Anxious Mothers = Fussy Babies? Relating Maternal Anxiety
to Infant Temperament

Kim D. O'Neil

A thesis submitted to the Faculty of Graduate Studies
and Research in partial fulfillment of the requirements
for the degree of Master of Arts

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Abstract

This study examined the relations between different anxiety types (pregnancy specific, state, and trait) and their differential associations to infant temperament. Anxiety was measured using the Prenatal Anxiety Questionnaire (Van den Bergh, 1989) and the State-Trait Anxiety Inventory (Spielberger et al., 1970). Infant behaviour was measured with the Infant Behaviour Questionnaire (Rothbart, 1971). Prenatal and postnatal demographic variables were measured to examine associations with both anxiety and temperament. All anxiety types were significantly inter-related. Prenatal state anxiety uniquely predicted infant attention span and positive affect. Postnatal state anxiety was associated with infant activity and fussiness, and postnatal trait anxiety was related to infant fussiness. Pregnancy specific anxiety was not associated with infant temperament. Results are discussed in terms of practical implications with regard to prenatal interventions.

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Anxious mothers = fussy babies? Relating maternal anxiety to infant temperament

In recent years, researchers have explored the notion that the emotional condition of a pregnant woman can affect the fetus, and, consequently, the later development of the child (Van den Bergh, 1992). Maternal anxiety has been found to be associated with various aspects of fetal and neonatal development. For example, results from past research have indicated that women with higher levels of prenatal anxiety had an increased incident of abnormal deliveries (Carlson & LaBarba, 1979; Davids & Devaut, 1962; McDonald & Parham, 1964). Moreover, there is evidence for a relation between maternal psychological stress and later negative infant behavioural outcomes (Davids, Hoklen, and Gray, 1963; Farber, Vaughn, and Egeland, 1981; Ottinger & Simmons, 1964).

More recent research has examined the relations between anxiety and infant/child outcomes (Bhagwanani, Seagraves, Dierken, & Lax, 2001; O'Connor, Heron, Goldring, Beveridge, & Glover 2001). However, much of this research has confounded different types of anxiety. This confounding is attributable in part, to methodological issues. Past studies have assessed prenatal anxiety by using a general anxiety measure, or else by measuring state and/or trait anxiety. It is only recently that researchers have started to assess prenatal anxiety specifically, and there is some evidence to suggest that pregnancy specific anxiety predicts temperament beyond other types of anxiety (Huizink, De Medina, Mulder, Visser, & Buitelaar, 2001; Roy, Noyes, & Wisenbaker, 1999). As yet, what is lacking in the research is a comprehensive study examining how various types of anxiety (e.g. prenatal, state, trait) are related to each other, and how each may be predictive of infant temperament.

The primary goal of this thesis was to examine the relations between different types of anxieties, particularly pregnancy specific anxiety with state and trait anxiety. There may be factors that underlie the development of prenatal anxiety. For example, maternal *general* levels of anxiety, both trait (dispositional, stable anxiety) and state (situational, transitional anxiety), likely contribute towards anxiety during pregnancy (Van den Bergh, 2001). The secondary goal of this thesis was to examine whether different forms of anxiety during pregnancy were predictive of infant temperamental characteristics after birth, and whether these anxieties predicted *different* infant outcomes than anxiety experienced postnatally. Thus, the inter-relations between pregnancy specific anxiety, trait anxiety, state anxiety and the outcome of infant temperament were explored.

Prenatal Health and Postnatal Outcomes

In the last 50 years there has been a strong research interest in the implications of maternal prenatal health and well being for postnatal developmental outcomes. There is evidence from animal studies to suggest that maternal stress during pregnancy may predict a variety of physical and emotional disturbances in the offspring. For example, Henry, Kabbaj, Simon, Lemoal, and Maccari (1994) reported that prenatal stress caused decreased sex-typical behaviours and increased stress responses in rat offspring. Using non-human primates, Clarke, Wittwer, Abbott, and Schneider (1994) found that the induction of stress in mothers was associated with neuromotor delays, increased stress responses and shorter attention spans in their offspring. Further, there has been evidence in rats and non-human primates that increased prenatal stress puts the offspring at higher risk for impaired neuromotor development (Grimm and Frieder, 1987), increased

emotionality (Clarke et al., 1994) and decreased exploratory behaviour (Takahashi, Baker, & Kalin, 1990).

It has been postulated that the results from animal studies can be explained in terms of stress experienced by the mother having an influence on the development of the hypothalamic-pituitary-adrenal (HPA) axis in the fetus (Henry et al., 1994). Specifically, stress may cause overactivity or impaired negative feedback in the HPA axis.

In an early study on humans, Pasamanick, Rogers, and Lilienfeld (1956) found an association between repeated health related problems during pregnancy and the later referral of children for behavioural problems. Although the connection between pregnancy and later emotional/behavioural difficulties in the child may be attributable to biological insult to the unborn fetus, the mechanisms by which this takes place remain speculative in nature. While there is evidence to suggest a biological basis for infant temperament being predicted in utero, the mechanisms by which fetal characteristics can be influenced and formed prenatally remain unclear.

Evidence does exist that fetal neurobehaviour provides the basis for temperament differences (reactivity and regulation) in infants. DiPietro, Hodgson, and Costigan (1996) found that more active fetuses were more difficult, unpredictable, and unadaptable as infants than less active fetuses. Other findings suggest there is a biological basis to infant temperament. Kagan et al., (1987) found that faster and less variable fetal heart rate was associated with shyness for children aged two to five years. DiPietro et al. (1996) replicated these results in infants, reporting that higher prenatal heart rate was associated with more crying and a lower threshold to novelty (both of which were associated to inhibited temperament). In this same study, fetal activity was also strongly

associated with postnatal night waking. Further, infant night waking at three months was negatively correlated with prenatal state regulation and activity periodicity.

Results from several additional studies have also supported the notion that there is a biological basis to link maternal prenatal occurrences and infant temperament. For example, Gunner and Brodersen (1991) found that higher scores on distress measures in mothers were correlated with increased cortisol responses in the fetus. Buss et al. (1997) reported that distress to novelty in infants postnatally was associated with greater EEG activation and increased cortisol levels in utero. Thus, it can be speculated that infant temperament is partially formed and can be altered by prenatal physiological occurrences.

It has been suggested in the literature that maternal prenatal physical health is associated with child outcomes. In support of this notion, Dombroski (2000) found a relation between intrauterine fever exposure and inhibition and lack of task persistence at age 5 years, and further, poor academic performance at age 12 years. Differences have also been found in the frontal brain activity of infants of mothers who have a history of suffering from depression (Dawson, Frey, Self, Panagiotides, Hessel, Yamada, and Rinaldi, 1999). Further, this study suggested that infant frontal brain activity was related to infant positive affiliative behaviour and negative affect.

Cohen, Velez, Brook, and Smith (1989) reported that pregnancy problems in mothers (both physical and emotional) were related to later conduct disorder and oppositional disorder in children. They found that maternal emotional problems prenatally were related to child externalizing behaviour problems (ADD, conduct disorder, and oppositional disorder). Further, pregnancy and birth problems predicted adolescent psychopathology and diagnosable levels of high anxiety in children. As well, Martin, Wisenbaker, and Huttunen (1999) reported that maternal nausea in the second

and third trimesters of pregnancy predicted lower sensory thresholds, higher activity, and emotional intensity in infants, task persistence problems at five years of age, and attentional and learning problems at age 12 years. What remains unclear, is if there is any diagnostic specificity to such effects.

It can be speculated as to how physical problems during birth and pregnancy in mothers may be associated with the development of behavioural problems in infants and subsequent later childhood development. Since significant vulnerability to illness in early childhood has been shown to follow pregnancy and birth problems (Robinson & Robinson, 1965), and poor health in children has been associated with increased risk of emotional and behavioural problems (McGee, Silva, & Williams, 1984), it can be hypothesized that there is a physical impairment in children who experience these behavioural problems that is potentially caused by physical stress/problems in mothers prenatally or during birth.

Maternal Anxiety

The idea that maternal emotional health and in particular, prenatal maternal stress and anxiety, predisposes children to behavioural problems was introduced almost thirty years ago (Stott, 1973). To date, however, there are few studies that have analyzed the effects maternal anxiety may have on infant development, and specifically, infant temperament. Those studies that have examined maternal anxiety lack statistical control of confounding variables. In particular, researchers have not distinguished between different *types* of maternal anxiety (pregnancy specific, state, and trait), and further, have failed, for the most part, to distinguish between prenatal and postnatal anxiety. Yet, there are recent findings to suggest general trait anxiety levels measured prenatally, and pregnancy specific anxiety both have unique predictive value in terms of infant/child

outcomes (Huizink et al., 2001; O'Connor et al., 2001). In the present study, three types of anxiety (pregnancy specific, state and trait) were examined with a view to analyzing their intercorrelations and their unique associations with infant temperament.

Definitions. One of the most familiar distinctions in the anxiety literature is that between *trait* anxiety and *state* anxiety. Spielberger (1970) defined *trait* anxiety as referring to the relatively stable individual differences in anxiety proneness. That is to say, trait anxiety refers to the differences between people in their tendency to perceive situations as stressful, dangerous, or threatening, and to respond to these situations with elevations in the intensity of their state anxiety. Tucker-Ladd (2001) referred to trait anxiety as encompassing a sequence of events: some change or event (real or imaginary), internal processes (perception, interpretation, coping), and emotional and physiological reactions (sweating, elevated blood pressure). Trait anxiety is a “tension” state, not necessarily associated with a specific stimulus, but a general personality trait. Trait anxiety can manifest itself in many ways from moderate to extreme. Such manifestations may include worry, distress, tension, nervousness, insecurity, panic reactions, neurotic disorders, and Generalized Anxiety Disorder.

While trait anxiety refers to differences in people’s disposition, *state* anxiety refers to differences in peoples’ perceptions of a specific situation as psychologically dangerous or threatening. State anxiety is characterized by subjective feelings of tension, nervousness, and worry, and varies in intensity and may fluctuate with time. This anxiety state is transitory in nature (Spielberger, 1970). For the purposes of this study prenatal state anxiety refers to state anxiety that was measured while mothers were pregnant and postnatal state anxiety refers to state anxiety that was measured after the birth of the infants.

One form of maternal stress that has received recent research attention is *pregnancy specific* anxiety. It is only recently that researchers have begun to explore the idea that this type of prenatal anxiety is a unique construct, with different associated outcomes than both state and trait anxiety. Pregnancy specific anxiety is a maternal emotion experienced during pregnancy. Van den Bergh (2000) defined prenatal anxiety as anxiety relating to the health and well being of the unborn child, and to concerns about the physical and emotional health of the mother herself. This affect may be a result of a manifestation of already present trait anxiety or tendency towards state anxiety, or as more recently suggested (Van den Bergh, 2000), there may be causes specific to the pregnancy state which gives rise to prenatal anxiety.

More recently, researchers have examined the notion that general anxiety can be differentiated from pregnancy anxiety and that anxiety during pregnancy is a specific phenomenon with specific anxiety dimensions (Rizzardo, Magni, Andreoli, Merlin, Andreoli, Fabbri, Martinotti, & Cosentino, 1988; Wadhwa, Sandman, Truszczyńska, Chicz-DeMet, Dunkel-Schetter, & Garite, 2000). Pregnancy specific anxiety involves the mental and psychological stress experienced during pregnancy (i.e., mothers being tense, worried or afraid about the pregnancy and/or pending birth). Pregnancy specific anxiety can also be a result of nervousness or restlessness. It may develop as a result of expectations and concerns women may have about the pending birth of their baby, health concerns, life changes, financial stresses, and increased responsibilities (Coleman, Nelson, & Sundre, 1999). If a woman has a predisposition toward anxiety or depression, the stresses associated with pregnancy may enhance these tendencies (Martin, Noyes, &

Wisembaker, 1990). The current study referred to this type of pregnancy anxiety as pregnancy specific anxiety.

Trait anxiety. Trait anxiety is part of one's personality and as such may dictate a person's level of response to situational or specific anxiety. Therefore, it is possible that women who suffer from trait anxiety may be more prone to prenatal anxiety (Martin et al., 1990). Hence, an understanding of trait anxiety becomes a crucial element to be considered when examining prenatal anxiety.

Maternal trait anxiety can have great influence on behavioural development. O'Connor et al. (2001) reported that postnatal trait anxiety was predictive of inattention and hyperactivity in children four years of age. Barlow (2000) found that maternal trait anxiety was related to infant temperament. He maintained that trait anxiety resulted from genetic contributions (i.e., anxiety is hereditary), and early childhood experiences (including parental history and psychological or personality tendencies).

Further, Bhagwanani et al. (2001) reported that maternal anxiety (both trait and state anxiety), as measured prenatally, was associated with adverse perinatal outcomes. Specifically, low trait anxiety scores were significantly associated with low birth weight, preterm delivery, and chorioamnionitis. High prenatal state anxiety scores correlated with the presence of meconium (fetal fecal matter) in the amniotic fluid and neonatal congenital abnormalities. Singer, Danviller, Bruenin, Hawkins, and Yamashita (1996) replicated these findings, demonstrating that mothers of preterm infants had reported greater psychological distress than mothers of term infants. Thus, there is empirical evidence for an established association between maternal anxiety (both state and trait) and biological risk factors for the developing fetus.

State anxiety. In researching outcomes related to pregnancy anxiety, past researchers have measured state anxiety during pregnancy and its associations with infant outcome (e.g., Van den Bergh, 1990). There is evidence that both types of anxiety (state and trait) give rise to differential child outcomes (Van den Bergh, 1990). Further, researchers have also examined state anxiety both prenatally and postnatally and found different significant associations with maternal attitudes and birth experience for both prenatal state anxiety and postnatal state anxiety. Engle et al. (1990) found postnatal state anxiety was significantly correlated with less desire for control during labour and delivery, a more negative attitude towards the baby, and more complications for labour and delivery. Prenatal state anxiety was significantly and negatively correlated with social support, assertiveness, and desire for control during labour and delivery. Although this study found a significant correlation between prenatal and postnatal state anxiety scores, postnatal state anxiety scores were significantly lower than prenatal state anxiety scores.

It can be speculated that anxiety experienced prenatally is related to higher amounts of state anxiety while anxiety experienced after birth is more affected by the trait anxiety construct. This was in fact the finding of Gorusch and Key (1974), who reported that women with abnormal pregnancies had significantly higher state anxiety than women with normal pregnancies, whereas no differences were found for trait anxiety levels prior to the pregnancy. Rizzardo et al. (1988) supported the idea that state anxiety impacts pregnancy and birth with their findings that high prenatal state anxiety predicted birth/pregnancy complications whereas both trait and pregnancy specific anxieties did not (although the authors point out that there may have been interactions, multivariate analyses were not conducted).

Van den Bergh (1992) confirmed an association between state anxiety and fetal behaviour. Her results indicated positive significant correlations between maternal state anxiety (measured prenatally) and both fetal motor activity and fetal behavioural state organization. In a later study, Van den Bergh (2001) reported that state anxiety (as measured prenatally) was significantly associated with a wealth of behavioural problems in both male and female children (e.g. hyperactivity, aggression, delinquent behaviour, social problems). However, trait anxiety was associated with attention disorder, withdrawal and anxiety in children. Therefore, there is evidence to suggest that state anxiety (experienced prenatally) is associated with fetal and later childhood outcomes and that both trait and state anxiety have differential predictive value.

Pregnancy Specific Anxiety

Relations with other forms of anxiety. Since pregnancy specific anxiety has only recently been examined as a unique construct, there is scant research examining the interassociations between trait anxiety, state anxiety, and pregnancy specific anxiety. It may be the case that pregnancy specific anxiety is a specific manifestation of already present state anxiety, related to state anxiety, but also a specific and distinct construct. To date, existing research has predominantly examined the relations between prenatal state and trait anxiety, and postnatal state and trait anxiety. With regard to the relation between state and trait anxiety with pregnancy specific anxiety, some past research has found intercorrelations between different types of anxiety. For example, Martin et al. (1990) postulated that because pregnancy is an inherently challenging and stressing event it (pregnancy) would potentiate the tendency to be anxious in women who had a predisposition toward anxiety. Indeed, it has been found that levels of state anxiety decline postnatally. Engle et al. (1990) reported a significant correlation between

prenatal and postnatal state anxiety, but indicated postnatal state anxiety scores were significantly lower than prenatal state anxiety scores. Therefore, it may be that pregnancy specific anxiety is related to state anxiety.

Scott-Heyes (1982) reported a significant correlation between prenatal state anxiety and trait anxiety. Similar results were reported by O'Connor et al. (2001), who found that prenatal trait anxiety was correlated with postnatal trait anxiety (although there was a significant unique effect of prenatal trait anxiety on child behaviour).

Another important finding with regards to the relation between trait and prenatal state anxiety is that women have been found to have significantly higher trait anxiety than men. For example, Stoner and Spencer (1986) found that women scored significantly higher on trait anxiety than men over the life span of college age through late adulthood, and that trait anxiety remained a continuous aspect of personality across the life span. Spielberger (1970) further reported in his research that mean trait anxiety scores were higher for women than men in samples of college students and military recruits. Bander and Betz (1981) found that females reported significantly higher levels of trait anxiety than males. It can be speculated that there is some biological mechanism that may predispose women specifically to anxiety, and that this predisposition leads to higher levels of anxiety during pregnancy and further effects their offspring. Thus, it was hypothesized in the current study that prenatal state anxiety and pregnancy specific anxiety would be related to postnatal trait anxiety.

Van den Bergh (2001) found that prenatal state anxiety was significantly and positively correlated with prenatal trait anxiety and postnatal state anxiety was significantly and positively correlated with postnatal trait anxiety. The current study sought to replicate these findings, and further add to the current body of research by

examining the interassociations between all three types of anxiety (pregnancy specific, state and trait) both prenatally, and postnatally.

Significant correlations have been found between prenatal state anxiety, prenatal trait anxiety and behavioural/emotional problems in children, suggesting that there may be a direct effect of maternal anxiety on fetal brain development (O'Connor et al., 2001). However, people suffer from anxiety unrelated to prenatal circumstances. What is the role of state anxiety (situational anxiety) and trait anxiety (anxiety that is a personality trait)? Indeed, the line seems to be unclear when attempting to distinguish pregnancy specific anxiety from trait anxiety and state anxiety. However, there seems to be some *specific* effect of prenatal state anxiety when trait anxiety is controlled for. O'Connor et al. (2001) found virtually no effect of maternal anxiety in the postnatal period (an indication of trait anxiety) on the magnitude of prenatal prediction. Yet, personality traits, and in particular, maternal personality have been found to be predictive of parenting behaviour (Clark, Kochanska, and Ready, 2000) and child temperament and psychopathology (Kendler, Sham, and Maclean, 1997).

The current study also explored the relations between maternal anxiety experienced postnatally and infant outcomes. Understanding variables which predict infant temperament is important because infant temperament has long term relations with later problem behaviours. For example, infant temperament has been found to predict preschool behavioural reticence and inhibition (Fox, Henderson, Rubin, Calkins, & Schmidt, 2001), as well as a wealth of behavioural problems in elementary school and high school (e.g. poor social relations, poor academic performance, and externalizing and internalizing behavioural problems – Carlson, 1998). Carlson (1998) further documented in her study an unprecedented simple prediction from infant behaviour to diagnostic

ratings of psychopathology at age 17 years. This data was based on disorganized and poor infant attachments to their mothers. Further, difficulties in infant attachment have been seen as a result mother's personality (Clark et al., 2000). Thus, there is some evidence to suggest an association between mother's personality traits and infant behaviour. As such, in our model it was expected that general postnatal maternal anxiety would be associated with infant temperament. For example, it was expected that there would be positive associations between maternal trait anxiety and state anxiety experienced after birth and difficult infant temperament. It was also expected that there would be interassociations between trait anxiety, state anxiety (both prenatal and postnatal), and pregnancy specific anxiety.

Conceptual Mechanisms. Several different theoretical explanations have been posited to account for the relation between maternal prenatal anxiety and postnatal child outcomes. One possible explanation is related to basic genetics. Mothers who tend to be anxious, stressed and easily distressed will tend to have offspring with similar tendencies. Thus, anxiety could be hereditary. In support of this notion, Goldsmith, Lemery, Buss, and Campor (1999) reported that genetic influences predicted stranger distress in infants. Moreover, they found that of nine dimensions tapped by the Revised Infant Temperament Questionnaire (Carey & McDevitt, 1978), significant genetic effects were found for seven temperament traits, with no significant evidence of environmental effects. This finding suggests that anxiety may be minimally influenced by the environment.

Another possible conceptual link is that stress during pregnancy somehow alters hormones or other biochemical agents that in turn affect the neurochemistry of the offspring. There is some empirical evidence to support this idea from research with nonhuman subjects. Huttunen (1971) found that pregnant rats that experienced stress

induction gave birth to pups that demonstrated persistent increase in the turnover rate of intracerebrally injected norepinephrine. In human research, Lundy, Piero, Cuadra, and Nearing (1997) reported that both depressed mothers and their day-old infants had higher levels of the stress hormones norepinephrine and cortisol.

Results from some recent studies with humans have indicated an association between prenatal anxiety and increased uterine artery resistance (Texiera, Fisk, & Glover, 1999), and prenatal stress and an overactive HPA axis (which is implicated in depression and anxiety in both children and adults – Chrousos & Gold, 1992). Speltz, DeKlyen, Claderon, Greenberg and Fisher (1999) found significantly more neuropsychological deficits in preschoolers diagnosed with conduct problems. Thus, it is possible that stress in mothers may create some hormonal imbalances, which lead to neurological differences in their offspring. It is these neurological/biological alterations that may cause problem/deviant behaviour in children. It has been known for decades that maternal conditions and teratogens occurring during pregnancy can affect fetal physical development adversely, and more recently, there has been evidence of adverse psychological development (O'Connor et al., 2001; Van den Bergh et al., 2001; Huiznick et al., 2001).

A third mechanism that has been suggested to account for the association between prenatal anxiety and behavioural outcomes is that anxious women perceive their children negatively and/or they remain anxious after pregnancy. This *postnatal anxiety* may affect the way they parent and influence the behaviour of the child. Evidence for this has been found in research related to women who have had children through invitro-fertilization. Women experiencing this procedure have been found to have elevated levels of emotional distress and anxiety, and rated their infants as having more difficult

temperaments. As a consequence of viewing their infants as more difficult, these mothers suffered from problematic attachment issues (McMahon, Ungerer, Beaurepaire, Tennant, & Saunders, 1997).

Relatedly, Field, Healy, Goldstein, Perry, Bendell, Schanberg, Zimmerman, and Kuhn (1988) found that infants of depressed mothers had more negative behaviour states than infants of non-depressed mothers. These infants may have been responding to or “matching” their mother’s negative behaviour state. Indeed, evidence for this matched negative interaction was indicated in their study. They further suggested that infants mirror or mimic their mother’s negative mood state. Therefore, mothers who are anxious, depressed or nervous may be teaching their infants similar negative emotional affect. Whereas it is possible mothers may just perceive their child as more difficult, it is also possible that a mother’s impaired interactions with her infant can influence infant functioning.

Poor attachment may be another possible explanation why maternal affect seems to be associated with infant temperament. Research by White, Wilson, Elander, and Persson (1999) indicated that maternal-fetal attachment was positively related to infant mood. One possible explanation is that the relation between maternal prenatal psychological affect and infant temperament is mediated by mother-infant attachment. In this regard, mother’s negative affect may influence the infant attachment relationship, which in turn impacts upon the infant’s behaviour. That is to say, if mom is distressed and anxious during pregnancy, she is more likely to be anxious postnatally, which in turn could affect the quality of mother-infant relationship.

There are findings, however, that indicate a relation between maternal anxiety and infant problems *at birth*, in which case, mediating effects of maternal-infant attachment

does not adequately explain what processes are taking place for maternal anxiety to be affecting her offspring (Bhagwanani et al., 2001).

Finally, it may be that anxious women experience more complications during birth and delivery, which can result in more negative child outcomes. Maternal-infant interactions are impaired when physical complications have been experienced by either the mother or infant during pregnancy and birth (Field, Sandberg, Garcia, Vega-Lahr, Goldstein, & Guy, 1986). This may contribute to problem behaviours seen in infants and young children. Alternatively, maternal prenatal depression and anxiety may be related to postnatal depression and adjustment problems in the mother, and this may result in children experiencing more negative emotionality as found by Field (1995).

While the mechanisms by which maternal emotionality is associated with child outcome remain unclear, there seems to be an important association between maternal emotions and child temperament. Chess and Thomas (1987) revealed that negative maternal emotionality was a major contributor to difficult child traits (e.g., aggression, anxiety, and fussiness), which were found to predict adverse psychological outcomes from early childhood to adulthood. It may be that events during pregnancy may be related to the development of child temperament. For example, Zukerman, Bauchner, Parker, and Cabral (1990) reported a correlation between prenatal depressive symptoms and the temperamental traits of inconsolability and excessive crying in infants. Van den Bergh (1990) found similar results in infants of moms who were highly anxious during pregnancy. As well, Whaley, Pinto and Sigman (1999) have indicated maternal anxiety to be a risk factor for the development of anxiety in children, and further that maternal anxiety predicted diagnosable levels of anxiety in children, separation anxiety disorder, phobias, and ongoing strain.

The implications of this research are that early behavioural problems can be predictive of later childhood and adolescent problems. Since anxiety has been found to be one of the most stable behavioural characteristics from very early childhood (Kagan, Reznick, Clarke, Snidman, & Garcia-Coll, 1984) it is possible that prenatal anxiety can predict early anxiety in childhood, and further anxiety in later adulthood. Cohen and colleagues (1989) reported that emotional problems experienced during pregnancy by mothers predicted externalizing problems in early childhood and later childhood and adolescent symptoms of psychopathology.

Thus, there are several conceptual mechanisms that may underlie the relation between prenatal anxiety and behavioural outcomes in the child. Tracing these behaviour problems to their roots is an important step in identifying and treating the possible causes. If researchers can identify the potential causes of behavioural problems to the developing fetus (i.e., prenatally), this yields the possibility of preventative measures being developed for in utero applications. While there is recent evidence for significant associations between prenatal anxiety and infant development, the mechanisms that underlie these associations as yet remain unclear.

Maternal Prenatal Anxiety and Child Outcomes

In terms of maternal psychological influence on infant temperament, results from several studies have indicated an association between maternal anxiety and infant behavioural outcomes. For example, Halpern, Brand, and Malone (2001) found an association between difficult infant temperament and greater psychological distress reported by mothers during pregnancy. In another study, Farber et al. (1981) reported that infants of emotionally disturbed women were more restless, irritable, poor sleepers and experienced a host of gastrointestinal difficulties. Ottinger and Simmons (1964)

found newborns (2 to 4 days old) of high anxious mother cried more. This study measured general anxiety levels in mothers in their third trimester of pregnancy. Davids et al., (1963) also measured general anxiety levels in mothers during their third trimester of pregnancy and observed that infants of high anxious pregnant women scored significantly lower on both the mental scale and motor scale of the Bayley Scales of Infant Development than their counterparts of low anxious mothers.

Research conducted by Van den Bergh (1990) measured pregnancy specific anxiety in conjunction with prenatal state anxiety as a measure of situational anxiety and trait anxiety as a measure of chronic anxiety in a sample of 70 women. All measures were conducted prenatally during each of the three trimesters of pregnancy. Both types of anxiety were found to be significantly associated with indices of fetal behavioural states and motor activity. Maternal prenatal state anxiety, pregnancy specific anxiety and trait anxiety were all positively and significantly correlated with fetal motor activity and fetal behavioural state organization. Further, infants of high anxious women changed more frequently from one behavioural state to another and cried more. At 10 weeks of age these infants were diagnosed as having significantly more difficult temperaments, and at 7 months there were significant correlations between maternal anxiety and infant overactivity, frequent hunger, crying, cramping and more difficult temperaments. Her results indicated that maternal emotions during pregnancy were correlated with neonatal and infant behaviour.

In her research on a sample of 52 mother-child pairs, Van den Bergh (2001) reported an association between maternal prenatal state anxiety, postnatal trait anxiety and a wealth of problematic behavioural outcomes in 8 and 9 year old males and females. Prenatal state anxiety was negatively associated with effortful control in boys and

positively associated with positive affect, hyperactivity, aggression, and attention disorder in males and social problems and externalizing problems in females. Postnatal anxiety (trait anxiety) in mothers was positively associated with withdrawal, anxiety and depression, and social problems in boys and hyperactivity, withdrawal, anxiety and positive affect in girls. In a later longitudinal study, Van den Bergh (2002) found maternal anxiety (measured prenatally) explained 10% - 25% of the variance in 7 month old infants of fetal and neonatal behavioural state organization (time spent awake), state-dependent activity, irritability, excessive crying, irregularity in biological functioning and difficult temperament.

Results from recent work by O'Connor et al. (2001) on a sample of 7,447 women have indicated an association between prenatal anxiety and a variety of disturbances in both boys and girls. This study measured anxiety using a general anxiety measure, and measured mothers during the second and third trimesters of pregnancy, as well as between 2 and 3 years following birth. In their study, strong associations were found between prenatal anxiety and hyperactivity/inattention, emotional problems and conduct problems in children 4 years of age. These findings held, even when the effects of postnatal anxiety (general anxiety levels measured postnatally), were controlled for, suggesting that there is an apparent *specificity* of the prenatal anxiety effect on child outcomes.

What is clear from these studies is that prenatal anxiety impacts infant behaviour as well as later childhood behaviour. What is not clear from this type of research is whether targeting *pregnancy specific* anxiety, and controlling for other types of anxieties (state and trait) as experienced prenatally, would yield similar results. Measuring all

anxiety types as unique constructs and examining their inter-associations and their specific predictive value were the primary considerations of this study.

Pregnancy specific anxiety and child outcomes. There is a growing body of literature which is examining pregnancy anxiety by measuring it as a specific anxiety construct (Huizink et al.; 2001 Van den Bergh, 2001). Research is now focusing on the idea that pregnancy specific anxiety may lead to different outcomes than both state and trait anxiety by measuring and controlling for different types of anxiety. For example, using the pregnancy specific anxiety measure (which was employed in the current study), and measuring at each trimester of pregnancy, Huizink et al. (2001) reported that various aspects of prenatal maternal stress (perceived stress, fear of giving birth, and fear of bearing a handicapped child) were negatively and significantly associated with exploration, test-affectivity, and goal directedness for infants at 3 months and 8 months. Further, perceived stress during pregnancy was significantly associated with infant difficulty and unadaptability at 3 months and 8 months of age. As well, Roy et al., (1999) reported that maternal prenatal anxiety (measured using a pregnancy specific anxiety measure) and depression predicted infant distress to novelty and fussiness in males, and biological irregularity in females. In addition, this maternal prenatal anxiety was associated with later inhibition, negative emotionality, unhappiness and emotional intensity in five-year-old children.

It has been suggested that maternal stress and emotions during pregnancy may affect fetal and neonatal behaviour and development (Van den Bergh, 1990). Using a prenatal questionnaire to assess both physical pregnancy distress and pregnancy specific anxiety, Martin et al. (1999) found that prenatal anxiety experienced during the second and third trimesters of pregnancy was associated with infant distress in response to

novelty in males at 6 months of age. Further, prenatal anxiety during the first and second trimesters of pregnancy was significantly associated with biological irregularity in 6 month old female infants, and prenatal anxiety in the second trimester of pregnancy was significantly associated with fussiness in 6 month old male infants. Follow-up analyses when the children were five years of age revealed significant associations between male inhibition and prenatal anxiety during the first and third trimester, and male biological irregularity and prenatal anxiety during the first and second trimesters. As well, significant associations were found between male negative emotionality and prenatal anxiety during the first and third trimesters, male emotionality intensity and prenatal anxiety during all three trimesters, and male unhappiness/nonadaptiveness and prenatal anxiety during the first and third trimesters.

With regard to the 5 year old females, significant associations were found between negative emotionality and prenatal anxiety during the first and second trimesters, emotionality intensity and prenatal anxiety during the second trimester, and unhappiness/nonadaptiveness and prenatal anxiety during all three trimesters.

The implication of this research is that maternal anxiety (measured using a pregnancy specific anxiety measure) is associated with differential child outcomes.

The Present Study

There were two goals central to the current study. The first goal was to examine the predictive value of maternal anxiety with regards to infant temperament. The second goal of this thesis was to examine the inter-relations between different forms of anxiety both experienced prenatally and postnatally in mothers.

There is scant research examining trait, state, and pregnancy specific anxiety as different constructs and their predictive value on child outcomes. This study had as one

of its purposes the examination of the relations between different anxiety types. It was hypothesized that pregnancy specific anxiety would be related to prenatal state anxiety, postnatal state anxiety and trait anxiety. In addition, prenatal state anxiety and postnatal state anxiety would both be related to trait anxiety.

Further, there is little research measuring these variables both prenatally and postnatally with a view to teasing apart the unique contribution of each anxiety type on specific infant outcomes. The current study sought to add to the current body of knowledge by measuring each of the three anxiety constructs separately, both prenatally and postnatally, and examining their unique associations with infant temperament.

In the current study, it was hypothesized that early physiological and psychological experiences by the mother transfer to the fetus to influence or alter temperament and behaviour. Previous research that has found significant associations between anxiety experienced prenatally and behavioural outcomes in offspring, suggesting that there is some hormonal mediation reflected in the activity of the maternal HPA axis which affects the developing fetus (Huizink et al., 2001; Van den Bergh, 2001, O'Connor et al., 2001). While the mechanisms by which anxiety experienced prenatally may influence fetal and later neonatal development remain unclear, the current study hypothesized that prenatal anxiety would predict infant temperament.

One of the focuses of this thesis was to examine whether pregnancy specific anxiety could be associated with the outcome of infant temperament. Of interest as well, was examining the idea that if an association between prenatal state anxiety and pregnancy specific anxiety with infant temperament was found, what kind of infant temperament traits will be associated with these anxieties. Past research has found associations between both state and trait anxiety and difficult infant temperament (Van

den Bergh, 1990). More recently, research has found significant associations between pregnancy specific anxiety and difficult behaviour and unadaptability in infants (Huizink et al., 2001). We expected to replicate these findings.

Infant Temperament

Infant temperament refers to an infant's characteristic modes of responding emotionally and behaviourally to environmental events, which include such attributes as activity level, irritability, fearfulness, sociability, and soothability (Rothbart, 1981). Infant temperament is often the building block to adult personality (Caspi & Silva, 1995). Temperament is considered to have a biological foundation, to be genetically influenced, and to be stable over time (Buss & Plomin, 1984). Further, temperamental attributes have been found to be only moderately heritable, and influenced by environmental variables. For example, Goldsmith et al. (1999) indicated the shared environment of siblings was significantly associated with positive affect in infants. Parenting variables have also been associated with infant temperament (Park, Belsky, Putnam, & Cynic, 1997). Thus, it was expected in the current study that maternal anxiety would be associated with infant temperament. Specifically, it was hypothesized that anxiety that is specific to pregnancy would predict infant temperament over and above trait anxiety (anxiety that is part of one's personality) and state anxiety (situational anxiety).

In addition, it was expected that both pregnancy specific anxiety and prenatal state anxiety would be associated with different indices of infant temperament than postnatal state anxiety and trait anxiety. In particular, it was hypothesized that pregnancy specific and prenatal state anxiety would predict difficult temperament traits in infants (e.g., fussiness, excessive crying, sleeping problems, distress to novel stimuli, low soothability, poor orienting) when trait anxiety was controlled for.

Another goal of this study was to examine the relations between pregnancy specific, prenatal anxiety and the variables of trait anxiety and state anxiety.

Methods

Participants

The participants in this study were $n = 60$, at Time 1, women from the Ottawa-Carleton area. Mothers ranged in age from 23 to 41 years ($M_{age} = 31.85$ years, $SD = 4.46$). Approximately one-third of the participants ($n = 20$) were recruited from a local diaper service in the greater Ottawa area, and the rest were recruited from prenatal classes in Ottawa-Carleton. The sample consisted predominately of Caucasian participants (96.7%), with 1.7% of the participants being African-American, and 1.7% of other ethnic origins. Mother's education levels ranged from 1.7% of the participants having an elementary school education, 3.3% with highschool education, 18.3% completed a college degree, 45% completed an undergraduate university degree, and 31.7% of the participants had a graduate degree.

At Time 2, approximately three months after birth, there were $n = 47$ participants, due to subject attrition. Four participants did not complete the study due to the time constraints in completing the current study. The remaining participants chose not to complete the Time 2 questionnaires for other reasons. Attrition analyses were conducted and results from t-tests revealed that mothers who dropped out (not because of timing issues) did not differ significantly from mothers who completed the study.

Procedure

Participants were recruited (Time 1) between 26 weeks and 40 weeks of pregnancy ($M = 34.1_{weeks}$, $SD = 3.97$). At this time, pregnant mothers completed the *State Trait Anxiety Inventory* (STAI, Spielberger, Gorsuch, & Lushene, 1970) and the

Prenatal Anxiety Questionnaire (PRAQ, Van den Bergh, 1989). At Time 2, approximately three months after the birth of the child ($M = 14.83_{\text{weeks}}$, $SD = 4.74$), participants were administered the STAI as well as completing the *Infant Behavior Questionnaire* (IBQ, Rothbart, 1981). The means and standard deviations for the measures of anxiety are presented in Table 1.

Materials

Demographic Questionnaires. Participants were asked to complete a prenatal demographic questionnaire form reporting their age, education level, education level of the baby's father, birth order of the child, any prenatal pregnancy complications, multiple fetuses, as well as smoking and alcoholic drinking habits (see Appendix A). A second, postnatal demographics questionnaire was completed following the birth of the baby reporting any birth complications, type of birth, gestational age of the infant, height and weight of the baby (see Appendix B).

Pregnancy Anxiety Scale. During their third trimester of pregnancy, mothers were asked to complete the *Pregnancy Anxiety Questionnaire* (PRAQ, Van den Bergh, 1989). This 45 item questionnaire was derived from the original *Pregnancy Anxiety Scale* (PAS, Taylor, 1980). Participants were asked to rate items on a 7-point scale, ranging from "not at all" to "extremely". The measure assesses five components of prenatal anxiety: (1) *fear for delivery* (8 items, e.g., "I fear the pain during labor and delivery"); (2) *fear of integrity of the baby* (2 items, e.g., "I am afraid that my baby will not be healthy"); ¹(3) *fear for disillusion and change in partner relationship* (11 items, e.g., "I am afraid of loneliness and isolation from others"); *egocentric feelings* (10 items, e.g., "I am concerned about my unattractive physical appearance"); and (5) *worries about own mood*

¹ This original subscale consisted of 6 items, but due to ethical concerns 4 items were dropped.

and mother-child relations (11 items, e.g., “I worry about a nervous breakdown”). The intercorrelations between the subscales ranged from .38 to .79, and Chronbach’s alpha for the entire scale was .94. Following procedures outlined by Van den Bergh (2002), an overall pregnancy anxiety score was obtained by summing all items relevant and dividing by the number of items (so that scores were representative of the original 7 point rating scale). The PRAQ is displayed in Appendix C.

State-Trait Anxiety Inventory (STAI, Speilberger, Gorsuch, & Lushene, 1970).

This 40 item standardized questionnaire differentiates between an anxiety state (fluctuating tension/apprehension) and an anxiety trait (characterological/dispositional anxiety proneness). Participants are asked to score items on the scale from 1 to 4 (1 = not at all, 4 = very much so). The two factors for the scale consist of (1) *state anxiety* (20 items, e.g., “I am presently worried over possible misfortunes”), $\alpha = .93$ in the current sample, and (2) *trait anxiety* (20 items, e.g., “I am a steady person”), $\alpha = .94$.

Instructions for the state anxiety subscale asked participants to indicate how they felt “right now, that is, at this moment”. Instructions for the trait anxiety subscale asked participants to indicate how they generally felt. This questionnaire was completed again 3 months after the birth of the child, at which point reliability alpha for the state anxiety subscale was .96, and for the trait subscale $\alpha = .93$. Trait anxiety at Time 1 was significantly and positively correlated with trait anxiety at Time 2 ($r = .60, p. < .001$).

Therefore, only the trait anxiety scores at Time 2 (three months after birth) were used as the measure of maternal trait anxiety. Means and standard deviations for state and trait anxiety scores are presented in Table 1. Speilberger et al. (1970) reported that the mean for females between the ages of 19 and 39 year for state anxiety was 36.17 ($SD = 10.96$) and for trait anxiety 36.15 ($SD = 9.53$). The complete STAI is displayed in Appendix D.

Table 1

Means and Variability for Prenatal State Anxiety and Trait Anxiety and Postnatal State Anxiety and Trait Anxiety

	Mean	SD	Range
Prenatal State Anxiety	31.74	10.33	20 - 72
Postnatal State Anxiety	32.18	13.02	20 – 76
Prenatal Trait Anxiety	32.82	8.91	21 – 65
Postnatal Trait Anxiety	34.20	10.40	20 - 63

Infant Behavior Questionnaire. Approximately three months after birth mothers completed the *Infant Behavior Questionnaire* (IBQ, Rothbart, 1981). This 94 item questionnaire was developed to assess six domains of infant temperament (activity level, soothability, distress to novelty, distress to limitations, smiling and laughter, and duration of orienting). The items on the IBQ ask participants to rate the frequency of behaviours observed over the past week (sometimes 2 weeks) from 1 to 7 times per week. Of particular interest for the present study were the indices of activity level (17 items, e.g., “During feeding how often did baby lie or sit quietly?”), $\alpha = .73$, distress and latency to sudden approach or novel stimuli (17 items, e.g., “When face was washed how often did the baby fuss or cry?”) $\alpha = .80$, distress to limitations (20 items, e.g., “After sleeping, how often did the baby play quietly in the crib?”), $\alpha = .84$, soothability (11 items, e.g., “Have you tried any of these soothing techniques in the last two weeks – rocking?”), $\alpha = .84$, attention span (11 items, e.g., “How often during the last week did the baby stare at a mobile, crib bumper or picture for 5 minutes or longer?”) $\alpha = .72$, and smiling and laughter (15 items, e.g., “When put into the bath water how often did the baby smile?”), $\alpha = .85$. The indices of distress to limitations (20 items) and soothability (11 items) were significantly correlated ($r = -.41, p < .05$) and were consequently combined to form an aggregate measure of *fussiness*. The IBQ is attached as Appendix E

Results

Overview

The first set of analyses examined relations between all demographic variables and both anxiety and infant temperament, the goal here was to assess if any of the demographic variables would need to be controlled for statistically in subsequent analyses. The associations between different forms of anxiety, both pre and postnatally

were then explored. Finally, the relations between all anxiety forms and child temperament were examined.

Preliminary Analyses

Demographic variables. Health related issues measured prenatally included prior pregnancies, multiple fetuses, pregnancy complications, smoking and drinking habits. There were 59 participants who were pregnant with one fetus while one participant was pregnant with twins². Fifty-two women were pregnant with a first born child, while 8 participants had been pregnant prior to the current pregnancy. There were 48 women who reported no prior pregnancy complications while 12 women reported minor pregnancy complications (e.g., high blood pressure, vaginal bleeding). Fifty-nine women did not smoke during the pregnancy and one participant reported smoking more than 10 cigarettes during the entire pregnancy. There were 48 women who indicated they did not drink alcohol during the pregnancy, while 12 women reported drinking less than 10 drinks during the entire pregnancy.

Correlations were conducted to examine the relations between prenatal demographic variables of age of the mother, education of the mother, and education of the father and both state anxiety and pregnancy anxiety. There were no significant correlations between any of the demographic variables and anxiety types, although the correlation between education of mother and state anxiety approached significance ($r = -.26, p = .06$). As a result, these variables were not controlled for statistically in subsequent data analyses.

The next set of analyses involved a series of t-tests to examine the differences in anxiety related to (1) birth order of the unborn child (first pregnancy vs. not first

² For analyses reasons, only one twin was selected at random to have ratings of child temperament.

pregnancy); (2) pregnancy complications experienced (yes vs. no); and, (3) alcohol consumption by the mother (never vs. < than 10 drinks during pregnancy). Results from a series of t-tests revealed no significant differences between any of the groups for any of the anxiety types. As a result, these variables were not controlled for statistically in subsequent prenatal data analyses.

Demographic variables were also measured postnatally as potential obstetric variables which may influence infant behaviour. The weight of the baby at birth ranged from 4.1 lbs. to 9.8 lbs. ($M = 7.52_{\text{lbs.}}$, $SD = 1.21$), the length of babies ranged from 14 cm to 22.7 cm ($M = 20.52_{\text{cm}}$, $SD = 1.53$), and the gestational age of infants ranged from 34.2 weeks to 41.5 weeks ($M = 39.48_{\text{weeks}}$, $SD = 1.68$). Eighty-three percent of mothers gave birth vaginally, while 17% had cesarean births. Thirty-seven moms reported no complications during the birth while ten reported minor birth complications (e.g., minor fetal distress, forcep delivery, induced labour).

Correlations were conducted to examine the relations between postnatal demographic variables and state anxiety, trait anxiety and pregnancy specific anxiety. There was a significant correlation between Time 1 state anxiety with the height of the infant ($r = -.55$, $p < .01$), and Time 2 state anxiety with the height of the infant ($r = -.42$, $p < .01$), suggesting that mother's who had higher state anxiety both prenatally and postnatally gave birth to smaller babies. There was a significant correlation between gestational age of the baby and distress to novelty ($r = -.33$, $p < .05$), and gestational age of the baby and attention span ($r = -.43$, $p < .01$), suggesting that the earlier babies were born the more distressed they were in novel situations and the poorer their attention spans. There were no other significant correlations between any of the demographic

variables and anxiety type. As a result these variables were not controlled for statistically in subsequent data analyses.

The next set of analyses involved a series of t-tests to examine the differences in anxiety and temperament related to (1) birth complications (yes vs. no); and, (2) type of delivery (vaginal vs. cesarean). Results from a series of t-tests revealed no significant differences between any of the groups for any of the anxiety types or indices of temperament. As a result, these variables were not controlled for statistically in subsequent prenatal data analyses.

Relations Between Anxiety Types

Prenatal assessment. Correlational analyses were conducted to examine the association between pregnancy anxiety and state anxiety (as assessed during pregnancy). Results indicated a significant correlation between prenatal state anxiety and pregnancy specific anxiety ($r = .57, p < .01$).

Postnatal assessment. At Time 2, state anxiety (after birth) was significantly and positively correlated with trait anxiety ($r = .77, p < .001$). Results from correlations exploring the relations between anxiety measures at Time 1 and Time 2 are presented in Table 2. Trait anxiety (at Time 2) was significantly correlated with both state anxiety and pregnancy specific anxiety. State anxiety at Time 2 was significantly correlated with pregnancy specific anxiety (at Time 1). Fisher- tests were conducted to test the difference between the correlations. No significant *differences* between these sets of correlations existed.

Regression analyses. Correlational analyses revealed that pregnancy specific anxiety was significantly related to state anxiety at both Time 1 and Time 2 and to trait anxiety. In order to determine if the relation between pregnancy specific and state

anxiety was explained by the common relation to trait anxiety, two separate regression equations were conducted. . Pregnancy specific anxiety served as the dependent variable. In step one, trait anxiety was entered. In step two, prenatal state anxiety (Time 1) was entered. In block two, prenatal state anxiety accounted for a significant change in R^2 ($R^2 \Delta = .124, F = 6.96, p < .05$). Thus, controlling for trait anxiety, prenatal state anxiety was still significantly related to pregnancy specific anxiety ($B = .40, p < .05$).

In the second regression equation, pregnancy specific anxiety was the dependent variable, and trait anxiety was entered first at step one. At step two, postnatal state anxiety (Time 2) was entered into the equation. In block two, postnatal state anxiety *did not* account for a significant change in R^2 ($R^2 \Delta = .007, F = .406, p = .53$). Thus, controlling for trait anxiety, postnatal state anxiety was *not* associated with pregnancy specific anxiety ($B = -.13, p = .53$).

Table 2

Correlations between State Anxiety, and Pregnancy Specific Anxiety at Time 1 with State Anxiety and Trait Anxiety at Time 2

	<i>Time 1:</i>	
	State Anxiety	Pregnancy Specific Anxiety
<i>Time 2:</i>		
State Anxiety	.46**	.34*
Trait Anxiety	.47**	.47**

** $p < .01$ * $p < .05$

Relations between Anxiety Types and Infant Behaviour

Correlational analyses. The goal of these analyses was to explore the relations between all anxiety types (state, trait and pregnancy specific) at both times (Time 1 and Time 2) and the indices of child temperament (attention, fussiness, smiling, activity, and distress to novel stimuli). Results from correlations are displayed in Table 2. There were no significant correlations between pregnancy specific anxiety and any of the indices of infant temperament. State anxiety *during pregnancy* was significantly and negatively correlated with child attention span and positive affect. State anxiety *after pregnancy* was significantly and positively correlated with child activity level and fussiness. Trait anxiety (at Time 2) was significantly and positively correlated with infant fussiness, and relations with activity level and distress to novelty approached significance.

Regression analyses. To assess the unique predictive value of prenatal state anxiety in predicting infant attention span and affect, two separate regression equations were conducted controlling for trait anxiety (at Time 2). The first regression involved predicting infant attention span. In step one, trait anxiety was entered. In step two, prenatal state anxiety was entered. In block two, prenatal state anxiety accounted for a significant change in R^2 ($R^2 \Delta = .09, F = 3.77, p = .06$). Thus, controlling for trait anxiety, prenatal state anxiety approached significance in predicting infant attention span ($B = -.34, p = .06$).

The second regression equation was conducted to predict infant positive affect. At step one, trait anxiety was entered. At step two, prenatal state anxiety was entered into the equation. In block two, prenatal state anxiety approached a significant change in R^2 ($R^2 \Delta = .09, F = 3.93, p = .055$). Thus, controlling for trait anxiety, prenatal state

anxiety approached significance in predicting positive affect ($B = -.34, p = .055$).

Regression results are presented in Table 3.

Table 3

Correlations between State Anxiety and Pregnancy Specific Anxiety at Time 1, State Anxiety and Trait Anxiety at Time 2 with Infant Behaviours

	<i>Time 1:</i>		<i>Time 2:</i>	
	State Anxiety	Pregnancy Specific Anxiety	State Anxiety	Trait Anxiety
Child Temperament				
Attention Span	-.33 [*]	-.17	.07	-.13
Activity Level	.11	-.07	.49 ^{**}	.25 ⁺
Distress to Novelty	-.03	.08	.28 ⁺	.25 ⁺
Smiling (Positive Affect)	-.36 [*]	-.21	-.03	-.20
Fussiness	.20	.13	.30 [*]	.44 ^{**}

** $p < .01$ * $p < .05$ + $p < .10$

To assess the unique predictive value of postnatal state anxiety in predicting infant activity level, distress to novelty and fussiness, three separate regression equations were conducted controlling for trait anxiety (at Time 2). The first regression involved predicting infant activity. In step one, trait anxiety was entered. In step two, postnatal state anxiety was entered. In block two, postnatal state anxiety accounted for a significant change in R^2 ($R^2 \Delta = .199, F = 11.22, p < .01$). Thus, controlling for trait anxiety, postnatal state anxiety was significant in predicting infant activity level ($B = .70, p < .01$).

The second regression involved predicting infant distress to novelty. In step one, trait anxiety was entered. In step two, postnatal state anxiety was entered. In block two, postnatal state anxiety did not account for a significant change in R^2 ($R^2 \Delta = .02, F = 1.04, p = ns$). Thus, controlling for trait anxiety, postnatal state anxiety was not significant in predicting distress to novelty ($B = .24, ns$).

The last regression involved predicting infant fussiness. In step one, trait anxiety was entered. In step two, postnatal state anxiety was entered. In block two, postnatal state anxiety did not account for a significant change in R^2 ($R^2 \Delta = .03, F = .13, p = ns$). Thus, controlling for trait anxiety, postnatal state anxiety was not significant in predicting distress to novelty ($B = -.08, p = ns$).

Discussion

The central goal of this study was to explore the relations between anxiety experienced by mothers during pregnancy and infant temperament after birth. A secondary goal was to examine the relations between the different forms of anxiety and whether they had unique predictive value for infant temperament. Results indicated that state anxiety experienced prenatally was uniquely and differentially associated with

infant behaviour, as compared to state and trait anxiety experienced postnatally. Using a pregnancy specific anxiety measure, results indicated no significant associations between pregnancy specific anxiety and infant outcomes. Both state and trait anxiety measured postnatally were associated with similar infant temperaments.

The discussion will begin with an interpretation of the relations between the different forms of anxieties. Following this, the relations between different forms of anxiety and different indices of infant temperament will be discussed. Finally, caveats and future research directions will be explored.

Relations Between Anxiety Types

One goal of this study was to examine the interassociations between pregnancy specific anxiety, state anxiety experienced prenatally, state anxiety experienced postnatally, and trait anxiety. Results indicated that all forms of anxiety were highly inter-correlated. This is consistent with past research findings (Engle et al., 1990; Van den Bergh, 1990).

Results from the current study replicated previous results indicating significant associations between prenatal and postnatal state anxiety. Engle et al. (1990), using the STAI to measure anxiety, reported that prenatal and postnatal anxiety were significantly correlated.

Further, the current study found that state anxiety (both prenatally and postnatally) were related to trait anxiety. It makes intuitive sense that these different types of anxiety would be related to each other. If someone suffers from high levels of trait anxiety (i.e. is anxious by nature) he/she will be more prone to suffer from higher levels of situational anxiety (fluctuating, state anxiety). While the correlations with each other are high, they have been found to measure significantly *different* types of anxiety

(Spielberger et al., 1970). This is consistent with the current findings in this study wherein all anxiety types were significantly related to each other, but had differential predictive value in terms of outcome variables.

The current study sought to add to the body of literature by examining the relations between pregnancy specific anxiety and state and trait anxiety. Results indicated that pregnancy specific anxiety was significantly associated with state anxiety (experienced prenatally) even when controlling for trait anxiety. One implication of this finding is that pregnancy specific anxiety is similar to state anxiety experienced by the mother prenatally since both anxieties were associated when controlling for trait anxiety. However, pregnancy specific anxiety was *not* related to *postnatal* state anxiety when controlling for trait anxiety. This suggests that pregnancy specific anxiety is not similar to state anxiety after pregnancy. This was an interesting finding in that one interpretation may be that state anxiety *after* birth might be related to post-partum depression, hormonal changes, as well as the stresses related to having a young baby, while state anxiety during pregnancy may be related to pregnancy specific issues and concerns.

These findings also indicate that it may not be necessary to measure situational anxiety experienced during pregnancy with a pregnancy specific measure, but a state anxiety measure will predict outcomes better.

These results suggest that although different anxiety types are related, the relation between pregnancy specific anxiety and state anxiety experienced prenatally cannot be explained by their relations to trait anxiety. However, postnatal state anxiety does not predict pregnancy specific anxiety when we control for trait anxiety suggesting perhaps that a state anxiety measure may be more useful to measure situational anxiety during

pregnancy then a pregnancy specific measure. While our results were not able to support the use of a pregnancy specific measure, it certainly warrants future research.

Anxiety and Infant Temperament

The central goal of this study was to examine the unique predictive value of anxiety experienced by mothers while pregnant in predicting their infant's temperament. The results support the hypothesis that anxiety experienced prenatally has unique and differential predictive value than anxiety that is experienced in the non-pregnant state. State anxiety during pregnancy was significantly and negatively associated with attention span, and positive affect (smiling) in infants. Postnatal state anxiety was *not* significantly associated with these temperament traits. Postnatal state anxiety was significantly associated with infant activity level and fussiness. Further, trait anxiety (which was measured postnatally) was significantly associated with fussiness, and a trend was revealed for trait anxiety and distress to novel stimuli.

Another goal of this research was to ascertain whether a measure assessing pregnancy specific anxiety would better predict infant outcomes than a state anxiety measure used prenatally. The results did not support this finding. Pregnancy specific prenatal anxiety was not significantly associated with any of the indices of infant temperament. Indeed, the findings indicated that prenatal state anxiety was a better measure to use in predicting infant temperament. It may be that state anxiety measures encompass the general state of anxiety associated with pregnancy specific concerns, and for that reason, a specific pregnancy anxiety measure is not more predictive than a state anxiety measure. It may also be that due to our small sample size we were not able to detect unique predictions or differences between the two anxiety types. Indeed, using two subscales of the PRAQ in their study as the sole measure of anxiety as experienced

during pregnancy, Huizink et al. (2001) found that prenatal anxiety had a significant negative effect on the development and temperament of 3 and 8 month old infants. Several reasons may be postulated why the current study was not able to replicate these results. It may be that the Huizink et al. (2001) study contained more “extreme” scores of pregnancy specific anxiety than the current study sample. Further Huzink et al. (2001) measured pregnancy specific anxiety at each of the three trimesters to render a global score. It may be speculated that measuring mothers at each trimester of their pregnancy will more thoroughly encompass their specific anxieties, leading to a more robust anxiety score than what was achieved in the current study, consequently affecting results.

There has been some support for the idea that anxiety experienced prenatally has differential predictive value in child outcomes than anxiety that is measured while mothers are not pregnant. For example, Van den Bergh (2001) reported that prenatal state anxiety predicted *different* outcomes than postnatal state anxiety in 8 and 9 year old children. Prenatal state anxiety was associated with positive affect, hyperactivity, aggressive and delinquent behaviour, social problems and externalizing behaviours. Postnatal state anxiety was associated with withdrawal, depression/anxiety, hyperactivity and social problems. In addition, prenatal trait anxiety and postnatal trait anxiety also had different patterns of association. Prenatal trait anxiety predicted attention disorder and postnatal trait anxiety predicted withdrawal, anxiety, and positive affect. The present study only partially replicated these findings. Current results found associations between trait anxiety (measured postnatally) and infant fussiness, activity level and distress to novelty, not to positive affect and attention disorder as the Van den Bergh (2001) study. As well, there were no different patterns of association between prenatal trait anxiety and postnatal trait anxiety. These differences may be in part due to the age of the

participants. The Van den Bergh (2001) study examined 8- and 9-year-old children – not infants as the current study. It may be that different behaviours manifest themselves differently as children develop due to developmental or environmental influences.

Rizzardo et al. (1988) reported that state anxiety impacted on pregnancy and birth complications while trait anxiety and pregnancy specific anxiety did not. These findings were consistent with the findings in the current study: pregnancy specific anxiety did not predict infant outcome whereas state anxiety did predict infant temperament. Rizzardo et al. (1988) did not employ the same pregnancy specific anxiety questionnaire as the current study, therefore it is difficult to speculate as to why they were not able to achieve significance either. However, their data was collected on a much different sample than the current study obtained, participants were predominately of different ethnic origin (Italian), and for the most part were considered low/middle income and had only a mean schooling of 9 years. All these variables may have affected their results

In addition, the findings from the Rizzardo et al. (1988) study were not consistent with the findings in the present study that trait anxiety was associated with infant temperament as well. However, the Rizzardo et al. (1988) study did support the ideas put forth in this study that a) each anxiety construct is different and as such should be measured with different measurements, and b) each anxiety type will have differential predictive value.

O'Connor et al (2001) further supported the idea that general anxiety experienced prenatally was significantly and uniquely correlated with childhood behavioural problems after controlling for postnatal general anxiety. Van den Bergh (2002) conducted a longitudinal study examining prenatal anxiety and its associations with infant temperament, child behaviours at 8 and 9 years of age, and 14 and 15 years of age. In

each wave she controlled for maternal postnatal anxiety and found that at all times prenatal maternal anxiety measures predicted significantly temperament and behaviours. These relatively new findings suggest that anxiety can adversely affect pregnancy and consequent child development.

This unique association between prenatal anxiety and child behaviour is important to the current study in that the findings suggest there is specific and unique predictive value to anxiety experienced during pregnancy. While most of the past research has not measured prenatal anxiety with a pregnancy specific anxiety questionnaire it has put forth the idea that anxiety experienced prenatally should be examined specifically. The current study expanded current research by using a pregnancy specific anxiety questionnaire and supported the previous findings that prenatal anxiety has unique predictive value for child temperament.

While the current study did have some methodological shortcomings, and failed to find significant and direct associations between pregnancy specific prenatal anxiety and infant temperament, results did find support for the idea that anxiety as experienced prenatally may in fact affect infant behaviours. The findings in this study indicate that it may not be necessary to measure anxiety which taps into *pregnancy specific* concerns, however, the current study has replicated the *consistent* findings that anxiety experienced *prenatally uniquely* predicts temperaments and behaviour from infancy through to adolescence (Huzink et al., 2001; O'Connor et al., 2001; Van den Bergh, 2002). This is an extremely important finding. New research into the psychological state of the mother while she is pregnant needs to be addressed.

The findings that postnatal state anxiety uniquely predicted infant activity level when trait anxiety was controlled for, but did not predict infant fussiness and distress to

novelty when trait anxiety was controlled for, are interesting. One explanation for the current findings that postnatal state anxiety is associated with infant activity is that it (postnatal state anxiety) as experienced by the mother affects how a mother perceives her child. Mothers who experience high anxiety postnatally may view their infant as being more active. Alternatively, mothers who are highly anxious may parent their children in such a manner that these negative behaviours are modelled by the child. Mothers may project onto their infants their anxious behaviours and the infant may respond by being more active. In addition, mothers may also *become* more anxious as a result of having a more active child. Since results from this study indicated that only postnatal state anxiety predicted high activity level in infants this seems like the most likely explanation. State anxiety is an anxiety that is in response to situational factors. It may be that children who are active cause their mother's anxiety.

The results that postnatal state anxiety *did not* predict infant fussiness and distress to novelty when trait anxiety was controlled for suggests that these relations (between postnatal state anxiety and infant fussiness, distress to novelty) can be explained by their associations with trait anxiety. It becomes less clear then, to distinguish the direction of effect (from mother to child, or child to mother). However these findings somewhat replicated the findings in Van den Bergh (2001) wherein postnatal trait anxiety predicted anxiety and withdrawal in 8 and 9 year old children.

The finding that state anxiety as experienced prenatally was significantly associated with poorer attention spans and less positive affect is consistent with the notion that there is some (biological) mechanism experienced in the womb which may contribute to later infant behavioural development. However, there were no significant results using a pregnancy specific prenatal anxiety measure. This suggests that overall

state anxiety, regardless of the specific thought processes and stresses it involves, is a better predictor of behavioural outcomes. It may be that a global or general situational anxiety measure which measures more general state anxiety (not pregnancy specific content) is a more robust measure and thus a better predictor of later infant temperament. It can be speculated that it is not the content of what the mother is anxious about, but rather the overall level of state anxiety that is important to infant outcomes. A few conclusions may be drawn from the results from the current study. Firstly, different anxiety types are associated with different child outcomes, and as such there is value in measuring these different anxiety types with specific measures. In addition, there appear to be different patterns of association between anxieties experienced at the prenatal stage and anxiety that is measured postnatally. However, what might be concluded from the current study is that using measures which target pregnancy specific concerns/anxieties is not better than using a general measure which assesses overall situational/state anxiety in pregnant mothers.

Results from the current study support the idea that maternal prenatal anxiety uniquely predicts infant outcomes. Results from regression analyses controlling for trait anxiety indicated that prenatal state anxiety approached significance in predicting infant attention span and infant affect. No significant findings were found for the pregnancy specific measure. However, the results highlight the importance of examining prenatal psychological experiences in understanding how maternal anxiety levels affect the development of children.

If indeed, maternal prenatal anxiety is predictive of a variety of behaviours throughout child development, the mechanisms by which this is explained remain unclear and need further exploration. These findings are in keeping with studies conducted on

animal samples wherein increased maternal stress during pregnancy was associated with delays in neuromotor development, increased emotionality, and impaired adaptation to conditions of conflict (Grimm & Frieder, 1987; Clarke & Schneider, 1993; Takahashi et al., 1990). Hormones created by stress may cross the placental barrier and somehow alter/effect infant development. Van den Bergh (2001) proposed that maternal anxiety may lead to the increase in production of the prenatal hormone glucocorticoid, which in turn crosses the placental barrier, and enters the fetus, altering the HPA-axis of the fetus and as a consequence fetal brain development. It may be as well that highly anxious mothers will be more likely to be fatigued, eat poorly, use substances during pregnancy and engage in more or less physical activity (Nijhuis, 1992) all of which may directly or indirectly affect fetal development.

Despite the fact that research has not been able to provide clear explanations for the mechanisms by which prenatal anxiety predicts later child behaviours, prenatal research is important to developmental psychology. Although the findings seem to suggest that anxiety experienced during pregnancy may adversely affect fetal development, this must be taken with a cautionary note. There may be other variables that are influencing these adverse behavioural outcomes. However, this research is important in terms of practical applicability. Targeting mothers who may be highly anxious during pregnancy with intervention and social programs may in fact reduce negative behavioural outcomes in their children. Research findings into this relatively new area seem to be consistently supporting the idea that anxiety experienced by pregnant mothers may have a detrimental effect on children's temperament. Given these findings, education and support plans given to pregnant women should not only concentrate on physical aspects, but psychological as well. Reducing maternal anxiety

during pregnancy by intervention programs which specifically target anxiety in pregnant women may put children at lower risk for the later development of psychological problems.

This type of research (and the current study) suggest that behaviours may be shaped before birth, maternal anxiety during pregnancy may be considered a teratogen (Van den Bergh, 2001), and that prenatal anxiety may affect the development of neurobiological systems in the fetus. The practical implications of these findings are that women, health officials and society can all work together to provide and promote optimum conditions in which the fetus may develop by lowering stresses and anxieties as experienced by the mother prenatally.

Caveats and Future Research

The current study highlighted the idea that there is something unique to anxiety experienced prenatally which is associated with later infant outcomes. However, future longitudinal research needs to be conducted following up on whether prenatal, pregnancy specific, anxiety can indeed predict infant behaviour through to later childhood. Indeed, the few studies that have been conducted longitudinally found that maternal prenatal anxiety was significantly and *uniquely* associated with child behavioural outcomes from birth through to adolescence (O'Connor et al., 2001; Van den Bergh, 2002). Future research should examine the possible mechanisms to explain the associations between maternal anxiety and fetal development from a neurophysiological and neuroanatomical perspective. In addition, prenatal mediating factors (e.g. hormonal, pregnancy complications, substance use, and heredity) should be further examined with regards to their relations to fetal development and child outcomes.

While this study reported some interesting and significant findings with regards to the unique potential predictive value of state anxiety experienced during pregnancy, no significant findings were found relating prenatal pregnancy specific anxiety to infant temperament (e.g., fussiness, activity level, soothability). This may be due in part to the relatively small sample size ($N = 47$). Achieving large sample sizes in research with pregnant mothers and infants is always a challenge. Preparing for and having a new child is an inherently busy time and it is difficult to enlist participants who at this stage of their lives, are otherwise preoccupied. As such, while the original sample size at the beginning of the study was 60, due to participant attrition, the sample size became smaller, resulting in less power for the study. Future studies may wish to replicate this study using a larger sample size in an attempt to achieve more robust results.

Participant recruitment may have also influenced the generalizability of the sample. Although the participants were recruited from two unique populations (diaper service and public health prenatal classes) there may still have not been a diversity of SES represented. Diaper service customers were more likely representative of a middle-class population who could financially afford a service. Further, it may be that people who have lower SES may not avail themselves of prenatal class services. In addition, most of our participants were Caucasian (ethnic diversity was not represented) and had a university education. As a consequence, while each sample was obtained from populations that were unique from each other, the sample was not necessarily representative. Other researchers may want to try to include participants from a more diverse range of economic, educational, and ethnic backgrounds.

Although support was found for the notion that anxiety experienced prenatally is unique from other anxiety types, no support was found for the hypothesis that a

pregnancy specific measure would be a better predictor of infant outcomes. A new measure was used to assess pregnancy anxiety, and this may have potentially influenced the findings. Since research into pregnancy anxiety and child outcomes is fairly recent, the measure used in the current study to assess pregnancy anxiety (PRAQ) was a relatively new measure. As such, more research into the psychometric properties needs to be conducted for future studies.

In the current study, infants were assessed approximately 3 months after birth. Future studies may wish to examine infant temperament later in infancy, at which point mothers may be more “familiar” and accurate in assessing their children. Recent research has found associations with older children and different outcomes (O’Connor et al., 2001; Van den Bergh, 2001; Van den Bergh, 2002) and as such, further research assessing other outcomes (e.g. behavioural problems) is needed.

A potentially significant problem with the present study involves the issue of shared-method variance. Mothers completed self-report measures of anxiety *and* reported on their infant’s temperament. Problems arising from this include bias or inaccurate self-perceptions and subjective perceptions of infant behaviour. New mothers may have certain expectations of their infant’s behaviours and as a consequence report their expectations, not the way the child actually behaves. In addition, mothers who are more anxious may view their infant’s behaviour as more problematic, when in fact it is not. Similarly, mothers who are highly anxious may perceive themselves in a distorted, more negative light. However, these potential problems are often unavoidable in this type of research. Having fathers fill out measures (a separate challenge) regarding their infant’s behaviours may involve the same problematic issues, and other people may not

know the infant well enough to assess their behaviours. In addition, it would be difficult to have someone else assess a mother's emotional feelings and condition.

Future research may also look at mediating and moderating variables in mothers which may contribute to behavioural outcomes in the child such as maternal stress levels, quality of life (e.g. marital, financial), and social support. To date while there exists some research examining the role of other potential mediating variables such as social support (Engle et al., 1990) more studies need to be conducted to tease apart the effects of different variables.

We know that physical teratogens can damage the developing fetus, and there is now evidence to indicate that psychological teratogens may now adversely affect fetal development. These effects seem to have implications for children across the lifespan in terms of temperamental and behavioural problems. Indeed, this type of research can now perhaps shed some light on the causes and developmental routes of certain behavioural problems in children. In addition, this research may provide a possible explanation as to why some behaviours are more prevalent in children recently (e.g. ADD, ADHD). Future research should further examine this issue with a view to providing insight into prenatal interventions that may help minimize later behavioural problems in children.

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Appendix A

PRENATAL DEMOGRAPHIC INFORMATION

Name: _____

Date: _____

Phone No.: _____

Birthdate: _____

Ethnic group: Caucasian _____ Asian _____ Black _____

Hispanic _____ Aboriginal _____ Other _____

Mother's formal education completed (check one):

Elementary school _____
High school diploma or equivalent _____
Community college or equivalent _____
University degree _____
Graduate school degree _____

Father's formal education completed (check one):

Elementary school _____
High school diploma or equivalent _____
Community college or equivalent _____
University degree _____
Graduate school degree _____

Enter number of weeks you are pregnant: _____

Is this your first child? Yes No

Are you pregnant with multiple fetuses? Yes No

Have you had any health complications related to your pregnancy? Yes No

If yes please specify: _____

Please indicate number of cigarettes smoked on average per week during your pregnancy:

Please indicate the number of alcoholic beverages you have consumed on average per week during your pregnancy: _____

Appendix B

POSTNATAL DEMOGRAPHIC INFORMATION

Name: _____

Date: _____

Tell us about your birth experience:

Date of Birth of your baby: _____

Weight of baby: _____

Height of baby: _____

Gestational age of baby (in weeks): _____

Type of delivery: Vaginal Cesarean Section

Did you experience any serious complications during your delivery? Yes No

If yes, please specify: _____

Appendix C

Please provide the following information:

Name _____ Date _____

Below are a number of statements which people have used to describe their feelings during pregnancy. Read each statement and then circle the appropriate number to the right of the statement to indicate how you feel at this time during your pregnancy. There are no right or wrong answers. Give the answer which seems to describe your present feelings at best.

Pregnancy Anxiety Questionnaire

- 1 = Strongly agree
- 2 = Often agree
- 3 = Somewhat agree
- 4 = Neither agree nor disagree
- 5 = Somewhat disagree
- 6 = Often disagree
- 7 = Strongly disagree

1	I look forward to having a child to share my feelings with.	1 - 2 - 3 - 4 - 5 - 6 - 7 -
2	I am concerned over fantasies I have about my baby.	1 - 2 - 3 - 4 - 5 - 6 - 7 -
3	I am concerned about my emotional dependency on those close to me.	1 - 2 - 3 - 4 - 5 - 6 - 7 -
4	I worry about a "nervous breakdown."	1 - 2 - 3 - 4 - 5 - 6 - 7 -
5	I fear that the movements or non-movements of my fetus are abnormal.	1 - 2 - 3 - 4 - 5 - 6 - 7 -
6	I am looking forward to holding my new baby.	1 - 2 - 3 - 4 - 5 - 6 - 7 -
7	I fear the pain during labor and delivery.	1 - 2 - 3 - 4 - 5 - 6 - 7 -
8	I am looking forward to the labor experience.	1 - 2 - 3 - 4 - 5 - 6 - 7 -
9	I fear that beginning labor will not be recognized and that I will not know when to go to the hospital.	1 - 2 - 3 - 4 - 5 - 6 - 7 -
10	I am concerned that my body will not regain its normal shape after the conclusion of pregnancy.	1 - 2 - 3 - 4 - 5 - 6 - 7 -
11	I am excited about the new changes in my life.	1 - 2 - 3 - 4 - 5 - 6 - 7 -
12	I fear poverty and a lack of money to meet my needs.	1 - 2 - 3 - 4 - 5 - 6 - 7 -

13	I am afraid of loneliness and isolation from others.	1 -	2 -	3 -	4 -	5 -	6 -	7 -
14	I worry that my labor and delivery will be complicated or abnormal.	1 -	2 -	3 -	4 -	5 -	6 -	7 -
15	I fear inadequate "performance" during labor, and that even though I am educated/prepared in childbirth, I may lose control.	1 -	2 -	3 -	4 -	5 -	6 -	7 -
16	I am afraid that my baby will not be healthy.	1 -	2 -	3 -	4 -	5 -	6 -	7 -
17	I fear a long-term mental or physical illness.	1 -	2 -	3 -	4 -	5 -	6 -	7 -
18	I am concerned about the changes in my sexual appetite, and the effect it has on my partner.	1 -	2 -	3 -	4 -	5 -	6 -	7 -
19	I worry about various medical symptoms and their meaning.	1 -	2 -	3 -	4 -	5 -	6 -	7 -
20	I am concerned about my sudden mood changes.	1 -	2 -	3 -	4 -	5 -	6 -	7 -
21	I am concerned about becoming pre-occupied with myself, and feel that I might be turning inward.	1 -	2 -	3 -	4 -	5 -	6 -	7 -
22	I am concerned about my irritability.	1 -	2 -	3 -	4 -	5 -	6 -	7 -
23	I am concerned about my unattractive physical appearance.	1 -	2 -	3 -	4 -	5 -	6 -	7 -
24	I am afraid that intercourse will hurt my fetus.	1 -	2 -	3 -	4 -	5 -	6 -	7 -
25	I am concerned about my partner's marital fidelity.	1 -	2 -	3 -	4 -	5 -	6 -	7 -
26	I am afraid of hospitals and everything to do with them.	1 -	2 -	3 -	4 -	5 -	6 -	7 -
27	I am afraid of labour, because I have never been through it before. I am afraid of the unknown.	1 -	2 -	3 -	4 -	5 -	6 -	7 -
28	I am worried that I might shout and scream during labour, that I might lose control of myself.	1 -	2 -	3 -	4 -	5 -	6 -	7 -
29	I am afraid that I will lose a lot of blood during labour.	1 -	2 -	3 -	4 -	5 -	6 -	7 -
30	I am excited about parenting.	1 -	2 -	3 -	4 -	5 -	6 -	7 -
31	My partner is less involved with the pregnancy than I had expected.	1 -	2 -	3 -	4 -	5 -	6 -	7 -
32	I am a little worried that our baby might not be attractive and I am afraid of the reactions of others.	1 -	2 -	3 -	4 -	5 -	6 -	7 -

33	Sometimes I worry that becoming a mother will change me a lot and will make me feel old, for example.	1 -	2 -	3 -	4 -	5 -	6 -	7 -
34	I wonder whether my partner will be a good father and whether he will assume his responsibilities sufficiently.	1 -	2 -	3 -	4 -	5 -	6 -	7 -
35	I worry because I have put on so much weight.	1 -	2 -	3 -	4 -	5 -	6 -	7 -
36	I worry about the fact that something I have eaten or drank could harm the baby.	1 -	2 -	3 -	4 -	5 -	6 -	7 -
37	I am afraid that my partner will not pay enough attention to me once the baby has arrived.	1 -	2 -	3 -	4 -	5 -	6 -	7 -
38	I blame myself for not always sticking closely to my prescribed diet.	1 -	2 -	3 -	4 -	5 -	6 -	7 -
39	I was sad or felt bad about something that happened during the pregnancy and I wonder if it influenced the baby.	1 -	2 -	3 -	4 -	5 -	6 -	7 -
40	I worry about the baby turning out to be a difficult child.	1 -	2 -	3 -	4 -	5 -	6 -	7 -
41	I worry about the fact that I will be too busy with the child and that my partner will feel that I don't make enough time for him.	1 -	2 -	3 -	4 -	5 -	6 -	7 -
42	I worry about not being given a single room in the maternity ward and that I will not get along with my roommate(s).	1 -	2 -	3 -	4 -	5 -	6 -	7 -
43	I am afraid that we will have to give up a lot of things for the baby.	1 -	2 -	3 -	4 -	5 -	6 -	7 -
44	I worry that the baby's room and the house won't be entirely finished when I have to go into hospital.	1 -	2 -	3 -	4 -	5 -	6 -	7 -
45	I am starting to get fed up wearing maternity clothes.	1 -	2 -	3 -	4 -	5 -	6 -	7 -

c 1978
Mary K. Rothbart
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Infant Behavior Questionnaire

1978 Version

Subject No. _____

Date of Baby's Birth _____
mon. day year

Today's Date _____

Age of Child _____
mons. weeks

Sex of Child _____

INSTRUCTIONS: Please read carefully before starting:

As you read each description of the baby's behavior below, please indicate how often the baby did this during the LAST WEEK (the past seven days) by circling one of the numbers in the left column. These numbers indicate how often you observed the behavior described during the last week.

(1) Never	(2) Very Rarely	(3) Less Than Half the Time	(4) About Half the Time	(5) More Than Half the Time	(6) Almost Always	(7) Always	(X) Does Not Apply
--------------	-----------------------	--------------------------------------	----------------------------------	--------------------------------------	-------------------------	---------------	--------------------------

The "Does Not Apply" (X) column is used when you did not see the baby in the situation described during the last week. For example, if the situation mentions the baby having to wait for food or liquids and there was no time during the last week when the baby had to wait, circle the (X) column. "Does Not Apply" is different from "Never" (1). "Never" is used when you saw the baby in the situation, but the baby never engaged in the behavior listed during the last week. For example, if the baby did have to wait for food or liquids at least once but never cried loudly while waiting, circle the (1) column.

Please be sure to circle a number for every item.

Feeding

When having to wait for food or liquids during the last week, how often did the baby:

1 2 3 4 5 6 7 X (1) seem not bothered?

1 2 3 4 5 6 7 X (2) show mild fussing?

1 2 3 4 5 6 7 X (3) cry loudly?

During feeding, how often did the baby:

1 2 3 4 5 6 7 X (4) lie or sit quietly?

1 2 3 4 5 6 7 X (5) squirm or kick?

During feeding, how often did the baby:

1 2 3 4 5 6 7 X (6) wave arms?

1 2 3 4 5 6 7 X (7) fuss or cry when s/he had enough to eat?

1 2 3 4 5 6 7 X (8) fuss or cry when given a disliked food?

When given a new food or liquid, how often did the baby:

1 2 3 4 5 6 7 X (9) accept it immediately?

1 2 3 4 5 6 7 X (10) reject it by spitting out, closing mouth, etc.?

1 2 3 4 5 6 7 X (11) not accept it no matter how many times offered?

(1) Never	(2) Very Rarely	(3) Less Than Half the Time	(4) About Half the Time	(5) More Than Half the Time	(6) Almost Always	(7) Always	(X) Does Not Apply
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SleepingBefore falling asleep at night during the last week, how often did the baby:

1 2 3 4 5 6 7 X (12) show no fussing or crying?

During sleep, how often did the baby:

1 2 3 4 5 6 7 X (13) toss about in the crib?

1 2 3 4 5 6 7 X (14) move from the middle to the end of the crib?

1 2 3 4 5 6 7 X (15) sleep in one position only?

After sleeping, how often did the baby:

1 2 3 4 5 6 7 X (16) fuss or cry immediately?

1 2 3 4 5 6 7 X (17) play quietly in the crib?

1 2 3 4 5 6 7 X (18) coo and vocalize for periods of 5 minutes or longer?

1 2 3 4 5 6 7 X (19) cry if someone doesn't come within a few minutes?

How often did the baby:

1 2 3 4 5 6 7 X (20) seem angry (crying and fussing) when you left her/him in the crib?

1 2 3 4 5 6 7 X (21) seem contented when left in the crib?

1 2 3 4 5 6 7 X (22) cry or fuss before going to sleep for naps?

Bathing and DressingWhen being dressed or undressed during the last week, how often did the baby:

1 2 3 4 5 6 7 X (23) wave her/his arms and kick?

1 2 3 4 5 6 7 X (24) squirm and/or try to roll away?

1 2 3 4 5 6 7 X (25) smile or laugh?

When put into the bath water, how often did the baby:

1 2 3 4 5 6 7 X (26) startle (gasps, throws out arms; stiffens body, etc.)?

1 2 3 4 5 6 7 X (27) smile?

1 2 3 4 5 6 7 X (28) laugh?

1 2 3 4 5 6 7 X (29) have a surprised expression?

1 2 3 4 5 6 7 X (30) splash or kick?

1 2 3 4 5 6 7 X (31) turn body and/or squirm?

When face was washed, how often did the baby:

1 2 3 4 5 6 7 X (32) smile or laugh?

1 2 3 4 5 6 7 X (33) fuss or cry?

When hair was washed, how often did the baby:

1 2 3 4 5 6 7 X (34) smile or laugh?

1 2 3 4 5 6 7 X (35) fuss or cry?

PlayHow often during the last week did the baby:

(1) Never	(2) Very Rarely	(3) Less Than Half the Time	(4) About Half the Time	(5) More Than Half the Time	(6) Almost Always	(7) Always	(X) Does Not Apply
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- 1 2 3 4 5 6 7 X (36)look at pictures in books and/or magazines for 2-5 minutes at a time?
 1 2 3 4 5 6 7 X (37)look at pictures in books and/or magazines for 5 minutes or longer at a time?
 1 2 3 4 5 6 7 X (38)stare at a mobile, crib bumper or picture for 5 minutes or longer?
 1 2 3 4 5 6 7 X (39)play with one toy or object for 5-10 minutes?
 1 2 3 4 5 6 7 X (40)play with one toy or object for 10 minutes or longer?
 1 2 3 4 5 6 7 X (41)spend time just looking at playthings?
 1 2 3 4 5 6 7 X (42)repeat the same sounds over and over again?
 1 2 3 4 5 6 7 X (43)laugh aloud in play?
 1 2 3 4 5 6 7 X (44)smile or laugh when tickled?
 1 2 3 4 5 6 7 X (45)cry or show distress when tickled?
 1 2 3 4 5 6 7 X (46)repeat the same movement with an object for 2 minutes or longer (e.g., putting a block in a cup, kicking or hitting a mobile)?

When something the baby was playing with had to be removed, how often did s/he:

- 1 2 3 4 5 6 7 X (47)cry or show distress for a time?
 1 2 3 4 5 6 7 X (48)cry or show distress for several minutes for longer?
 1 2 3 4 5 6 7 X (49)seem not bothered?

When tossed around playfully, how often did the baby:

- 1 2 3 4 5 6 7 X (50)smile?
 1 2 3 4 5 6 7 X (51)laugh?

During a peekaboo game, how often did the baby:

- 1 2 3 4 5 6 7 X (52)smile?
 1 2 3 4 5 6 7 X (53)laugh?

Daily Activities

How often during the last week did the baby:

- 1 2 3 4 5 6 7 X (54)cry or show distress at a loud sound (blender, vacuum cleaner, etc.)?
 1 2 3 4 5 6 7 X (55)cry or show distress at a change in parents' appearance (glasses off, shower cap on, etc.)?
 1 2 3 4 5 6 7 X (56)when in a position to see the television set, look at it for 2 to 5 minutes at a time?
 1 2 3 4 5 6 7 X (57)when in a position to see the television set, look at it for 5 minutes or longer?
 1 2 3 4 5 6 7 X (58)protest being put in a confining place (infant seat, play pen, car seat, etc.)?
 1 2 3 4 5 6 7 X (59)startle at a sudden change in body position (for example, when moved suddenly)?
 1 2 3 4 5 6 7 X (60)startle to a loud or sudden noise?
 1 2 3 4 5 6 7 X (61)cry after startling?

When being held, how often did the baby:

- 1 2 3 4 5 6 7 X (62)squirm, pull away, or kick?

When placed on his/her back, how often did the baby:

- 1 2 3 4 5 6 7 X (63)fuss or protest?
 1 2 3 4 5 6 7 X (64)smile or laugh?
 1 2 3 4 5 6 7 X (65)lie quietly?
 1 2 3 4 5 6 7 X (66)wave arms and kick?

(1) Never	(2) Very Rarely	(3) Less Than Half the Time	(4) About Half the Time	(5) More Than Half the Time	(6) Almost Always	(7) Always	(X) Does Not Apply
--------------	-----------------------	--------------------------------------	----------------------------------	--------------------------------------	-------------------------	---------------	--------------------------

1 2 3 4 5 6 7 X (67)squirm and/or turn body?

When the baby wanted something, how often did s/he:

1 2 3 4 5 6 7 X (68)become upset when s/he could not get what s/he wanted?

1 2 3 4 5 6 7 X (69)have tantrums (crying, screaming, face red, etc.) when s/he did not get what s/he wanted?

When placed in an infant seat or car seat, how often did the baby:

1 2 3 4 5 6 7 X (70)wave arms and kick?

1 2 3 4 5 6 7 X (71)squirm and turn body?

1 2 3 4 5 6 7 X (72)lie or sit quietly?

1 2 3 4 5 6 7 X (73)show distress at first; then quiet down?

When you returned from having been away and the baby was awake, how often did s/he:

1 2 3 4 5 6 7 X (74)smile or laugh?

When introduced to a strange person, how often did the baby:

1 2 3 4 5 6 7 X (75)cling to a parent?

1 2 3 4 5 6 7 X (76)refuse to go to a stranger?

1 2 3 4 5 6 7 X (77)hang back from the stranger?

1 2 3 4 5 6 7 X (78)never "warm up" to the stranger?

1 2 3 4 5 6 7 X (79)approach the stranger at once?

1 2 3 4 5 6 7 X (80)smile or laugh?

When introduced to a dog or cat, how often did the baby:

1 2 3 4 5 6 7 X (81)cry or show distress?

1 2 3 4 5 6 7 X (82)smile or laugh?

1 2 3 4 5 6 7 X (83)approach at once?

Soothing Techniques

Have you tried any of the following soothing techniques in the last two weeks? If so, how often did the method soothe the baby? Circle (X) if you did not try the technique during the LAST TWO WEEKS.

1 2 3 4 5 6 7 X (84)rocking?

1 2 3 4 5 6 7 X (85)holding?

1 2 3 4 5 6 7 X (86)singing or talking?

1 2 3 4 5 6 7 X (87)walking with the baby?

1 2 3 4 5 6 7 X (88)giving the baby a toy?

1 2 3 4 5 6 7 X (89)showing the baby something to look at?

1 2 3 4 5 6 7 X (90)patting or gently rubbing some parts of the baby's body?

1 2 3 4 5 6 7 X (91)offering food or liquid?

1 2 3 4 5 6 7 X (92)offering baby her/his security object?

1 2 3 4 5 6 7 X (93)changing baby's position?

1 2 3 4 5 6 7 X (94)other (please specify) _____

Appendix E
SELF-EVALUATION QUESTIONNAIRE

STAI Form Y-1

Please provide the following information:

Name _____ Date _____ S _____

Age _____ Gender (Circle) M F T _____

DIRECTIONS:

A number of statements which people have used to describe themselves are given below. Read each statement and then circle the appropriate number to the right of the statement to indicate how you feel *right now*, that is, *at this moment*. There are no right or wrong answers. Do not spend too much time on any one statement but give the answer which seems to describe your present feelings best.

NOT AT ALL
SOMEWHAT
MODERATELY SO
VERY MUCH SO

1. I feel calm	1	2	3	4
2. I feel secure	1	2	3	4
3. I am tense	1	2	3	4
4. I feel strained	1	2	3	4
5. I feel at ease	1	2	3	4
6. I feel upset	1	2	3	4
7. I am presently worrying over possible misfortunes	1	2	3	4
8. I feel satisfied	1	2	3	4
9. I feel frightened	1	2	3	4
10. I feel comfortable	1	2	3	4
11. I feel self-confident	1	2	3	4
12. I feel nervous	1	2	3	4
13. I am jittery	1	2	3	4
14. I feel indecisive	1	2	3	4
15. I am relaxed	1	2	3	4
16. I feel content	1	2	3	4
17. I am worried	1	2	3	4
18. I feel confused	1	2	3	4
19. I feel steady	1	2	3	4
20. I feel pleasant	1	2	3	4

SELF-EVALUATION QUESTIONNAIRE

STAI Form Y-2

Name _____ Date _____

DIRECTIONS

A number of statements which people have used to describe themselves are given below. Read each statement and then circle the appropriate number to the right of the statement to indicate how you *generally* feel. There are no right or wrong answers. Do not spend too much time on any one statement but give the answer which seems to describe how you generally feel.

ALMOST NEVER
SOMETIMES
OFTEN
ALMOST ALWAYS

21. I feel pleasant	1	2	3	4
22. I feel nervous and restless	1	2	3	4
23. I feel satisfied with myself	1	2	3	4
24. I wish I could be as happy as others seem to be	1	2	3	4
25. I feel like a failure	1	2	3	4
26. I feel rested	1	2	3	4
27. I am "calm, cool, and collected"	1	2	3	4
28. I feel that difficulties are piling up so that I cannot overcome them	1	2	3	4
29. I worry too much over something that really doesn't matter	1	2	3	4
30. I am happy	1	2	3	4
31. I have disturbing thoughts	1	2	3	4
32. I lack self-confidence	1	2	3	4
33. I feel secure	1	2	3	4
34. I make decisions easily	1	2	3	4
35. I feel inadequate	1	2	3	4
36. I am content	1	2	3	4
37. Some unimportant thought runs through my mind and bothers me	1	2	3	4
38. I take disappointments so keenly that I can't put them out of my mind	1	2	3	4
39. I am a steady person	1	2	3	4
40. I get in a state of tension or turmoil as I think over my recent concerns
and interests	1	2	3	4