Shaver (Eds.), *Handbook of attachment* (pp. 355-377). New York: Guilford Press.

Feeney, J. A. (2002). Attachment, marital interaction, and relationship satisfaction: A diary study. *Personal Relationships*, *9*(1), 39-55. doi:10.1111/1475-6811.00003

Feeney, J., Alexander, R., Noller, P., & Hohaus, L. (2003). Attachment insecurity, depression, and the transition to parenthood. *Personal Relationships*, *10*(4), 475-493. doi:10.1046/j.1475-6811.2003.00061.x

Feeney, J. A., Hohaus, L., Noller, P., & Alexander, R. P. (2001). *Becoming parents. Exploring the Bonds between Mothers, Fathers and Their Infants.* Cambridge: Cambridge University Press. doi:10.1017/CBO9781139164511

Feeney, J. A., & Noller, P. (2004). Attachment and sexuality in close relationships. In J. H. Harvey, A. Wenzel, & S. Sprecher (Eds.), *The handbook of sexuality in close relationships* (pp. 183-201). Mahwah, NJ, USA: Lawrence Erlbaum Associates Publishers.

Felice, E., Saliba, J., Grech, V., & Cox, J. (2004). Prevalence rates and psychosocial characteristics associated with depression in pregnancy and postpartum in Maltese women. *Journal of Affective Disorders*, *82*(2), 297-301. doi:10.1016/j.jad.2003.11.011

Fellenzer, J. L., & Cibula, D. A. (2014). Intendedness of pregnancy and other predictive factors for symptoms of prenatal depression in a population-based study. *Maternal and Child Health Journal*, *18*(10), 2426-2436. doi:10.1007/s10995-014-1481-4

Fergerson, S. S., Jamieson, D. J., & Lindsay, M. (2002). Diagnosing postpartum depression: Can we do better? *American journal of Obstetrics and Gynecology*, *186*(5), 899-902. doi:10.1067/mob.2002.123404

Field, T., Diego, M., Hernandez-Reif, M., Figueiredo, B., Deeds, O., Ascencio, A., Schanberg, S., & Kuhn, C. (2010). Comorbid depression and anxiety effects on pregnancy and neonatal outcome. *Infant Behavior and Development*, *33*(1), 23-29. doi:10.1016/j.infbeh.2009.10.004

Field, T., Diego, M., Hernandez-Reif, M., Schanberg, S., Kuhn, C., Yando, R., & Bendell, D. (2003). Pregnancy anxiety and comorbid depression and anger: Effects on the fetus and neonate. *Depression and Anxiety*, *17*(3), 140-151. doi:10.1002/da.10071

Figueiredo, B., Field, T., Diego, M., Hernandez-Reif, M., Deeds, O., & Ascencio, A. (2008). Partner relationships during the transition to parenthood. *Journal of Reproductive and Infant Psychology*, *26*(2), 99-107. doi:10.1080/02646830701873057

Fisher, J. R., Feekery, C. J., & Rowe-Murray, H. J. (2002). Nature, severity and correlates of psychological distress in women admitted to a private mother–baby unit. *Journal of Paediatrics and Child Health*, *38*(2), 140-145. doi:10.1046/j.1440-1754.2002.00723.x

Fisher, J. R., Hammarberg, K., & Baker, H. G. (2005). Assisted conception is a risk factor for postnatal mood disturbance and early parenting difficulties. *Fertility and Sterility*, *84*(2), 426-430. doi:10.1016/j.fertnstert.2005.02.016

Fisher, J., Mello, M. C. D., Patel, V., Rahman, A., Tran, T., Holton, S., & Holmes, W. (2012). Prevalence and determinants of common perinatal mental disorders in women in low-and lower-middle-income countries: A systematic review. *Bulletin of the World Health Organization*, *90*(2), 139-149. doi:10.2471/BLT.11.091850

Fisher, J. R., Wynter, K. H., & Rowe, H. J. (2010). Innovative psycho-educational program to prevent common postpartum mental disorders in primiparous women: A before and after controlled study. *BMC Public Health*, *10*(1), 432-446. doi:10.1186/1471-2458-10-432

Flykt, M., Kanninen, K., Sinkkonen, J., & Punamäki, R. L. (2010). Maternal depression and dyadic interaction: The role of maternal attachment style. *Infant and Child Development*, *19*(5), 530-550. doi:10.1002/icd.679

Fraley, R. C., & Davis, K. E. (1997). Attachment formation and transfer in young adults' close friendships and romantic relationships. *Personal relationships*, *4*(2), 131-144. doi:10.1111/j.1475-6811.1997.tb00135.x

Fraley, R. C., Heffernan, M. E., Vicary, A. M., & Brumbaugh, C. C. (2011). The experiences in close relationships—Relationship Structures Questionnaire: A method for assessing attachment orientations across relationships. *Psychological Assessment*, *23*(3), 615-625. doi:10.1037/a0022898

Fraley, R. C., & Waller, N. G. (1998). Adult attachment patterns: A test of the typological model. In J. A. Simpson & W. S. Rholes (Eds.), *Attachment theory and close relationships* (pp. 394-428). New York: Guilford Press.

Fraley, R. C., Waller, N. G., & Brennan, K. A. (2000). An item response theory analysis of self-report measures of adult attachment. *Journal of Personality and Social Psychology*, *78*(2), 350-365. doi:10.1037/0022-3514.78.2.350

Freeman, H., & Brown, B. B. (2001). Primary attachment to parents and peers during adolescence: Differences by attachment style. *Journal of Youth and Adolescence*, *30*(6), 653-674. doi:10.1023/A:1012200511045

Gaillard, A., Le Strat, Y., Mandelbrot, L., Keïta, H., & Dubertret, C. (2014). Predictors of postpartum depression: Prospective study of 264 women followed during pregnancy and postpartum. *Psychiatry Research*, *215*(2), 341-346. doi:10.1016/j.psychres.2013.10.003

Gale, S., & Harlow, B. L. (2003). Postpartum mood disorders: A review of clinical and epidemiological factors. *Journal of Psychosomatic Obstetrics & Gynecology*, *24*(4), 257-266. doi:10.3109/01674820309074690

Gameiro, S., Moura-Ramos, M., Canavarro, M. C., & Soares, I. (2011). Network support, and parenting in mothers and fathers who conceived spontaneously or through assisted reproduction. *Journal of Reproductive and Infant Psychology, 29*(2), 170-182. doi:10.1080/02646838.2011.553950

Gavin, N. I., Gaynes, B. N., Lohr, K. N., Meltzer-Brody, S., Gartlehner, G., & Swinson, T. (2005). Perinatal depression: A systematic review of prevalence and incidence. *Obstetrics & Gynecology*, *106*(5, Part 1), 1071-1083. doi:10.1097/01.AOG.0000183597.31630.db

George, A., Luz, R. F., De Tychey, C., Thilly, N., & Spitz, E. (2013). Anxiety symptoms and coping strategies in the perinatal period. *BMC Pregnancy and Childbirth*, *13*(1), 233-238. doi:10.1186/1471-2393-13-233

Glasheen, C., Richardson, G. A., Kim, K. H., Larkby, C. A., Swartz, H. A., & Day, N. L. (2013). Exposure to maternal pre-and postnatal depression and anxiety symptoms: Risk for major depression, anxiety disorders, and conduct disorder in adolescent offspring. *Development and Psychopathology*, *25*(4, Part 1), 1045-1063. doi:10.1017/S0954579413000369

Glazier, R. H., Elgar, F. J., Goel, V., & Holzapfel, S. (2004). Stress, social support, and emotional distress in a community sample of pregnant women. *Journal of Psychosomatic Obstetrics & Gynecology*, *25*(3-4), 247-255. doi:10.1080/01674820400024406

Goker, A., Yanikkerem, E., Demet, M. M., Dikayak, S., Yildirim, Y., & Koyuncu, F. M. (2012). Postpartum depression: Is mode of delivery a risk factor? *ISRN Obstetrics and Gynecology*, *2012,* 1-6. doi:10.5402/2012/616759

Goldstein, L. H., Diener, M. L., & Mangelsdorf, S. C. (1996). Maternal characteristics and social support across the transition to motherhood: Associations with maternal behavior. *Journal of Family Psychology*, *10*(1), 60-71. doi:10.1037/0893-3200.10.1.60

Gorman, L. L., O'Hara, M. W., Figueiredo, B., Hayes, S., Jacquemain, F., Kammerer, M. H., Klier, C. M., Rosi, S., Seneviratne, G., & Sutter-Dallay, A. L. (2004). Adaptation of the structured clinical interview for DSM–IV disorders for assessing depression in women during pregnancy and post-partum across countries and cultures. *The British Journal of Psychiatry*, *184*(46), s17-s23. doi:10.1192/bjp.184.46.s17

Gotlib, I. H., Whiffen, V. E., Wallace, P. M., & Mount, J. H. (1991). Prospective investigation of postpartum depression: Factors involved in onset and recovery. *Journal of Abnormal Psychology*, *100*(2), 122-132. doi:10.1037/0021-843X.100.2.122

Gourounti, K., Anagnostopoulos, F., & Sandall, J. (2014). Poor marital support associate with anxiety and worries during pregnancy in Greek pregnant women. *Midwifery*, *30*(6), 628-635. doi:10.1016/j.midw.2013.10.008

Goyal, D., Gay, C. L., & Lee, K. A. (2007). Patterns of sleep disruption and depressive symptoms in new mothers. *The Journal of Perinatal & Neonatal Nursing*, *21*(2), 123-129. doi:10.1097/01.JPN.0000270629.58746.96

Goyal, D., Gay, C., & Lee, K. A. (2010). How much does low socioeconomic status increase the risk of prenatal and postpartum depressive symptoms in first-time mothers? *Women's Health Issues*, *20*(2), 96-104. doi:10.1016/j.whi.2009.11.003

Grace, S. L., Evindar, A., & Stewart, D. E. (2003). The effect of postpartum depression on child cognitive development and behavior: A review and critical analysis of the literature. *Archives of Women's Mental Health*, *6*(4), 263-274. doi:10.1007/s00737-003-0024-6

Grant, K. A., Bautovich, A., McMahon, C., Reilly, N., Leader, L., & Austin, M. P. (2012). Parental care and control during childhood: Associations with maternal perinatal mood disturbance and parenting stress. *Archives of Women's Mental Health*, *15*(4), 297-305. doi:10.1007/s00737-012-0292-0

Grant, K. A., McMahon, C., & Austin, M. P. (2008). Maternal anxiety during the transition to parenthood: A prospective study. *Journal of Affective Disorders*, *108*(1), 101-111. doi:10.1016/j.jad.2007.10.002

Gregoire, A. (1995). Hormones and postnatal depression. *British Journal of Midwifery, 3,* 99-105.

Gress-Smith, J. L., Luecken, L. J., Lemery-Chalfant, K., & Howe, R. (2012). Postpartum depression prevalence and impact on infant health, weight, and sleep in low-income and ethnic minority women and infants. *Maternal and Child Health Journal*, *16*(4), 887-893. doi:10.1007/s10995-011-0812-y

Grote, N. K., Bridge, J. A., Gavin, A. R., Melville, J. L., Iyengar, S., & Katon, W. J. (2010). A meta-analysis of depression during pregnancy and the risk of preterm birth, low birth weight, and intrauterine growth restriction. *Archives of General Psychiatry*, *67*(10), 1012-1024. doi:10.1001/archgenpsychiatry.2010.111

Grote, N. K., & Clark, M. S. (2001). Perceiving unfairness in the family: cause or consequence of marital distress? *Journal of Personality and Social Psychology*, *80*(2), 281-293. doi:10.1037/0022-3514.80.2.281

Habif, V. L., & Lahey, B. B. (1980). assessment of the life stress-depression relationship: The use of social support as a moderator variable. *Journal of Behavioral Assessment*, *2*(3),167-173. doi:10.1007/BF01321437

Hahn-Holbrook, J., Schetter, C. D., Arora, C., & Hobel, C. J. (2013). Placental corticotropin- releasing hormone mediates the association between prenatal social support and postpartum depression. *Clinical Psychological Science*, *1*(3), 253-265. doi:10.1177/2167702612470646

Halbreich, U. (2004). Prevalence of mood symptoms and depressions during pregnancy: Implications for clinical practice and research. *CNS Spectrums*, *9*(3), 177-184.

Hammarberg, K., Fisher, J., & Wynter, K. (2008). Psychological and social aspects of pregnancy, childbirth and early parenting after assisted conception: A systematic review. *Human Reproduction, 14*(5), 395-414. doi:10.1093/humupd/dmn030

Harris, B., Lovett, L., Newcombe, R. G., Read, G. F., Walker, R., & Riad-Fahmy, D. (1994). Maternity blues and major endocrine changes: Cardiff puerperal mood and hormone study II. *BMJ*, *308*(6934), 949-953. doi:10.1136/bmj.308.6934.949

Hart, R., & McMahon, C. A. (2006). Mood state and psychological adjustment to pregnancy. *Archives of Women's Mental Health*, *9*(6), 329-337. doi:10.1007/ s00737-006-0141-0

Hazan, C., Campa, M., & Gur-Yaish, N. (2006). What is adult attachment. In M. Mikulincer, & G. S. Goodman (Eds.), *Dynamics of romantic love: Attachment, caregiving, and sex* (pp. 47-40). New York: Guildford Press.

Hazan, C., & Shaver, P. (1987). Romantic love conceptualized as an attachment process. *Journal of Personality and Social Psychology*, *52*(3), 511-524. doi:10.1037/0022-3514.52.3.511

Hedegaard, M., Henriksen, T. B., Sabroe, S., & Secher, N. J. (1993). Psychological distress in pregnancy and preterm delivery. *BMJ*, *307*(6898), 234-239. doi:10.1136/ bmj.307.6898.234

Henderson, J., & Redshaw, M. (2013). Anxiety in the perinatal period: Antenatal and postnatal influences and women's experience of care. *Journal of Reproductive and Infant Psychology*, *31*(5), 465-478. doi:10.1080/02646838.2013.835037

Heron, J., O'Connor, T. G., Evans, J., Golding, J., Glover, V., & ALSPAC Study Team. (2004). The course of anxiety and depression through pregnancy and the postpartum in a community sample. *Journal of Affective Disorders*, *80*(1), 65-73. doi:10.1016/j.jad.2003.08.004

Hildingsson, I., Rådestad, I., Rubertsson, C., & Waldenström, U. (2002). Few women wish tobe delivered by caesarean section. *British Journal of Obstetrics and Gynaecology, 109,* 618-623. doi:10.1111/j.1471-0528.2002.01393.x

Hildingsson, I., Tingvall, M., & Rubertsson, C. (2008). Partner support in the childbearing period—A follow up study. *Women and Birth*, *21*(4), 141-148. doi:10.1016/j.wombi. 2008.07.003

Hopkins, J., Campbell, S. B., & Marcus, M. (1987). Role of infant-related stressors in postpartum depression. *Journal of Abnormal Psychology*, *96*(3), 237-241. doi:10.1037/0021-843X.96.3.237

Hostetter, A. L., & Stowe, Z. N. (2002). Postpartum mood disorders. Identification and treatment. In F. Lewis-Hall, T. S. Williams, J. A. Panetta, & J. M. Herrera

(Eds.), *Psychiatric illness in women. Emerging treatments and research* (pp. 133-156). Washington DC: American Psychiatric Publishing Inc.

Huizink, A. C., Robles de Medina, P. G., Mulder, E. J., Visser, G. H., & Buitelaar, J. K. (2003). Stress during pregnancy is associated with developmental outcome in infancy. *Journal of Child Psychology and Psychiatry*, *44*(6), 810-818. doi:10.1111/1469-7610.00166

Hung, C. H. (2007). Postpartum stress as a predictor of women's minor psychiatric morbidity. *Community Mental Health Journal, 43,* 1-12. doi: 10.1007/s10597-006-9066-3

Insel, T. R. (1992). Oxytocin—a neuropeptide for affiliation: evidence from behavioral, receptor autoradiographic, and comparative studies. *Psychoneuroendocrinology*, *17*(1), 3-35. doi:10.1016/0306-4530(92)90073-G

Ip, S., Chung, M., Raman, G., Trikalinos, T. A., & Lau, J. (2009). A summary of the Agency for Healthcare Research and Quality's evidence report on breastfeeding in developed countries. *Breastfeeding Medicine*, *4*(S1), S17-S30. doi:10.1089/bfm.2009.0050

Johnstone, S. J., Boyce, P. M., Hickey, A. R., Morris-Yates, A. D., & Harris, M. G. (2001). Obstetric risk factors for postnatal depression in urban and rural community samples. *Australian and New Zealand Journal of Psychiatry*, *35*(1), 69-74. doi:10.1046/j.1440-1614.2001.00862.x

Josefsson, A., Angelsiöö, L., Berg, G., Ekström, C. M., Gunnervik, C., Nordin, C., & Sydsjö, G. (2002). Obstetric, somatic, and demographic risk factors for postpartum depressive symptoms. *Obstetrics & Gynecology*, *99*(2), 223-228. doi:10.1016/S0029-7844(01) 01722-7

Kalmijn, M. (2012). Longitudinal analyses of the effects of age, marriage, and parenthood on social contacts and supports. *Advances in Life Course Research, 17,* 177-190. doi:10.1016/j.alcr.2012.08.002

Karney, B. R., & Bradbury, T. N. (1995). The longitudinal course of marital quality and stability: A review of theory, methods, and research. *Psychological Bulletin*, *118*(1), 3-34. doi:10.1037/0033-2909.118.1.3

Karraker, K. H., & Young, M. (2007). Night waking in 6-month-old infants and maternal depressive symptoms. *Journal of Applied Developmental Psychology*, *28*(5), 493-498. doi:10.1016/j.appdev.2007.06.002

Kendell, R. E., Chalmers, J. C., & Platz, C. (1987). Epidemiology of puerperal psychoses. *The British Journal of Psychiatry*, *150*(5), 662-673. doi:10.1192/bjp.150.5.662

Kendrick, K., Oberlander, T. F., & Tomfohr, L. (2010). Antenatal depression and anxiety affect postpartum parenting stress: A longitudinal, prospective study. *Canadian Journal of Psychiatry*, *55*(4), 222-228.

Kluwer, E. S. (2010). From partnership to parenthood: A review of marital change across the transition to parenthood. *Journal of Family Theory & Review*, *2*(2), 105-125. doi:10.1111/j.1756-2589.2010.00045.x

Kluwer, E. S., & Johnson, M. D. (2007). Conflict frequency and relationship quality across the transition to parenthood. *Journal of Marriage and Family*, *69*(5), 1089-1106. doi:10.1111/j.1741-3737.2007.00434.x

Kramer, M. S., Aboud, F., Mironova, E., Vanilovich, I., Platt, R. W., Matush, L., Igumnov, S., Fombonne, E., Bogdanovich ,N., Ducruet, T., Collet, J-P., Chalmers, B., Hodnett, E., Davidovsky, S., Skugarevsky, O., Trofimovich, O., Kozlova, L., & Shapiro, S. (2008). Breastfeeding and child cognitive

development: New evidence from a large randomized trial. *Archives of General Psychiatry*, *65*(5), 578-584. doi:10.1001/archpsyc.65.5.578

Kringeland, T., Daltveit, A. K., & Miller, A. (2010). How does preference for natural childbirth relate to the actual mode of delivery? A population-based cohort study from Norway. *Birth, 37,* 21-27. doi:10.1111/j.1523-536X.2009.00374.x

Kowalenko, N., Barnett, B., Fowler, C., & Matthey, S. (2000). *The Perinatal Period: Early Intervention for Mental Health. Clinical Approaches to Early Intervention in Child and Adolescent Mental Health, Volume 4*. Bedford Park, South Australia: Australian Early Intervention Network for Mental Health in Young People.

Lancaster, C. A., Gold, K. J., Flynn, H. A., Yoo, H., Marcus, S. M., & Davis, M. M. (2010). Risk factors for depressive symptoms during pregnancy: A systematic review. *American Journal of Obstetrics and Gynecology*, *202*(1), 5-14. doi:10.1016/j.ajog.2009.09.007

Leach, L. S., Mackinnon, A., Poyser, C., & Fairweather-Schmidt, A. K. (2015). Depression and anxiety in expectant and new fathers: Longitudinal findings in Australian men. *The British Journal of Psychiatry*, *206*, 1-8. doi:10.1192/ bjp.bp.114.148775

Leahy-Warren, P., McCarthy, G., & Corcoran, P. (2011). Postnatal depression in first time mothers: Prevalence and relationships between functional and structural social support at 6 and 12 weeks postpartum. *Archives of Psychiatric Nursing*, *25*(3), 174-184. doi:10.1016/j.apnu.2010.08.005

Leinonen, J. A., Solantaus, T. S., & Punamäki, R. L. (2003). Parental mental health and children's adjustment: The quality of marital interaction and parenting as

mediating factors. *Journal of Child Psychology and Psychiatry*, *44*(2), 227-241 . doi:10.1111/1469-7610.t01-1-00116

Le Strat, Y.L., Dubertret, C., & Le Foll, B. (2011). Prevalence and correlates of major depressive episode in pregnant and postpartum women in the United States. *Journal of Affective Disorders, 135*(1), 128-138. doi:10.1016/j.jad.2011.07.004

Levy-Shiff, R. (1994). Individual and contextual correlates of marital change across the transition to parenthood. *Developmental Psychology*, *30*(4), 591-601. doi:10.1037/0012-1649.30.4.591

Logsdon, M. C., & Usui, W. (2001). Psychosocial predictors of postpartum depression in diverse groups of women. *Western Journal of Nursing Research*, *23*(6), 563-574. doi:10.1177/01939450122045384

Lovibond, S.H., Lovibond, P. F. (1995). *Manual for the depression anxiety stress scales 2nd Edition.* Psychology Foundation of Australia: Sydney.

Lovibond, P. F., & Lovibond, S. H. (1995). The structure of negative emotional states: Comparison of the Depression Anxiety Stress Scales (DASS) with the Beck Depression and Anxiety Inventories. *Behaviour Research and Therapy, 33*(3), 335-343. doi:10.1016/0005-7967(94)00075-U

Mancuso, A., De Vivo, A., Fanara, G., Settineri, S., Triolo, O., & Giacobbe, A. (2006). Women's preference on mode of delivery in Southern Italy. *Acta Obstetricia et Gynecologica Scandinavica*, *85*(6), 694-699. doi:10.1080/00016340600645255

Mandl, K. D., Tronick, E. Z., Brennan, T. A., Alpert, H. R., & Homer, C. J. (1999). Infant health care use and maternal depression. *Archives of Pediatrics & Adolescent Medicine*, *153*(8), 808-813. doi:10.1001/archpedi.153.8.808

Marrs, C. R., Durette, R. T., Ferraro, D. P., & Cross, C. L. (2009). Dimensions of postpartum psychiatric distress: Preliminary evidence for broadening clinical

scope. *Journal of Affective Disorders*, *115*(1), 100-111. doi:10.1016/j.jad.2008.08.012

Matthey, S. (2008). Using the Edinburgh Postnatal Depression Scale to screen for anxiety disorders. *Depression and Anxiety*, *25*(11), 926-931. doi:10.1002/da.20415

Matthey, S. (2010). Are we overpathologising motherhood? *Journal of Affective Disorders*, *120*(1), 263-266. doi:10.1016/j.jad.2009.05.004

Matthey, S., Barnett, B., Howie, P., & Kavanagh, D. J. (2003). Diagnosing postpartum depression in mothers and fathers: Whatever happened to anxiety? *Journal of Affective Disorders*, *74*(2), 139-147. doi:10.1016/S0165-0327(02)00012-5

Matthey, S., Barnett, B., Ungerer, J., & Waters, B. (2000). Paternal and maternal depressed mood during the transition to parenthood. *Journal of Affective Disorders*, *60*(2), 75-85. doi:10.1016/S0165-0327(99)00159-7

Matthey, S., Fisher, J., & Rowe, H. (2013). Using the Edinburgh postnatal depression scale to screen for anxiety disorders: conceptual and methodological considerations. *Journal of Affective Disorders*, *146*(2), 224-230. doi:10.1016/j.jad.2012.09.009

Matthey, S., Henshaw, C., Elliott, S., & Barnett, B. (2006). Variability in use of cut-off scores and formats on the Edinburgh Postnatal Depression Scale–implications for clinical and research practice. *Archives of Women's Mental Health*, *9*(6), 309-315. doi:10.1007/s00737-006-0152-x

Matthey, S., Phillips, J., White, T., Glossop, P., Hopper, U., Panasetis, P., Larkin, M., Barnett, B. (2004). Routine psychosocial assessment of women in the antenatal period: Frequency of risk factors and implications for clinical services. *Archives of Women's Mental Health*, *7*(4), 223-229. doi:10.1007/s00737-004-0064-6

McCrory, C., & McNally, S. (2013). The effect of pregnancy intention on maternal prenatal behaviours and parent and child health: Results of an Irish cohort study. *Paediatric and Perinatal Epidemiology*, *27*(2), 208-215. doi:10.1111/ppe.12027

McMahon, C., Barnett, B., Kowalenko, N., & Tennant, C. (2005). Psychological factors associated with persistent postnatal depression: Past and current relationships, defence styles and the mediating role of insecure attachment style. *Journal of Affective Disorders*, *84*(1), 15-24. doi:10.1016/j.jad.2004.05.005

McMahon, C. A., Boivin, J., Gibson, F. L., Hammarberg, K., Wynter, K., Saunders, D., & Fisher, J. (2011). Age at first birth, mode of conception and psychological wellbeing in pregnancy: Findings from the parental age and transition to parenthood Australia (PATPA) study. *Human Reproduction*, *26*(6), 1389-1398. doi:10.1093/humrep/der 076

McMahon, C., Trapolini, T., & Barnett, B. (2008). Maternal state of mind regarding attachment predicts persistence of postnatal depression in the preschool years. *Journal of Affective Disorders*, *107*(1), 199-203. doi:10.1016/j.jad.2007.07.017

McMahon, C. A., Ungerer, J. A., Beaurepaire, J., Tennant, C., & Saunders, D. (1997). Anxiety during pregnancy and fetal attachment after in-vitro fertilization conception. *Human Reproduction*, *12*(1), 176-182. doi:10.1093/humrep/ 12.1.176

McMahon, C. A., Ungerer, J. A., Tennant, C., & Saunders, D. (1997). Psychosocial adjustment and the quality of the mother-child relationship at four months postpartum after conception by in vitro fertilization. *Fertility and Sterility*, *68*(3), 492-500. doi:10.1016/S0015-0282(97)00230-6

Meltzer-Brody, S. (2011). New insights into perinatal depression: pathogenesis and treatment during pregnancy and postpartum. *Dialogues in Clinical Neuroscience*, *13*(1), 89-100.

Meredith, P., & Noller, P. (2003). Attachment and infant difficultness in postnatal depression. *Journal of Family Issues*, *24*(5), 668-686. doi:10.1177/0192513X03024005005

Mikulincer, M., & Florian, V. (1998). The relationship between adult attachment styles and emotional and cognitive reactions to stressful events. In J. A. Simpson & W. S. Rholes (Eds.), *Attachment theory and Close Relationships* (pp. 394-428). New York: Guilford Press.

Mikulincer, M., & Shaver, P. R. (2007). *Attachment in adulthood: Structure, dynamics and change.* New York: Guilford Press.

Milgrom, J., Gemmill, A. W., Bilszta, J. L., Hayes, B., Barnett, B., Brooks, J., Ericksen, J., Ellwood, D., & Buist, A. (2008). Antenatal risk factors for postnatal depression: A large prospective study. *Journal of Affective Disorders*, *108*(1), 147-157. doi:10.1016/j.jad.2007.10.014

Milgrom, J., Martin, P. R., & Negri, L. M. (1999). *Treating postnatal depression: A psychological approach for health care practitioners*. Chichester: Wiley.

Miller, R. L., Pallant, J. F., & Negri, L. M. (2006). Anxiety and stress in the postpartum: Is there more to postnatal distress than depression? *BMC Psychiatry*, *6*(1), 12-22. doi:10.1186/1471-244X-6-12

Mitnick, D. M., Heyman, R. E., & Smith Slep, A. M. (2009). Changes in relationship satisfaction across the transition to parenthood: A meta-analysis. *Journal of Family Psychology*, *23*(6), 848. doi:10.1037/a0017004

Molfese, V. J., Bricker, M. C., Manion, L. G., Beadnell, B., Yaple, K., & Moires, K. A. (1987). Review Article: Anxiety, depression and stress in pregnancy: A multivariate model of intra-partum risks and pregnancy outcomes. *Journal of Psychosomatic Obstetrics & Gynecology*, *7*(2), 77-92. doi:10.3109/01674828709019593

Möller, K., Philip Hwang, C., & Wickberg, B. (2006). Romantic attachment, parenthood and marital satisfaction. *Journal of Reproductive and Infant Psychology*, *24*(3), 233-240. doi:10.1080/02646830600821272

Monti, F., Agostini, F., Fagandini, P., Paterlini, M., La Sala, G. B., & Blickstein, I. (2008). Anxiety symptoms during late pregnancy and early parenthood following assisted reproductive technology. *Journal of Perinatal Medicine*, *36*(5), 425-432. doi:10.1515/JPM.2008.074

Monti, F., Agostini, F., Fagandini, P., La Sala, G. B., & Blickstein, I. (2009). Depressive symptoms during late pregnancy and early parenthood following assisted reproductive technology. *Fertility and sterility*, *91*(3), 851-857. doi:10.1016/ j.fertnstert.2008.01.021

Munk-Olsen, T., Laursen, T. M., Pedersen, C. B., Mors, O., & Mortensen, P. B. (2006). New parents and mental disorders: A population-based register study. *JAMA*, *296*(21), 2582-2589. doi:10.1001/jama.296.21.2582

Nielsen, F. D., Videbech, P., Hedegaard, M., & Dalby, S. J. (2000). Postpartum depression: Identification of women at risk. *BJOG, 107,* 1210-1217. doi:10.1111 / j.1471-0528.2000.tb11609.x

National Institute for Health and Care Excellence (NICE). *Antenatal and postnatal mental health: Clinical management and service guidance.* June 2015.

Nonacs, M. D., & Cohen, L. S. (1998). Postpartum mood disorders: Diagnosis and treatment guidelines. *Journal of Clinical Psychiatry*, *59*, 2134-40.

O'Brien, B., & Naber, S. (1992). Nausea and vomiting during pregnancy: Effects on the quality of women's lives. *Birth*, *19*(3), 138-143. doi:10.1111/j.1523-536X.1992.tb00671.x

O'Hara, M. W., & McCabe, J. E. (2013). Postpartum depression: current status and future directions. *Annual Review of Clinical Psychology*, *9*, 379-407. doi:10.1146/annurev- clinpsy-050212-185612

O'Hara, M. W., Neunaber, D. J., & Zekoski, E. M. (1984). Prospective study of postpartum depression: Prevalence, course, and predictive factors. *Journal of Abnormal Psychology*, *93*(2), 158-171. doi:10.1037/0021-843X.93.2.158

O'Hara, M. W., & Swain, A. M. (1996). Rates and risk of postpartum depression-A meta-analysis. *International Review of Psychiatry*, *8*(1), 37-54. doi:10.3109/0954026 9609037816

O'Hara, M. W., Zekoski, E. M., Philipps, L. H., & Wright, E. J. (1990). Controlled prospective study of postpartum mood disorders: comparison of childbearing and nonchildbearing women. *Journal of Abnormal Psychology*, *99*(1), 3-15. doi:10.1037/0021-843X.99.1.3

O'Mahen, H. A., Beach, S. R., & Banawan, S. F. (2001). Depression in marriage. In J. H. Harvey & A. Wenzel (Eds.), *Close romantic relationships: Maintenance and enhancement* (pp. 299-320). New Jersey: Lawrence Erlbaum Associates, Inc.

Orr, S. T., & Miller, C. A. (1997). Unintended pregnancy and the psychosocial well-being of pregnant women. *Women's Health Issues*, *7*(1), 38-46. doi:10.1016/S1049-3867(96)00017-5

Parico, T. J. M., Lizan-Garcia, M., Otero, P. A., Benlloch, M. M. J., Beseler, S. B., Sanchez-Palomares, M., Santos, S. L., & Rivera, L. L. (2006). Full breastfeeding and hospitalization as a result of infections in the first year of life. *Pediatrics, 118,* e92-e99. doi:10.1542/peds.2005-1629

Patton, G. C., Romaniuk, H., Spry, E., Coffey, C., Olsson, C., Doyle, L. W., Oats, J., Hearps, S., Carlin, J. B., & Brown, S. (2015). Prediction of perinatal depression from adolescence and before conception (VIHCS): 20 year prospective cohort study. *The Lancet,* in press. doi:10.1016/S0140-6736(14)62248-0

Paul, I. M., Downs, D. S., Schaefer, E. W., Beiler, J. S., & Weisman, C. S. (2013). Postpartum anxiety and maternal-infant health outcomes. *Pediatrics*, *131*(4), e1218-e1224. doi:10.1542/peds.2012-2147

Paykel, E. S., Emms, E. M., Fletcher, J., & Rassaby, E. (1980). Life events and social support in puerperal depression. *The British Journal of Psychiatry*, *136*(4), 339-346. doi:10.1192/bjp.136.4.339

Pearlstein, T. B., Zlotnick, C., Battle, C. L., Stuart, S., O'Hara, M. W., Price, A. B., Grause, M. A., & Howard, M. (2006). Patient choice of treatment for postpartum depression: A pilot study. *Archives of Women's Mental Health*, *9*(6), 303-308. doi:10.1007/s00737-006-0145-9

Petch, J., & Halford, W. K. (2008). Psycho-education to enhance couples' transition to parenthood. *Clinical Psychology Review*, *28*(7), 1125-1137. doi:10.1016/j.cpr.2008.03.005

Petrosyan, D., Armenian, H. K., & Arzoumanian, K. (2011). Interaction of maternal age and mode of delivery in the development of postpartum depression in Yerevan, Armenia. *Journal of Affective Disorders*, *135*(1), 77-81. doi:10.1016/j.jad.2011.06.061

Pope, S. (2000). *Postnatal depression: A systematic review of published scientific literature to 1999: An information paper*. National Health and Medical Research Council.

Posmontier, B. (2008). Sleep quality in women with and without postpartum depression. *Journal of Obstetric, Gynecologic, & Neonatal Nursing*, *37*(6), 722-737. doi:10.1111/j.1552-6909.2008.00298.x

Pridham, K., Lin, C. Y., & Brown, R. (2001). Mothers' evaluation of their caregiving for premature and full-term infants through the first year: Contributing factors. *Research in Nursing & Health*, *24*(3), 157-169. doi:10.1002/nur.1019

Rahman, A., Iqbal, Z., Bunn, J., Lovel, H., & Harrngton, R. (2003). Impact of maternal depression on infant nutritional status and illness: A cohort study. *Archives of General Psychiatry, 61,* 946-952. doi:10.1001/archpsyc.61.9.946

Rallis, S., Skouteris, H., McCabe, M., & Milgrom, J. (2014). The transition to motherhood: Towards a broader understanding of perinatal distress. *Women and Birth*, *27*(1), 68-71. doi:10.1016/j.wombi.2013.12.004

Razurel, C., Kaiser, B., Sellenet, C., & Epiney, M. (2013). Relation between perceived stress, social support, and coping strategies and maternal well-being: A review of the literature. *Women and Health, 53,* 74-90. doi:10.1080/03630242.2012.732681

Reck, C., Struben, K., Backenstrass, M., Stefenelli, U., Reinig, K., Fuchs, T., Sohn, C., & Mundt, C. (2008). Prevalence, onset and comorbidity of postpartum anxiety and depressive disorders. *Acta Psychiatrica Scandinavica*, *118*(6), 459-468. doi:10.1111/j.1600-0447.2008.01264.x

Reich, T., & Winokur, G. (1970). Postpartum psychoses in patients with manic depressive disease. *The Journal of Nervous and Mental Disease*, *151*(1), 60-68. doi:10.1097/00005053-197007000-00008

Remick, R. A. (2002). Diagnosis and management of depression in primary care: A clinical update and review. *Canadian Medical Association Journal*, *167*(11), 1253-1260.

Rholes, W. S., Simpson, J. A., Campbell, L., & Grich, J. (2001). Adult attachment and the transition to parenthood. *Journal of Personality and Social Psychology*, *81*(3), 421-435. doi:10.1037/0022-3514.81.3.421

Roberts, S. L., Bushnell, J. A., Collings, S. C., & Purdie, G. L. (2006). Psychological health of men with partners who have post-partum depression. *Australian and New Zealand Journal of Psychiatry*, *40*(8), 704-711. doi:10.1080/j.1440-1614.2006.01871.x

Robertson, E., Grace, S., Wallington, T., & Stewart, D. E. (2004). Antenatal risk factors for postpartum depression: a synthesis of recent literature. *General Hospital Psychiatry*, *26*(4), 289-295. doi:10.1016/j.genhosppsych.2004.02.006

Robertson, E., Jones, I., Haque, S., Holder, R., & Craddock, N. (2005). Risk of puerperal and non-puerperal recurrence of illness following bipolar affective puerperal (postpartum) psychosis. *The British Journal of Psychiatry*, *186*(3), 258-259. doi:10.1192/bjp.186.3.258

Ross, L. E., Evans, S. G., Sellers, E. M., & Romach, M. K. (2003). Measurement issues in postpartum depression part 1: Anxiety as a feature of postpartum depression. *Archives of Women's Mental Health*, *6*(1), 51-57. doi:10.1007/s00737-002-0155-1

Ross, L. E., McLean, L. M., & Psych, C. (2006). Anxiety disorders during pregnancy and the postpartum period: A systematic review. *Journal of Clinical Psychiatry, 67*(8), 1285-1298. doi:10.4088/JCP.v67n0818

Ross, L. E., McQueen, K., Vigod, S., & Dennis, C. L. (2011). Risk for postpartum depression associated with assisted reproductive technologies and multiple births: A systematic review. *Human Reproduction Update*, *17*(1), 96-106. doi:10.1093/humupd/dmq025

Rowe, H. J., Fisher, J. R., & Loh, W. M. (2008). The Edinburgh Postnatal Depression Scale detects but does not distinguish anxiety disorders from depression in mothers of infants. *Archives of Women's Mental Health*, *11*(2), 103-108. doi:10.1007/s00737-008-0003-z

Sadeh, A., Tikotzky, L., & Scher, A. (2010). Parenting and infant sleep. *Sleep Medicine Reviews*, *14*(2), 89-96. doi:10.1016/j.smrv.2009.05.003

Safford, S. M., Alloy, L. B., Crossfield, A. G., Morocco, A. M., & Wang, J. C. (2004). The relationship of cognitive style and attachment style to depression and anxiety in young adults. *Journal of Cognitive Psychotherapy*, *18*(1), 25-41. doi:10.1891/jcop.18.1.25.28046

Schetter, C. D., & Tanner, L. (2012). Anxiety, depression and stress in pregnancy: Implications for mothers, children, research, and practice. *Current Opinion in Psychiatry*, *25*(2), 141-148. doi:10.1097/YCO.0b013e3283503680

Senchak, M., & Leonard, K. E. (1992). Attachment styles and marital adjustment among newlywed couples. *Journal of Social and Personal Relationships*, *9*(1), 51-64. doi:10.1177/0265407592091003

Shaver, P. R., & Hazan, C. (1988). A biased overview of the study of love. *Journal of Social and Personal relationships*, *5*(4), 473-501. doi:10.1177/0265407588054005

Shaver, P. R., & Hazan, C. (1993). Adult romantic attachment: Theory and evidence. *Advances in personal relationships*, *4*, 29-70.

Shaver, P. R., & Mikulincer, M. (2002). Attachment-related psychodynamics. *Attachment & Human Development*, *4*(2), 133-161. doi:10.1080/14616730210154171

Simpson, J. A., Rholes, W. S., Campbell, L., Tran, S., & Wilson, C. L. (2003). Adult attachment, the transition to parenthood, and depressive symptoms. *Journal of Personality and Social Psychology*, *84*(6), 1172-1187. doi:10.1037/0022-3514.84.6.1172

Simpson, J. A., Rholes, W. S., & Phillips, D. (1996). Conflict in close relationships: An attachment perspective. *Journal of Personality and Social Psychology*, *71*(5), 899-914. doi:10.1037/0022-3514.71.5.899

Singh, S., Sedgh, G., & Hussain, R. (2010). Unintended pregnancy: Worldwide levels, trends, and outcomes. *Studies in Family Planning*, *41*(4), 241-250. doi:10.1111/j.1728-4465.2010.00250.x

Skouteris, H., Wertheim, E. H., Rallis, S., Milgrom, J., & Paxton, S. J. (2009). Depression and anxiety through pregnancy and the early postpartum: An examination of prospective relationships. *Journal of Affective Disorders*, *113*(3), 303-308. doi:10.1016/j.jad.2008.06.002

Smith, L. E., & Howard, K. S. (2008). Continuity of paternal social support and depressive symptoms among new mothers. *Journal of Family Psychology*, *22*(5), 763-773. doi:10.1037/a0013581

Sockol, L. E., Epperson, C. N., & Barber, J. P. (2011). A meta-analysis of treatments for perinatal depression. *Clinical Psychology Review, 31,* 839-849. doi:10.1016/ j.cpr.2011.03.009

Sohr-Preston, S. L., & Scaramella, L. V. (2006). Implications of timing of maternal depressive symptoms for early cognitive and language development. *Clinical Child and Family Psychology Review*, *9*(1), 65-83. doi:10.1007/s10567-006-0004-2

Spanier, G. B. (1976). Measuring dyadic adjustment: New scales for assessing the quality of marriage and similar dyads. *Journal of Marriage and the Family*, *38*(1), 15-28. doi:10.2307/350547

Spoozak., Gotman, N., Smith, M. V., Belanger, K., & Yonkers, K. A. (2009). Evaluation of a social support measure that may indicate risk of depression during pregnancy. *Journal of Affective Disorders, 114*(1-3), 216-223. doi:10.1016/j.jad.2008.07.015

Sroufe, A. L., & Waters, E. (1977). Attachment as an organisational construct. *Child Development, 48*(4), 1184-1199. doi:10.2307/1128475

Stein, A., Cooper, P. J., Campbell, E. A., Day, A., & Altham, P. M. (1989). Social adversity and perinatal complications: their relation to postnatal depression. *BMJ*, *298*(6680), 1073-1074. doi:10.1136/bmj.298.6680.1073

Stemp, P. S., Turner, R. J., & Noh, S. (1986). Psychological distress in the postpartum period: The significance of social support. *Journal of Marriage and the Family*, *48*(2), 271-277. doi:10.2307/352394

Stice, E., Ragan, J., & Randall, P. (2004). Prospective relations between social support and depression: Differential direction of effects for parent and peer support?

Journal of Abnormal Psychology, *113*(1), 155-159. doi:10.1037/0021-843X.113.1.155

Strahan, B. J. (1995). Predictors of depression: An attachment theoretical approach. *Journal of Family Studies*, *1*(1), 33-47. doi:10.5172/jfs.1.1.33

Stuart, S., & Koleva, H. (2014). Psychological treatments for perinatal depression. *Best Practice & Research Clinical Obstetrics and Gynaecology, 28,* 61-70. doi:10.1016/ j.bpobgyn.2013.09.004

Tamaki, R., Murata, M., & Okano, T. (1997). Risk factors for postpartum depression in Japan. *Psychiatry and Clinical Neurosciences*, *51*(3), 93-98. doi:10.1111/j.1440-1819.1997.tb02368.x

Teixeira, C., Figueiredo, B., Conde, A., Pacheco, A., & Costa, R. (2009). Anxiety and depression during pregnancy in women and men. *Journal of Affective Disorders*, *119*(1), 142-148. doi:10.1016/j.jad.2009.03.005

Terry, D. J., Mayocchi, L., & Hynes, G. J. (1996). Depressive symptomatology in new mothers: A stress and coping perspective. *Journal of Abnormal Psychology*, *105*(2), 220-231. doi:10.1037/0021-843X.105.2.220

Thorp, S. R., Krause, E. D., Cukrowicz, K. C., & Lynch, T. R. (2004). Postpartum partner support, demand-withdraw communication, and maternal stress. *Psychology of Women Quarterly*, *28*(4), 362-369. doi:10.1111/j.1471-6402.2004.00153.x

Trinke, S. J., & Bartholomew, K. (1997). Hierarchies of attachment relationships in young adulthood. *Journal of Social and Personal Relationships*, *14*(5), 603-625. doi:10.1177/0265407597145002

Turner, C. T., & Papinczak, T. A. (2000). An analysis of personal and social factors influencing initiation and duration of breastfeeding in a large Queensland maternity hospital. *Breastfeeding Review*, *8*(1), 25-33.

Ugarriza, D. N. (2002). Postpartum depression women's explanation of depression. *Journal of Nursing Scholarship*, *34*(3), 227-233. doi:10.1111/j.1547-5069.2002.00227.x

Vigod, S. N., Villegas, L., Dennis, C. L., & Ross, L. E. (2010). Prevalence and risk factors for postpartum depression among women with preterm and low-birth-weight infants: A systematic review. *BJOG: An International Journal of Obstetrics & Gynaecology*, *117*(5), 540-550. doi:10.1111/j.1471-0528.2009.02493.x

Vliegen, N., Luyten, P., & Biringen, Z. (2009). A multimethod perspective on emotional availability in the postpartum period. *Parenting: Science and Practice*, *9*(3-4), 228- 243. doi:10.1080/15295190902844514

Vythilingum, B. (2008). Anxiety disorders in pregnancy. *Current Psychiatry Reports*, *10*(4), 331-335. doi:10.1007/s11920-008-0053-y

Wardrop, A. A., & Popadiuk, N. E. (2013). Women's experiences with postpartum anxiety: Expectations, relationships, and sociocultural influences. *The Qualitative Report*, *18*(3), 1-24.

Warfa, N., Harper, M., Nicolais, G., & Bhui, K. (2014). Adult attachment style as a risk factor for maternal postnatal depression: A systematic review. *BMC Psychology*, *2*(1), 56-66. doi:10.1186/s40359-014-0056-x

Warner, R., Appleby, L., Whitton, A. B. S. C., & Faragher, B. (1996). Demographic and obstetric risk factors for postnatal psychiatric morbidity. *The British Journal of Psychiatry*, *168*(5), 607-611. doi:10.1192/bjp.168.5.607

Waters, E., Merrick, S., Treboux, D., Crowell, J., & Albersheim (2000). Attachment security in infancy and early adulthood: A twenty-year longitudinal study. *Child Development, 71*(3), 684-689. doi:10.1111/1467-8624.00176

Watson, J. P., Elliott, S. A., Rugg, A. J., & Brough, D. I. (1984). Psychiatric disorder in pregnancy and the first postnatal year. *The British Journal of Psychiatry*, *144*(5), 453-462. doi:10.1192/bjp.144.5.453

Webster, J., Nicholas, C., Velacott, C., Cridland, N., & Fawcett, L. (2011). Quality of life and depression following childbirth: impact of social support. *Midwifery*, *27*(5), 745-749. doi:10.1016/j.midw.2010.05.014

Weiss, R. S. (1991). The attachment bond in childhood and adulthood. In C. M. Parkes, J. Stevenson-Hinde, & P. Marris (Eds.). *Attachment across the life cycle* (pp. 66-76). London: Routledge Press

Weissman, M. M., & Olfson, M. (1995). Depression in women: Implications for health care research. *Science*, *269*(5225), 799-801. doi:10.1126/science.7638596

Wenzel, A., Haugen, E. N., Jackson, L. C., & Brendle, J. R. (2005). Anxiety symptoms and disorders at eight weeks postpartum. *Journal of Anxiety Disorders*, *19*(3), 295-311. doi:10.1016/j.janxdis.2004.04.001

Whisman, M. A., Davila, J., & Goodman, S. H. (2011). Relationship adjustment, depression, and anxiety during pregnancy and the postpartum period. *Journal of Family Psychology*, *25*(3), 375-383. doi:10.1037/a0023790

Wilkinson, R. B., & Mulcahy, R. (2010). Attachment and interpersonal relationships in postnatal depression. *Journal of Reproductive and Infant Psychology*, *28*(3), 252-265. doi:10.1080/02646831003587353

Wilkinson, R. B., & Scherl, F. B. (2006). Psychological health, maternal attachment and attachment style in breast-and formula-feeding mothers: A preliminary study.

Journal of Reproductive and Infant Psychology, *24*(1), 5-19. doi:10.1080/02646830500475153

Williams, N. L., & Riskind, J. H. (2004). Adult romantic attachment and cognitive vulnerabilities to anxiety and depression: Examining the interpersonal basis of vulnerability models. *Journal of Cognitive Psychotherapy*, *18*(1), 7-24. doi:10.1891/jcop.18.1.7.28047

Woolhouse, H., Gartland, D., Perlen, S., Donath, S., & Brown, S. J. (2014). Physical health after childbirth and maternal depression in the first 12 months postpartum: Results of an Australian nulliparous pregnancy cohort study. *Midwifery, 30*(3), 378-384. http://dx.doi.org/10.1016/j.midw.2013.03.006.

World Health Organization. (1992). *The ICD-10 classification of mental and behavioural disorders: Clinical descriptions and diagnostic guidelines.* Geneva: World Health Organization.

Wu, J., Viguera, A., Riley, L., Cohen, L., & Ecker, J. (2002). Mood disturbance in pregnancy and the mode of delivery. *American Journal of Obstetrics and Gynecology*, *187*(4), 864-867. doi:10.1067/mob.2002.127126

Xie, R. H., He, G., Koszycki, D., Walker, M., & Wen, S. W. (2009). Prenatal social support, postnatal social support, and postpartum depression. *Annals of Epidemiology*, *19*(9), 637-643. doi:10.1016/j.annepidem.2009.03.008

Xie, R. H., Lei, J., Wang, S., Xie, H., Walker, M., & Wen, S. W. (2011). Cesarean section and postpartum depression in a cohort of Chinese women with a high cesarean delivery rate. *Journal of Women's Health*, *20*(12), 1881-1886. doi:10.1089/jwh.2011.2842

Yang, S. N., Shen, L. J., Ping, T., Wang, Y. C., & Chien, C. W. (2011). The delivery mode and seasonal variation are associated with the development of postpartum

depression. *Journal of Affective Disorders*, *132*(1), 158-164. doi:10.1016/j.jad.2011.02.009

Yelland, J., Sutherland, G., & Brown, S. J. (2010). Postpartum anxiety, depression and social health: Findings from a population-based survey of Australian women. *BMC Public Health*, *10*(1), 771-781. doi:10.1186/1471-2458-10-771

Ystrom, E. (2012). Breastfeeding cessation and symptoms of anxiety and depression: A longitudinal cohort study. *BMC Pregnancy and Childbirth*, *12*(1), 36-41. doi:10.1186/1471-2393-12-36

Zelkowitz, P., & Papageorgiou, A. (2005). Maternal anxiety: an emerging prognostic factor in neonatology. *Acta Paediatrica*, *94*(12), 1704-1705. doi:10.1080/08035250500355030

Appendices

Appendix 1

Project Advertisement

Transition to Parenthood 2011/2012 – Expectant Parents Needed

Expectant parents are invited to take part in an online wellbeing and relationships project being conducted through the Australian National University.

Who can participate?

Expectant mothers and fathers over the age of 18. It doesn't matter whether you are becoming a parent for the first or fourth time.

What do I need to do?

Participation is completely voluntary and involves completing two online surveys, one pre-baby and one post-baby. You can withdraw from the study at any time.

If you are interested in participating or would like further information about the study:

Please contact Danielle Clout at the Australian National University Department of Psychology on 6125 2796 during office hours or email danielle.clout@anu.edu.au.

Appendix 2

Project Information Sheet

Transition to Parenthood 2011/2012 – Information Sheet

Principal Investigator

Danielle Clout: Doctor of Psychology Candidate at the Australian National University, Department of Psychology. Ph 6125 0509 or danielle.clout@anu.edu.au.

Supervisor

Dr. Ross Wilkinson: Senior Lecturer, Department of Psychology at the Australian National University, Ph 6125 2814 or ross.wilkinson@anu.edu.au.

What is the purpose of the research

This study is about how people find the experience of becoming a parent, regardless of whether it's for the first or fourth time. The questions focus on your interpersonal relationships and psychological wellbeing. The questions also ask about your expectations and experiences of caring for your new baby.

What do I have to do?

- Complete a series of online questionnaires during the third trimester of pregnancy, which will take approximately 40 minutes to complete.
- Complete a second series of online questionnaires approximately 4-6 months after the birth of your child. This questionnaire will also take approximately 40 minutes to complete.

.

Participation is voluntary

Participation in all stages of this study is **voluntary** and you are free to withdraw without penalty at any time by notifying the investigators or simply exiting the online survey.

How your information will be protected

All responses will be confidential within the confines of the law. Each survey will require the use of a code, which will be kept separately from any personally identifiable details. Only the investigators listed below will have access to my responses

Risks of participating in this study

If you find that completing this questionnaire causes you distress then contact the investigators immediately on the numbers provided below and they will organise appropriate care and assistance. Alternatively you could call Lifeline on 131114 at any time 24 hours.

Further Information

If you have any queries regarding this questionnaire you can contact either Danielle Clout or Ross Wilkinson at the Department of Psychology, Level 1, Building 39 of the Australian National University on 6125 2796 during office hours or email danielle.clout@anu.edu.au or ross.wilkinson@anu.edu.au.

If you have *any concerns about the ethical implications* of this survey you could contact the Australian National University Human Research Ethics Committee, Research Office at Chancelry 10B, The Australian National University, ACT, 0200 or email them at human.ethics.officer@anu.edu.au.

Appendix 3

Online Consent Information

Transition to Parenthood 2011/2012 – Consent Information

Thank you for volunteering to participate in this research project on the transition to parenthood. This study is about how people find the experience of becoming a parent, whether it's for the first or fourth time. Please read the information below and click next if you agree to participate in this study.

Principal Investigator: Danielle Clout: Doctor of Psychology Candidate at the Australian National University, Department of Psychology. Ph 6125 0509 or danielle.clout@anu.edu.au.

Supervisor: Dr. Ross Wilkinson: Senior Lecturer at the Australian National University, Department of Psychology. Ph 6125 2814 or ross.wilkinson@anu.edu.au

In relation to this project I am also aware of the following;

1) This study is about how people find the experience of becoming a parent. The questions will focus on my interpersonal relationships, psychological health and expectations and experiences of caring for my new baby.
2) This study will be conducted in two phases. The first phase will be conducted prenatally and will involve completing this online questionnaire. The second phase will be conducted at approximately 4-6 months postpartum and will involve an additional online questionnaire.

3) Participation is completely voluntary and I am free to withdraw without penalty at any time by notifying the investigators listed above.
4) All responses are confidential within the confines of the law. Each survey will require the use of a code, which will be kept separately from any personally identifiable details. Only the investigators listed below will have access to my responses.
5) If the results of this study are published, my identity will not be revealed
6) There are no foreseen adverse effects or risks related to this project
7) If completing this questionnaire package is distressing to me then I can contact the investigators immediately on the numbers provided above and they will organise appropriate support and assistance. Alternatively I can call lifeline on 131114 at any time
8) If I have any queries or concerns regarding the questionnaire packages I can contact the investigators listed above
9) Approval has been given by the ANU Human Research Ethics Committee. Should I have any problems or queries about the ethical implications of the study, and I do not feel comfortable contacting the research staff I am aware I may contact the ANU Human Research Ethics Committee. The contact details are, The ANU Human Research Ethics Committee, Research Office at Chancelry 10B, The Australian National University, ACT, 0200 or email human.ethics.officer@anu.edu.au

After considering the above points, please click next to accept the invitation to participate in this project.

Participants indicate consent by progressing to the next step in the questionnaire

Appendix 4

Depression, Anxiety and Stress Scales (Lovibond & Lovibond, 1995a)

DASS21	*Name:*	*Date:*			
Please read each statement and circle a number 0, 1, 2 or 3 which indicates how much the statement applied to you *over the past week*. There are no right or wrong answers. Do not spend too much time on any statement. *The rating scale is as follows:* 0 Did not apply to me at all 1 Applied to me to some degree, or some of the time 2 Applied to me to a considerable degree, or a good part of time 3 Applied to me very much, or most of the time					
1	I found it hard to wind down	0	1	2	3
2	I was aware of dryness of my mouth	0	1	2	3
3	I couldn't seem to experience any positive feeling at all	0	1	2	3
4	I experienced breathing difficulty (eg, excessively rapid breathing, breathlessness in the absence of physical exertion)	0	1	2	3
5	I found it difficult to work up the initiative to do things	0	1	2	3
6	I tended to over-react to situations	0	1	2	3
7	I experienced trembling (eg, in the hands)	0	1	2	3
8	I felt that I was using a lot of nervous energy	0	1	2	3
9	I was worried about situations in which I might panic and make a fool of myself	0	1	2	3
10	I felt that I had nothing to look forward to	0	1	2	3
11	I found myself getting agitated	0	1	2	3
12	I found it difficult to relax	0	1	2	3
13	I felt down-hearted and blue	0	1	2	3
14	I was intolerant of anything that kept me from getting on with what I was doing	0	1	2	3
15	I felt I was close to panic	0	1	2	3
16	I was unable to become enthusiastic about anything	0	1	2	3
17	I felt I wasn't worth much as a person	0	1	2	3
18	I felt that I was rather touchy	0	1	2	3

19	I was aware of the action of my heart in the absence of physical exertion (eg, sense of heart rate increase, heart missing a beat)	0	1	2	3
20	I felt scared without any good reason	0	1	2	3
21	I felt that life was meaningless	0	1	2	3

Appendix 5

Edinburgh Postnatal Depression Scale (Cox, Holden, & Sagovsky, 1987)

The questions below relate to how you have felt over the previous 7 days:

1. I've been able to laugh and see the funny side of things
As much as I always did (0)
Not quite so much now (1)
Definitely not so much now (2)
Not at all (3)

2. I've looked forward with enjoyment to things
As much as I ever did (0)
Rather less than I used to (1)
Definitely less than I used to (2)
Hardly at all (3)

3. I've blamed myself unnecessarily when things went wrong
Yes, most of the time (3)
Yes, same of the time (2)
Not very often (1)
No, Never (0)

4. I've been anxious or worried for no good reason
No, not at all (0)
Hardly ever (1)
Yes, sometimes (2)
Yes, very often (3)

5. I've felt scared or panicky for no good reason
Yes, quite a lot (3)
Yes, sometimes (2)
No, not much (1)
No, not at all (0)

6. Things have been getting on top of me
Yes, most of the time I haven't been able to cope at all (3)
Yes, sometimes I haven't been coping as well as usual (2)
No, most of the time I have coped quite well (1)
No, I have been coping as well as ever (0)

7. I've been so unhappy that I've had difficulty sleeping
Yes, most of the time (3)
Yes, sometimes (2)
Not very often (1)
No, not at all (0)

8. I've felt sad or miserable
Yes, most of the time (3)
Yes, sometimes (2)
Not very often (1)
No, never (0)

9. I've been so unhappy that I have been crying
Yes, most of the time (3)
Yes, quite often (2)
Only occasionally (1)
No, never (0)

10. The thought of harming myself has occurred to me
Yes, quite often (3)
Sometimes (2)
Hardly ever (1)
Never (0)

Appendix 6

Modified Version of the Experiences in Close Relationships Scale (ECR) (Brennan, Clark, & Shaver, 1998)

Please read each of the following statements and rate the extent to which you believe each statement best describes your feelings about close relationships.

Dimension	Modified ECR-R items
Avoidance	1. I prefer not to show others how I feel deep down.
Anxiety	2. I often worry that other people close to me don't really love me.
Avoidance	3. I find it difficult to allow myself to depend on other people.
Anxiety	4. I often worry that other people don't care as much about me as I care about them.
Avoidance	5. I am very comfortable being close to other people. r
Anxiety	6. Sometimes people change their feelings about me for no apparent reason.
Avoidance	7. It is usually easy for me to discuss my problems and concerns with other people. r
Anxiety	8. My desire to be close sometimes scares people away.
Avoidance	9. It helps to turn to others for support in times of need. r
Anxiety	10. My relationships with people make me doubt myself.
Avoidance	11. I am nervous when people get too emotionally close to me.
Anxiety	12. When I show my feelings to people I care about, I'm afraid that they will not feel the same about me.
Avoidance	13. I find it easy to depend on other people. r
Anxiety	14. I am afraid that once somebody gets to know me, he or she won't like who I am.
Avoidance	15. It is easy for me to be affectionate with other people. r
Anxiety	16. It makes me mad that I don't get the affection and support I need from other people.
Avoidance	17. I feel comfortable sharing private thoughts and feelings with other people. r
Anxiety	18. I worry a lot about relationships.
Avoidance	19. I feel comfortable depending on other people. r

Anxiety	20. I find that other people don't want to be as close as I would like.

Note. r indicates reversed scored item. Items are endorsed on a 5 point likert scale from 1 (Strongly disagree) to 5 (Strongly agree).

Appendix 7

Relationship Structures Questionnaire of the Experiences in Close Relationships-Revised (Fraley, Heffernan, Vicary, & Brumbaugh, 2011)

Please answer the following 9 questions about your marital partner (Paper 1)

Please answer the following 9 questions about your mother or a mother like figure (Paper 2)

Please answer the following 9 questions about your father or a father like figure (Paper 2)

Please answer the following 9 questions about your relationship with your closest friend or friends (Paper 2)

Dimension	Modified ECR-R items
Avoidance	1. It helps to turn to this person in times of need. r
Avoidance	2. I usually discuss my problems and concerns with this person. r
Avoidance	3. I talk things over with this person. r
Avoidance	4. I find it easy to depend on this person. r
Avoidance	5. I don't feel comfortable opening up to this person.
Avoidance	6. I prefer not to show this person how I feel deep down.
Anxiety	7. I often worry that this person doesn't really care for me.
Anxiety	8. I'm afraid this person may abandon me.
Anxiety	9. I worry that this person won't care about me as much as I care about them

Note. r indicates reversed scored item. Items are endorsed on a 5 point likert scale from 1 (Strongly disagree) to 7 (Strongly agree).

Appendix 8

Dyadic Adjustment Scale (Spanier, 1976)

Most people have disagreements in their relationships. Please indicate below the approximate extent of agreement or disagreement between you and your partner for each item on the following list.

I. Handling of family finances

Always Agree	Almost always Agree	Occasionally Disagree	Frequently Disagree	Almost Always Disagree	Always Disagree

2. Matters of recreation

Always Agree	Almost always Agree	Occasionally Disagree	Frequently Disagree	Almost Always Disagree	Always Disagree

3. Religious matters

Always Agree	Almost always Agree	Occasionally Disagree	Frequently Disagree	Almost Always Disagree	Always Disagree

4. Demonstrations of affection

Always Agree	Almost always Agree	Occasionally Disagree	Frequently Disagree	Almost Always Disagree	Always Disagree

5. Friends

Always Agree	Almost always Agree	Occasionally Disagree	Frequently Disagree	Almost Always Disagree	Always Disagree

6. Sex relations

Always Agree	Almost always Agree	Occasionally Disagree	Frequently Disagree	Almost Always Disagree	Always Disagree

7. Conventionality (correct or proper behaviour)

Always Agree	Almost always Agree	Occasionally Disagree	Frequently Disagree	Almost Always Disagree	Always Disagree

8. Philosophy of life

Always Agree	Almost always Agree	Occasionally Disagree	Frequently Disagree	Almost Always Disagree	Always Disagree

9. Ways of dealing with parents or in-laws

Always Agree	Almost always Agree	Occasionally Disagree	Frequently Disagree	Almost Always Disagree	Always Disagree

10. Aims, goals, and things believed important

Always Agree	Almost always Agree	Occasionally Disagree	Frequently Disagree	Almost Always Disagree	Always Disagree

11. Amount of time spent together

Always Agree	Almost always Agree	Occasionally Disagree	Frequently Disagree	Almost Always Disagree	Always Disagree

12. Making major decisions

Always Agree	Almost always Agree	Occasionally Disagree	Frequently Disagree	Almost Always Disagree	Always Disagree

13. Household tasks

Always Agree	Almost always Agree	Occasionally Disagree	Frequently Disagree	Almost Always Disagree	Always Disagree

14. Leisure time, interests, and activities

Always Agree	Almost always Agree	Occasionally Disagree	Frequently Disagree	Almost Always Disagree	Always Disagree

15. Career decisions

Always Agree	Almost always Agree	Occasionally Disagree	Frequently Disagree	Almost Always Disagree	Always Disagree

---

16. How often do you discuss or have you considered divorce, separation or terminating your relationship

All the time	Most of the time	More often than not	Occasionally	Rarely ever	Never

17. How often do you or your mate leave the house after a fight?

All the time	Most of the time	More often than not	Occasionally	Rarely ever	Never

18. In general, how often do you think things between you and your partner are going well?

All the time	Most of the time	More often than not	Occasionally	Rarely ever	Never

19. Do you confide in your partner?

All the time	Most of the time	More often than not	Occasionally	Rarely ever	Never

20. Do you ever regret that you married your partner (or lived together)?

All the time	Most of the time	More often than not	Occasionally	Rarely ever	Never

21. How often do you and your partner quarrel?

All the time	Most of the time	More often than not	Occasionally	Rarely ever	Never

22. How often do you and your partner "get on each other's nerves?"

All the time | Most of the time | More often than not | Occasionally | Rarely ever | Never

---

23. Do you kiss your partner?

Every day | Almost every day | Occasionally | Rarely | Never

24. Do you and your partner engage in outside interests together?

None of them | Very few of them | some of them | Most of them | All of them

---

How often would you say the following events occur between you and your mate?

25. Have an interesting chat?

Never | Less than once a month | Once or twice a month | Once or twice a week | Once a day | More often

26. Laugh together?

Never | Less than once a month | Once or twice a month | Once or twice a week | Once a day | More often

27. Calmly discuss something?

Never | Less than once a month | Once or twice a month | Once or twice a week | Once a day | More often

28. Work together on a project?

Never | Less than once a month | Once or twice a month | Once or twice a week | Once a day | More often

---

These are some things with which couples can sometimes agree and sometimes disagree. Indicate if the items below were problems in your relationship during the past FEW WEEKS.

29. Being too tired for sex NO YES

30. Not showing love NO YES

---

31. Please circle the one that best describes the degree of happiness in your relationship?

Extremely unhappy | Fairly unhappy | A little unhappy | Happy | Very happy | Extremely happy | Perfect

---

32. Which of the following statements best describes how you feel about the future of your relationship?

(please circle the most appropriate statement)

a) I want desperately for my relationship to succeed, and would go to almost any length to see that it does.

b) I want very much for my relationship to succeed, and will do all I can to see that it does.

c) I want very much for my relationship to succeed and will do my fair share to see that it does.

d) It would be nice if my relationship succeeded, but I can't do much more than I'm doing now to help it succeed.

e) My relationship can never succeed, and there is no more that I can do to keep the relationship going.

Appendix 9

Modified version of the Attachment Network Questionnaire (Trinke & Bartholomew, 1997)

Please list the significant people in your life, those people that you currently feel a strong emotional tie to, regardless of whether that tie is positive, negative or mixed.

Initials	Gender	Age	Relationship to you
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			

From the people on this list, please list the names or nicknames of *up to three* important people in your life that apply to each statement listed below. List people in order of importance. That is, please make sure that the person you list *first* for a particular question is *the most important one*, and the second is the next most important, and so on.

Please make sure you do not list the same person twice within a statement. You do not need to list three people for every statement; just list the ones that are relevant to the statement. You also do not need to include your romantic partner if they are not relevant to the questions.

1. Who do you talk to when you are worried about something or when something bad happens to you?
2. Who do you turn to for comfort when you are feeling upset or down?
3. Who do you feel will always be there for you, if you needed him/her?
4. Who do you feel you can always count on no matter what?
5. Who do you like to spend time with?
6. Who is important for you to see/talk with regularly?
7. Who do you not like to be away from?
8. Who do you miss most during separations

Appendix 10

Interpersonal Support Evaluation Inventory (Cohen & Hoberman, 1983)

This scale is made up of a list of statements each of which may or may not be true about you. For each statement circle "definitely true" if you are sure it is true about you and "probably true" if you think it is true but are not absolutely certain. Similarly, you should circle "definitely false" if you are sure the statement is true and "probably false" if you think it is false but are not absolutely certain.

1. There are several people that I trust to help solve my problems.
Definitely true probably true probably false definitely false

2. If I needed help fixing an appliance or repairing my car, there is someone who would help me.
Definitely true probably true probably false definitely false

3. Most of my friends are more interesting than I am.
Definitely true probably true probably false definitely false

4. There is someone who takes pride in my accomplishments.
Definitely true probably true probably false definitely false

5. When I feel lonely, there are several people I can talk to.
Definitely true probably true probably false definitely false

6. There is no one that I feel comfortable talking about intimate interpersonal problems with.
Definitely true probably true probably false definitely false

7. I often meet or talk with family or friends.
Definitely true probably true probably false definitely false

8. Most people I know think highly of me.
Definitely true probably true probably false definitely false

9. If I needed a ride to the airport very early in the morning, I would have a hard time finding someone to take me.
Definitely true probably true probably false definitely false

10. I feel like I'm not always included by my circle of friends.
Definitely true probably true probably false definitely false

11. There really is no one who can give me an objective view of how I'm handling my problems.
Definitely true probably true probably false definitely false

12. There are several different people I enjoy spending time with.
Definitely true probably true probably false definitely false

13. I think that my friends feel that I'm not very good at helping them solve their problems.
Definitely true probably true probably false definitely false

14. If I were sick and needed someone (friends, family member, or acquaintance) to take me to the doctor, I would have trouble finding someone.
Definitely true probably true probably false definitely false

15. If I wanted to go on a trip for a day (e.g., to the mountains, beach or county), I would have a hard time finding someone to go with me.
Definitely true probably true probably false definitely false

16. If I needed a place to stay for a week because of an emergency (e.g. electricity our in my house), I could easily find someone who would put me up.
Definitely true probably true probably false definitely false

17. I feel that there is no one I can share my most private worries and fears with.
Definitely true probably true probably false definitely false

18. If I were sick, I could easily find someone to help me with my daily chores.
Definitely true probably true probably false definitely false

19. There is someone I can turn to for advice about handling problems with my family.
Definitely true probably true probably false definitely false

20. I am as good at doing other things as most other people are.
Definitely true probably true probably false definitely false

21. If I decide one afternoon that I would like to go to a movie that evening, I could easily find someone to go with me.
Definitely true probably true probably false definitely false

22. When I need suggestions on how to deal with a personal problem, I know someone I can turn to.
Definitely true probably true probably false definitely false

23. If I needed an emergency loan of $100, there is someone (friend, relative, or acquaintance) I could get it from.
Definitely true probably true probably false definitely false

24. In general, people do not have much confidence in me.
Definitely true probably true probably false definitely false

25. Most people I know do enjoy the same things that I do.
Definitely true probably true probably false definitely false

26. There is someone I could turn to for advice about making career plans or changing my job.
Definitely true probably true probably false definitely false

27. I don't often get invited to do things with others.
Definitely true probably true probably false definitely false

28. Most of my friends are more successful in making changes in their lives than I am.
Definitely true probably true probably false definitely false

29. If I had to go out of town for a few weeks, it would be difficult to find someone who would look after my house/apartment (e.g. plants, pets, garden).
Definitely true probably true probably false definitely false

30. There really is no one I can trust to give me good financial advice.
Definitely true probably true probably false definitely false

31. If I wanted to have lunch with someone, I could easily find someone to join me.
Definitely true probably true probably false definitely false

32. I am more satisfied with my life than most people are with theirs.
Definitely true probably true probably false definitely false

33. If I was stranded 10 miles from home, there is someone I could call who could come and get me.
Definitely true probably true probably false definitely false

34. No one I know would throw a birthday party for me.
Definitely true probably true probably false definitely false

35. It would be difficult for me to find someone who would lend me their car for a few hours.
Definitely true probably true probably false definitely false

36. If a family crisis arose, it would be difficult to find someone who could give me good advice about how to handle it.
Definitely true probably true probably false definitely false

37. I am closer to my friends than most other people are to theirs.
Definitely true probably true probably false definitely false

38. There is at least one person I know whose advice I really trust.
Definitely true probably true probably false definitely false

39. If I needed some help in moving to a new house or apartment, I would have a hard time finding someone to help me.
Definitely true probably true probably false definitely false

40. I have a hard time keeping pace with my friends.
Definitely true probably true probably false definitely false