

The Effect of Parental Self-Efficacy on Infant Responsiveness, whose Mothers Present
with Symptoms of Depression and Parenting Problems During the Postnatal Period.



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Abstract

Postnatal depression has a prevalence of 11-20% among all mothers, with long lasting negative outcomes for both mothers and children. Research has found a negative association between postnatal depression and the level of a mother's parental self-efficacy, and indicates that these two factors negatively impact a child's socialising and communication development. This study aims to further examine the relationship of a mother's parental self-efficacy with the social responsiveness of her infant, and explore parental self-efficacy associations with mild to moderate symptoms of postnatal depression and social support. Observations of recorded mother and infant dyad teaching interactions were coded to provide quantitative data for analysis using the Nursing Child Assessment Teaching Scales (NCAST). Postnatal depression, social support and parental self-efficacy were also measured at 2 months and 8 months post birth. Results showed a small correlation between one of the parental self-efficacy measures at 2 months, and infant responsiveness at 8 months. There was a small, non-significant positive association found between high parental self-efficacy measured by the Parenting Stress Index at 2 months and infant responsiveness at 2 and 8 months, however no other associations were found in the other analyses of the two variables. Analyses also found a significant medium positive association between parental self-efficacy and social support. Changes in parental self-efficacy were associated with changes in depression, however, only one finding was significant. Suggestions for future research include further investigation into the relationship between parental self-efficacy and infant responsiveness, and future work is needed to improve measurement of infant social responsiveness.

Declaration

This thesis contains no material which has been accepted for the award of any other degree or diploma in any University, and, to the best of my knowledge, this thesis contains no material previously published except where due reference is made. I give permission for the digital version of this thesis to be made available on the web, via the University of Adelaide's digital thesis repository, the Library Search and through web search engines, unless permission has been granted by the School to restrict access for a period of time.

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The Effect of Parental Self-Efficacy on Infant Responsiveness, whose Mothers Present with Symptoms of Depression and Parenting Problems During the Postnatal Period.

Research has found that on average, the rates of Postnatal Depression range from 11% to 20% of all mothers during the postpartum period (Martins & Gaffan, 2000; Eberhard-Gran, Slinning, & Rognerud, 2014). It is well documented that postnatal depression has adverse long-lasting effects on both a mother and child including increased occurrence of psychopathology and various negative developmental outcomes. (Farías-Antúnez, Otero, & Santos, 2018; Field, 2010; Murray, 1992; Weaver, Shaw, Dishion, & Wilson, 2008). Furthermore, research indicates mother's who experience sub-clinical levels of depression are also at risk for poorer maternal and child outcomes (Eberhard-Gran, Slinning, & Rognerud, 2014; Vieites & Reeb-Sutherland, 2017). A number of interventions have been developed to improve depression for mothers in the postnatal period (Forman, O'Hara, Stuart, Gorman, Larsen, & Coy, 2007; Logsdon, Wisner, & Hanusa, 2009). However, interventions targeted solely at improving a mother's postnatal depression, have been shown generally unsuccessful in improving outcomes for children (Field, 1998; Forman, et al., 2007; Jung, Short, Letourneau, & Andrews, 2007; Logsdon, Wisner, & Hanusa, 2009). As such there is a need to further understand the mechanism by which maternal depression leads to poor outcomes for children.

Numerous studies have found postnatal depression to have a negative association with parental self-efficacy (Abdollahi, Zarghami, Azhar, Sazlina, & Lye, 2014; Denis, Ponsin, & Callahan, 2012). Parental self-efficacy influences a parent's confidence and use of parenting strategies (Field, 2010; Konuk Sener & Cimete, 2016; Leahy-Warren, McCarthy, & Corcoran, 2011), and in particular, negatively impacts on communication and social interaction between mother and child (Jones & Prinz, 2005). Additionally, research has highlighted the contribution of strong social support to greater parental self-efficacy, as

well as the role of social support in reducing the effects of postnatal depression on mothers (Leahy-Warren, et al., 2011; Zheng, Morrell, & Watts, 2018ab). Conversely, research has shown that when social support and parental self-efficacy are low, and postnatal depression is present, the relationship between mother and infant can be negatively impacted (Cassé, Oosterman, & Schuengel, 2016). Good social support can help buffer the negative effects of postnatal depression and low parental self-efficacy, and is linked with better parenting and improved mental health whilst contributing to better quality interactions between mother and infant (Leahy-Warren, et al., 2011).

There is limited research looking at the effect of mothers' level of self-efficacy on the social responsiveness of children to their mothers during social interactions, particularly for mothers experiencing symptoms of depression. This is a clear gap in the existing research given the limited understanding of how maternal depression leads to poorer outcomes for children. Previous studies have used methods to assess mother-infant relations based primarily on self-report questionnaires, and stress-inducing paradigms such as the Face-to-Face Still-Face and Strange Situation (Forman, et al., 2007; Jung, et al., 2007). This is problematic because self-report questionnaires have been noted to be prone to bias (Cyr, Pasalich, McMahon, & Spieker, 2014; Jones & Prinz, 2005), and stress-inducing paradigms typically look at attachment rather than social responsiveness in routine interaction between mother and infant (Graham, Blissett, Antoniou, Zeegers, & McCleery, 2018; Martins & Gaffan, 2000). This study will focus on the relationship between parental self-efficacy and child responsiveness, by observing mother-infant interactions in routine teaching tasks whilst examining the effect of social support and mild to moderate postnatal depression. The main aim is to further investigate if there is a relationship between parental self-efficacy and infant responsiveness to see if changes in parental self-efficacy, will be associated with changes in infants' responsiveness. Any

associations may be key targets for interventions to improve both maternal depression and infants' healthy development.

1.1 Postnatal depression

Postnatal depression is usually diagnosed within the first month of the postnatal period but can occur anytime within the first year after birth (DSM 5, 2013; Milgrom, et al., 2011). Symptoms include negative emotionality and mood, including sadness and feelings of helplessness and worthlessness, withdrawal, sleeplessness, loss of appetite, lack of motivation for completing tasks, and interference with personal interactions and relatedness (DSM 5, 2013; Weaver, Shaw, Dishion, & Wilson, 2008). Major depression is diagnosed when sadness and negative affect occurs for two weeks or more in one episode, with the presence of five or more symptoms (DSM 5, 2013; Gavin, et al., 2005). Minor depression is diagnosed when less than three symptoms present for two weeks or more in one episode. Sequelae of postnatal depression include increased risk of other mental disorders such as bipolar disorder, attachment problems with their child (Özyurt, Özyurt, Ozturk, Yaman, & Berk, 2018), increased safety concerns for infants (Field, 2010), and in extreme cases, suicide (Wisner, et al., 2013). A review by Gavin and colleagues (2005) found minor depressive episodes accounted for more than half of depression cases occurring in the perinatal period (pregnancy and one year postpartum) with depression peak times at approximately 2 months and 6 months postpartum. These findings point to the value of further research looking at mothers with mild to moderately depressive symptoms in the first year postpartum.

1.1.1 Infant Outcomes

Postnatal depression is associated with poorer developmental outcomes for children in both the short and long term. This is particularly the case when maternal depression is accompanied by maladaptive parenting behaviours (Herwig, Wirtz, & Bengel, 2004). For

example, infants of depressed mothers are more likely to be underweight up to the age of 12 months, and overweight as a child (Farías-Antúnez et al., 2018), and male adolescents whose mothers had postnatal depression have been found to have lower intelligence scores than children of non-depressed mothers (Hay, Pawlby, Waters, & Sharp, 2008). Research has shown that children whose mothers experience postnatal depression have greater likelihood of psychopathology (Herwig, Wirtz, & Bengel, 2004), in comparison to children whose mothers do not experience this difficulty (Farías-Antúnez, Otero, & Santos, 2018; Field, 2010; Murray, 1992). For instance, postnatal depression has been linked with adolescent internalising behaviours (Verbeek, et al., 2011), adolescent depression (Gentile, 2017), and development of emotional disorders in adolescent females (Hay, et al., 2008).

Additionally, there is evidence that postnatal depression has affects on infants socio-emotional behaviour and the development of social responsiveness during the first year of life, even for minor depression (Vieites & Reeb-Sutherland, 2017; Field, 1988). There is also evidence that this is the case for mothers who experience sub-threshold levels of postnatal depression. For example Vieties and Reeb-Sutherland conducted a study examining the association between mothers' non-clinical (sub-threshold) depression and infant social response using the Face-to-Face-Still-Face paradigm ($n = 63$). They found infants displayed less negative affect toward mothers, similar to the response of infants of clinically depressed mothers, at age 5 months, but no association at age 9 months. This finding differed from infants of mothers who were not depressed. These findings demonstrate that sub-threshold depressive symptoms have significant impact on infants responsive behaviour.

The way a mother responds in early interactions directly shapes an infants social learning (Boundya, Cameron-Faulknerb, & Theakston, 2016). For example, a study by Field and colleagues (1988) demonstrated how mothers' postnatal depression and social

responsiveness effects infant responsiveness. In a study of 74 mother-infant dyads ($n = 40$ depressed) they used video-recorded interactions to measure activity state and affect of both mother and infant, and found that the depressed affect and social interaction behaviour of a mother with clinical depression, positively correlated with the depressed affect and negative response behaviour of her infant. Furthermore, the depressed behaviour and negative affect of the infant persisted in interactions with a non-depressed unfamiliar adult, suggesting this was a generalised pattern exhibited by infants. This affect was noticeable as early as 3 months old. These studies demonstrate that a mother's depression is associated with differences in an infant's social responsive behaviour and correlated with infant negative affect, when compared to infants of non-depressed mothers.

The effect of a mother's depression on an infant's responsiveness is further supported by the results of a meta-analysis of 7 studies conducted by Graham, Blissett, Antoniou, Zeegers and McCleery (2018). They reported that infants of depressed mothers displayed greater positive affect during the "Still Face stage" of the Still-Face paradigm than infants of non-depressed mothers, before displaying similar levels of distress to infants of mothers without depression. The authors suggest this show of positive affect is a coping style adopted by infants attempting to elicit a positive response from their depressed mother. This illustrates that whilst infants of depressed mothers felt similarly distressed as infants of non-depressed mothers, their social behaviour in response to their mothers was different to that of infants of mothers without depression. Asselmann, Venz, Wittchen and Martini (2018) similarly conducted a study on 251 mother-infant dyads in Germany, assessing infant responsivity using the Still Face paradigm, and also found that the responses of infants of mothers experiencing depression and anxiety differed from infants of mothers without depression and anxiety. These infants displayed more negative affect, more touching and distancing behaviours and less positive vocalisations. Studies such as

these, demonstrate that differences in the social response of infants of depressed mothers compared to infants of mothers without depression exist in stress-inducing situations, however studies looking at infant response in more ordinary interactions are limited.

1.1.2 Evidence of the association between maternal depression and infant responsiveness from research examining interventions to improve maternal depression

Research has found that interventions solely targeting the improvement of mothers' depressive symptoms have not reported similar improvements in the quality of the mother-infant interactions (Field, 1998; Forman, O'Hara, Stuart, Gorman, Larsen, & Coy, 2007; Logsdon, Wisner, & Hanusa, 2009). Conversely, Jung and colleagues (2007) conducted a study aimed specifically at improving clinically depressed mothers' understanding of their infants' behaviour and responsiveness towards their infants, using the Keys to Caregiving intervention. Critically, the Keys to Caregiving intervention did not provide support to reduce mothers' level of depression but focused solely on improving the responsiveness of mothers during interactions with their infants. The study used the Face to Face Still Face paradigm to track changes in infant facial expressions following intervention, and found an increase in levels of interest and joy during interaction with their mothers in infants aged 3 to 6 months old. However, although interaction response was improved for both mother and infant, mothers' depression scores remained unchanged. The authors also observed that an improvement in dyad interactions can be corroborated through the increased positive facial expressions of the infant. This study highlights that infant behaviour can become more positive and interactive as a result of mothers' behaviour changing, even when depression does not. As such factors that are likely to improve the responsiveness of a mother towards her infant, despite symptoms of depression, such as increased self-

efficacy and social support, may be key mechanisms for avoiding poor developmental outcomes for infants whose mother experience depression during the postnatal period.

1.2 Parental Self-Efficacy

Parental self-efficacy can be defined as a person's beliefs and confidence regarding their ability to be able to successfully undertake and complete parenting tasks (Vance & Brandon, 2017) and is based on Bandura's theory of self-efficacy (1982). A person's level of parental self-efficacy depends on the knowledge a person has about parenting tasks, their perception of their own ability, and the strengths of these beliefs. Determinants include successful experiences, observations of others, feedback on parenting performance and a person's emotional state. Parental self-efficacy is relatively changeable within the first 2 years post-birth, then generally stabilises (Weaver et al, 2008). The influence of a mother's self-efficacy on her parenting abilities and confidence have been documented in a number of studies (Jones & Prinz, 2005; Leahy-Warren, McCarthy, & Corcoran, 2011) through a mother's use of various parenting strategies, including discipline, consistency and authoritative/ permissive/ democratic style (Konuk Sener & Cimete, 2016). As such, parental self-efficacy may be associated with the outcomes of infants of mothers experiencing depression as it is strongly associated with key parenting behaviours that support infants development of social responsiveness.

1.2.1 The association between postnatal depression and parental self-efficacy

Studies have consistently found an association between symptoms of depression and lower parental self-efficacy during the postnatal period (Abdollahi, Zarghami, Azhar, Sazlina, & Lye, 2014; Denis, Ponsin, & Callahan, 2012; Zhang & Jin 2016). Women experiencing postnatal depression often experience feelings of sadness, negativity and hopelessness, and are likely influenced by these feelings to believe that they are less effective or successful in their parenting leading to low parental self-efficacy. Bandura

(1982) discusses how improving self-efficacy can reduce depressive symptoms, and Zhang and Jin (2016) state that this can be achieved through increasing a person's sense of control and awareness of their ability to be successful in life's tasks. A review by Coleman and Karraker (1997) found that improving self-efficacy contributes to a parents increased sense of competence, increased perseverance and more consistent and effective discipline strategies, thus improving parenting and consequently its effect on children. These findings highlight the possibility that improving a mother's parental self-efficacy may not only improve parenting behaviours and infants outcomes, but also has the potential to reduce symptoms of depression.

1.2.2 The effect of Parental Self-Efficacy on infants' social-emotional development.

Low parental self-efficacy has been linked with problematic conduct behaviour in children (Jones & Prinz, 2005; Konuk Sener & Cimete, 2016). Low parental self-efficacy can result in mothers providing less effective discipline, and being more likely to be unpredictable in their responses, due to a low confidence in their parenting abilities and low expectations of the success of their efforts (Coleman & Karraker, 1997). Mothers with low parental self-efficacy are also more likely to perceive their infants as difficult in temperament (Denis, Ponsin, & Callahan, 2012). This in turn contributes to patterns of ineffectiveness when maladaptive parenting strategies are used. Unsuccessful interaction outcomes through use of poor parenting strategies result in negative or difficult child responses and behaviour, which in turn reinforces expectations and affirms perceptions of difficult temperament (Coleman & Karraker, 1997). This cycle can affect attachment between mother and child and contribute to a lower-quality relationship with adverse outcomes such as discussed previously.

Studies that have focused on interventions improving a mother's level of parental self-efficacy have recorded improvements in children's problematic conduct behaviour

when self-efficacy has increased (Jones & Prinz, 2005). In conjunction, parenting strategies have improved, becoming more positive and effective (Konuk Sener & Cimete, 2016). There is evidence that mothers with high self-efficacy engage with their infants in a more positive manner, and display more responsiveness and predictableness in their exchanges (Field, 2010). These findings indicate that improvements in parental self-efficacy can improve interactions with children. However, as far as the author is aware, no studies to date have studied the association between changes in parental self-efficacy and infant social responsiveness. This is a limitation of research to date as there is evidence to suggest that parental self-efficacy may be a key mechanism by which maternal depression impacts infants socio-emotional development.

1.3 Social Support

There is evidence that a key factor for greater parental self-efficacy during the postnatal period is support from spouse, family and friends (Anglely, Divney, Magriples, & Kershaw, 2014; Gao, Sun, & Chan, 2014). For example, Leahy-Warren, McCarthy and Corcoran (2011) conducted a study of 410 first time mothers in Ireland using self-report questionnaires, and found that parental self-efficacy was positively correlated with social support provided by spouse, family and friends. Their study found high levels of social support enhanced levels of parental self-efficacy, and postnatal depression had an inverse relationship to both these factors. This was supported in a study by Zheng, Morrell and Watts (2018b) who found that in a sample of Chinese mothers, depression decreased when parental self-efficacy and perception of social support increased over a 3 month period. However, this study is limited in only examining these changes over a 3 month period, and a longer follow up of mothers will allow further examination of longer term associations between parental self-efficacy and social support.

A difficult or unsupportive spousal relationship was found to have a negative impact on the relationship between a mother and child (Cassé, Oosterman, & Schuengel, 2016). Cassé and colleagues' study of a Dutch group of 260 mothers used self-report questionnaires, and the Ainsworth Strange Situation to assess mother-infant attachment where partner dissatisfaction was present. They found that for mothers experiencing partner dissatisfaction, attachment style with the infant depended on whether the mother had high or low parental self-efficacy. High parental self-efficacy mothers typically exhibited avoidant attachment to their infant, whilst low parental self-efficacy mothers tended to be securely attached to infants, but disorganised. Findings highlight the complex association between partner dissatisfaction and the level of parental self-efficacy, illustrating how important partner support and harmony is for mother-infant relations.

Research to date is limited in looking at long term associations between social support and parental self-efficacy among mothers experiencing symptoms of depression. This is a key omission as social support may be a key target for interventions aiming to improve parental self-efficacy in order to support the development of infants of mothers experiencing postnatal depression.

1.4 Research Aims and Hypotheses

There is evidence to suggest that among mothers with depression, parental self-efficacy may be a key mechanism by which depression impacts on infants' development of social responsiveness. However, research to date is limited with few studies examining this association among mothers experiencing depression, and no studies examining social responsiveness during everyday social interactions. A number of studies have examined the effect of depression on mother-infant attachment (Graham, Blissett, Antoniou, Zeegers, & McCleery, 2018; Handley, Michl-Petzing, Rogosch, Cicchetti, & Toth, 2017; Martins & Gaffan, 2000), and there is a large body of research examining the association of parental

self-efficacy with postnatal depression and social support. However, none of these studies have examined the effect of these factors on infants developing social-emotional behaviours. This is a key omission because there are indications that increases in parental self-efficacy can have positive effects on improving social responsiveness and development for infants of mothers with depressive symptoms. This study seeks to address this gap in the research by examining how changes in parental self-efficacy relate to infant responsiveness and affect. This has the potential to improve the effectiveness of interventions to improve outcomes for both mother and child.

The current study has four hypotheses. Firstly it is hypothesised that social support will be associated with parental self-efficacy, and mothers whose level of parental self-efficacy increases from 2-8 months will report lower levels of depression at 8 months.

Specifically:

(1) Mothers who report higher levels of social support at 1-2 months will have higher levels of parental self-efficacy at 8 months.

(2) Mothers whose parental self-efficacy scores increase between 2 months post birth and 8 months will report a decrease in postnatal depression at 8 months and mothers whose parental self-efficacy scores decline will report an increase in their depression scores.

Second, there will be an association between parental self-efficacy and infant responsiveness at both 2 months and 8 months of age. Specifically;

(3) There will be a significant difference in infant social responsiveness at 2 and 8 months of age between those whose mothers have high levels of parental self-efficacy compared to low levels of parental self-efficacy.

(4) Mothers with higher levels of parental self-efficacy at infant age 2 months will have infants with more positive social responsiveness during interactions with mothers at 8 months of age.

CHAPTER 2

Method

2.1 Data source

Data for the present study was collected during a Randomised Controlled Trial investigating the effectiveness of an online treatment for combined symptoms of depression and parenting problems conducted in partnership between the Women's and Children's Hospital Research and Evaluation Unit (WCH REU) and Child and Family Health Services (CaFHS) in South Australia. The present study uses data collected from the control group who had access to standard care services but did not have access to the online intervention. Assessments were completed at infant age 1-2 months (baseline), 8 months, and 12 months. The present study will use data from the 1-2 month and 8 month assessments.

2.2 Recruitment and Participants

Participants were screened for eligibility at the CaFHS 1-4 week health check that is provided to >90% of new births in South Australia. Participants who provided consent to be contacted by the research team about participation in the study completed the Edinburgh Postnatal Depression Scale (EPDS) and a 4-item parenting problems questionnaire. Mothers who scored 7 or higher on the EPDS and reported at least one parenting problem were eligible for participation in the trial. These mothers were contacted by the research team to arrange a baseline assessment. Figure 1 outlines the recruitment process arriving at the final participant dyad number of 61.

2.2.1 Parenting Problems questionnaire

Mothers completed a 4-item parenting problems questionnaire designed by the research team in collaboration with CaFHS. This questionnaire was used to identify mothers who were experiencing parenting problems. If mothers marked at least one of the

items then they were eligible for inclusion in the study. Items include: “My experience giving birth to my baby was difficult and/or disappointing”, “Caring for my baby has been a positive experience for me”, “My baby has been unsettled and/or feeding poorly” and “Being a parent is harder than I thought”.

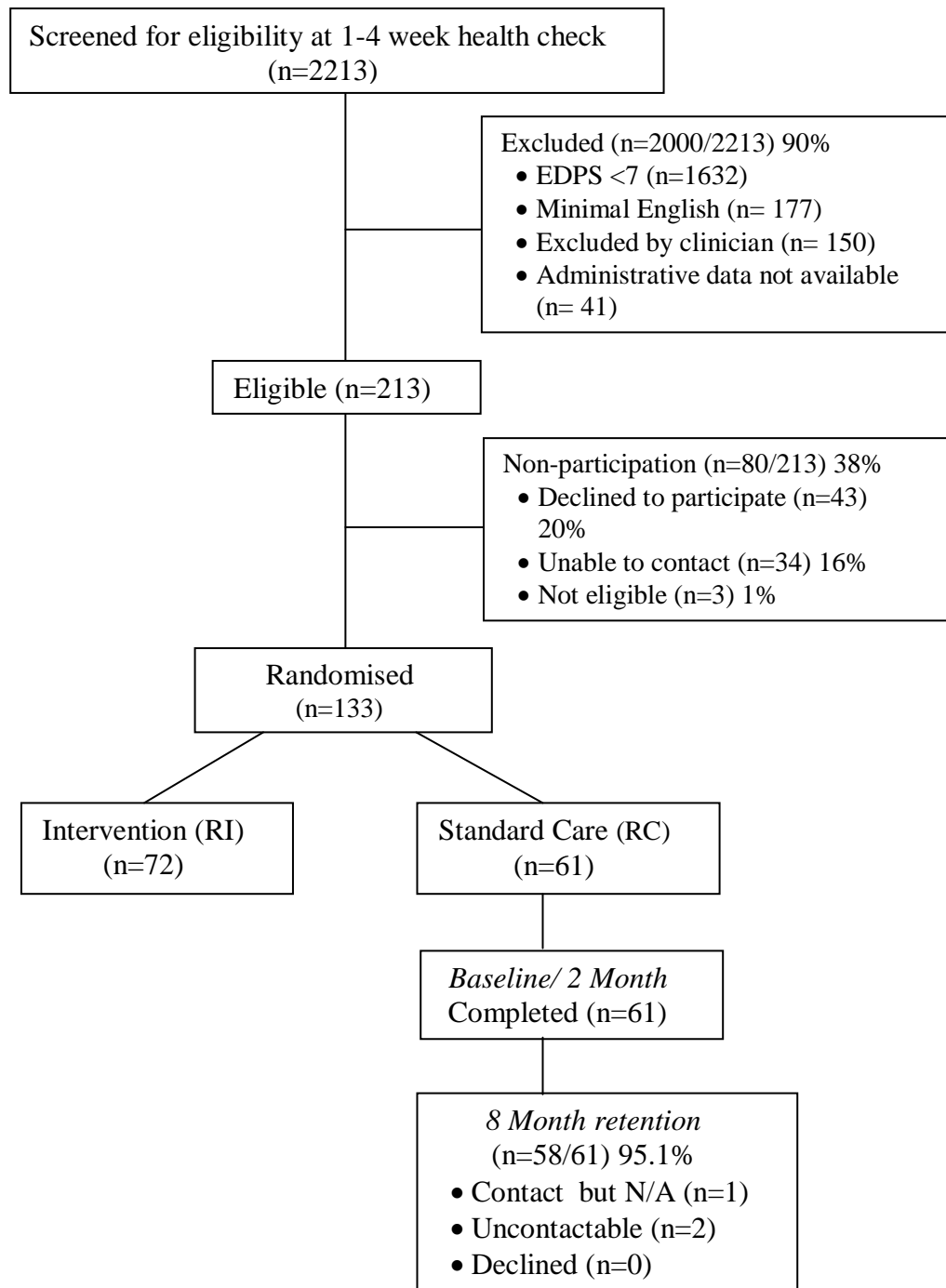


Figure 1. Participant Recruitment.

Note. EPDS – Edinburgh Postnatal Depression Scale. RC – Randomised Control group. RI – Randomised Intervention group.

2.3 Measures

As the current study is part of a larger study which included more assessment intervals as well as other data collected in the questionnaires, only the relevant measures to this study will be described here.

2.3.1 Postnatal Depression

The Edinburgh Postnatal Depression Scale (EPDS) by Cox, Holden and Sagovsky (1987) was used to measure postnatal depression. The scale is widely used to identify mothers experiencing depressive symptoms, and a score of ≥ 13 is usually used as the threshold for detecting women with high likelihood of meeting the diagnostic criteria for a major depressive episode during the postnatal period. Examples of items include: "I have looked forward with enjoyment to things" and "I have been anxious or worried for no good reason". Each question has a likert scale of 4 ratings, ranging from "*Most of the time/ As much as I did*" to "*No, Never/ Not at all*" with wording for each item varying slightly. The score range is 0 to 30.

Cox and colleagues found sensitivity of the EPDS at threshold ≥ 13 to be 85% and specificity to be 77%, with a positive predictive value of 83%. Eberhard-Gran, Slinning and Rognerud (2014) found the EPDS to have a 100% sensitivity rate at the threshold score ≥ 10 , with specificity of 87%. The current study using Cronbach's alpha found internal reliability was acceptable at .89 and .87 for 2 and 8 months respectively.

Three participants did not complete the 8 month questionnaires (n=58), otherwise there was no missing data for the EPDS at either 2 or 8 months.

2.3.2 Parental Self-Efficacy

Two measures were used to assess parental self-efficacy, the Parenting Sense of Competence Scale and the Parenting Stress Index – Competence subscale.

2.3.2.1 Parenting Sense of Competence Scale

The Parenting Sense of Competence scale (PSCO) (Gibaud-Wallston & Wandersman, 1978) measures a parent's confidence and satisfaction with their parenting. It is a 16 item self-report questionnaire graded on a 6 point Likert scale, ranging from *Strongly Disagree* to *Strongly Agree*, with scores ranging from 16 to 96. Higher scores indicate higher levels of parenting self-efficacy and competence. Example items include: "Being a parent is manageable, and any problems are easily resolved", and "I honestly believe I have all the skills necessary to be a good mother to my child".

The PSCO comprises three factors, these being Efficacy, Interest and Satisfaction. Reliability was measured by Johnson and Mash (1989) as .79, and in the current study Cronbach alphas were .79 and .75 for 2 and 8 months respectively, indicating acceptable internal reliability. For missing data, only 2 participants were missing 1 item each in the 2 month data set, and none in the 8 month data set. Missing values were replaced by calculating the average score on the subscale for each participant and substituting this value for the missing values prior to calculating total scores, as is the method used for other questionnaires such as the Parenting Stress Index (Abidin, 2012).

The PSCO scale does not have well established cut-off scores for assigning scores to high or low levels of competence. Therefore, a median split of each time assessment was used to identify mothers with average or below average feelings of competence in comparison to mothers reporting above average levels of competence. The median split scores used were 62 and 65 for the 2 and 8 month assessments respectively.

2.3.2.2 Parenting Stress Index

The Parenting Stress Index (PSI) (Abidin, 2012) comprises of 6 child domain and 7 parent domain subscales. The 3 subscales used in this study were Parental Competence (CO, 11 items with scores ranging from 11 to 55), measuring parental competence, and the

subscales of Isolation (IS, 6 items with scores ranging from 6 to 30) measuring stress due to isolation, and Spousal/ Parenting Partner Relationship (SP, 7 items with scores ranging from 7 to 35) measuring stress due to lack of spousal support (Social Support score total 65). Higher scores on these scales represent poorer functioning and on the Competence subscale, lower feelings of competence indicating low Parental self-efficacy.

Examples of items from the Competency subscale include: “I can’t make decisions without help” and “Being a parent is harder than I thought it would be”. The Isolation subscale includes items such as, “I feel alone and without friends” and “Since having children, I have a lot fewer chances to see my friends and to make new friends”. The Spousal/Parenting Partner Relationship subscale includes items such as, “Since having a child, my spouse/ parenting partner and I don’t do as many things together” and “My spouse/ parenting partner and I have a lot of conflict over how to raise our child”.

Items in the original Competence Subscales included the educational levels of both mother and father, but these were excluded from the study subscale. This study is interested in changes in parental self-efficacy as an attitude based construct, rather than factorial causes for initial differences in parental self-efficacy, such as education. This decision is supported by Zheng, Morrell and Watts (2018a), who found that education factors have a short-term effect on parental self-efficacy as measured at 6 weeks postpartum, but no long-term association was found between education level and parental self-efficacy at 3 months postpartum. These findings indicate minimal effect due to education would be observed in this current study at the 2 and 8 month assessment intervals. Due to the exclusion of these two items the recommended cut-off scores for the PSI competence subscale were not able to be used. The PSI High and Low Competence groups for hypothesis one were calculated using the same method as the PSCO. PSI lower scores represent less stress and higher levels of competence. The median split scores were

28 and 26 for the 2 and 8 month assessments respectively, with scores above the median representing lower levels of competence, and below median scores representing average or better competence.

Internal reliability analysis for this study produced a Cronbach alpha of .78 and .81 for the Competence subscale at 2 and 8 months respectively, and for the combined Social Support measure of IS and SP, .88 and .87 for 2 and 8 months respectively. All of these values are within the acceptable range for internal reliability (Pallant, 2001).

According to the manual by Abidin (2012), missing data can be calculated provided there are no more than 1 item score missing for a subscale. Missing items that met requirements for inclusion, were calculated as per the manual's instructions of obtaining an average score and using this as the replacement value before calculating the total score.

For the PSI Competence subscale, 2 participants were missing one item each from the 2 month assessment, and for the 8 month assessment, 2 different participants were missing one item each. For the PSI Support, one participant was a single mother and did not complete the subscale Spouse Support for either 2 or 8 months and therefore was excluded. Another single mother in the 8 month assessment did not complete the Spouse Support subscale at 8 months but her completed data at 2 months was retained for analysis to maximise numbers.

2.3.3 Infant Responsiveness

The Nursing Child Assessment Teaching Scales (NCAST), developed by Barnard (1979), was used to code the interactions at 2 and 8 months. Mothers were filmed completing a short standardised task with their infant. Examples of tasks include 'Child can hold on to a rattle' and 'Child can imitate caregiver's showing of tongue' for ages 0 to 3 months; 'Child can scribble on the piece of paper' and 'Child can pull the vehicle by the

string' for ages 6 to 9 months old. Interaction was required to be between 1 and 5 minutes long.

The NCAST consists of 73 items, with six subscales, four to measure the caregiver's response and behaviour during an interaction, and two subscales to measure the infant's response and behaviour to the caregiver. This study utilised the two infant behaviour subscales of Clarity of Cues (10 items), and Responsiveness to Caregiver (13 items). Each item has either a Yes or No response as to whether a certain behaviour was observed.

Examples of items from the Clarity of Cues subscale include: "Child widens eyes and/or shows postural attention to task situation" and "Child displays subtle disengagement cues during the teaching interaction". This subscale assesses the quality of communicative cues sent by the infant during the interaction with the mother. The Responsiveness to Caregiver subscale assesses how the infant responds to cues sent by the mother during the interaction, and examples include: "Child attempts to engage caregiver in eye-to-eye contact" and "When caregiver moves closer than eight inches from the child's face, the child shows some subtle and/ or potent disengagement cues".

Videos are coded by trained raters using a structured coding guide. The structure of the coding guidelines ensure that inter-rater and intra-rater reliability are high, with disagreement between raters consistently less than 10% (Oxford & Findlay, 2013). The manual states a Cronbach alpha for the Infant subscales as .81 (Oxford & Findlay, 2013), consistent with the findings in a review by Lotzin, Lu, Kriston, Schiborr, Musal, Romer and Ramsauer (2015). Oxford and Findlay also reported the Clarity of Cues subscale Cronbach alpha to be .50, and the Responsiveness to Caregiver subscale as .78. Items on the NCAST Infant scores are dichotomous measures ('Yes' or 'No' responses), and therefore internal reliability was assessed using the Kuder-Richardson statistic. The

internal reliability values in this study were .72 and .68 for 2 and 8 months respectively. When the subscales were analysed separately, the Clarity of Cues subscale reliability dropped to .32 and .07, but the Responsiveness to Caregiver remained consistent at .69 and .71. As the internal reliability value is within the acceptable range for the overall domain, the subscales will be analysed together to maintain reliability.

The NCAST does not have a recommended procedure for missing data. Data was missing in the present study due to the following reasons: the mother or infant's face were obscured from view part of the time; mothers spoke a language other than English and it was unclear what cue they were giving their infant; administration errors such as ambiguous instructions from the research assistant, video recording commenced after the interaction commenced, or was terminated before the interaction terminated and therefore led to the task not being recorded correctly. For the 2 and 8 month assessments, 53 and 49 mother-infant pairs respectively were analysed.

To replace missing values a procedure consistent with the PSI and PSCO scales was used. For the total infant domain where only 1 item was missing, the average score for the subscale was calculated and this score was substituted for the missing value.

2.3.3.1 NCAST Reliability Testing

Kuder-Richardson formula 20 coefficients were examined for the infant total and two subscales, being Response to Caregiver and Clarity of Cues subscales (see Table 1). As several coefficients were lower than the optimal range of .7 to .9, further analysis was undertaken to examine the inter-correlation of the items of each subscale. These are also presented in Table 1. The Response to Caregiver subscale at 8 months was within the range recommended by Briggs and Cheek (Pallant, 2001) of .2 to .4. However, the inter-correlation coefficients of the other subscales were all below the optimal range suggesting a low inter-correlation between the items, indicating items were not measuring similar

constructs. A further result was a number of items were recorded as having a lack of variability in the scores with most if not all participants scoring the same (see Table 2). Due to the low inter-correlation, the subscales were not analysed separately, however analysis still included the NCAST infant total scores as the reliability of the Infant Total Score was within the optimal range of .7 to .9 at 2 months, and slightly below at 8 months (.681). Given that the manual (Oxford & Findlay, 2013) had documented Cronbach alpha values for the Infant Total score all within the optimal range ($\geq .81$), it was decided analysis would include all items.

Table 1

Internal Reliability Coefficients and Inter-Correlations for NCAST.

Scale	Kuder-Richardson 20	# Items Analysed n/total n	Inter- Correlation
NCAST Infant Total 2Mth	.73	21/23	.12
NCAST Clarity of Cues 2 Mth	.32	9/10	.04
NCAST Response to Caregiver 2 Mth	.69	12/13	.16
NCAST Infant Total 8 Mth	.68	15/23	.12
NCAST Clarity of Cues 8 Mth	.07	6/10	-.004
NCAST Response to Caregiver 8 Mth	.71	9/13	.21

Note. NCAST – Nursing Child Assessment Teaching Scales

Table 2

Items from inter-correlation analysis with zero variance of scores

Scale	N	Items Excluded
NCAST Clarity 2 Mths	1	<ul style="list-style-type: none"> Child makes clearly recognisable arm movements during the teaching episode (clapping, reaching, waving, pounding, pointing, pushing away),
NCAST Response to Caregiver 2 Mths	1	<ul style="list-style-type: none"> Child physically resists or responds aggressively when caregiver attempts to intrude physically in child's use of the task materials
NCAST Total 2 Mths	2	As above
NCAST Clarity 8 Mths	4	<ul style="list-style-type: none"> Child widens eyes and/or shows postural attention to task situation, Child's movements are clearly directed toward the task or task material or away from the task material (not diffuse), Child makes clearly recognisable arm movements during the teaching episode (clapping, reaching, waving, pounding, pointing, pushing away), Child displays subtle disengagement cues during the teaching interaction
NCAST Response to Caregiver 8 Mths	4	<ul style="list-style-type: none"> Child gazes at caregiver's face or task materials after the caregiver has shown verbal or non-verbal alerting behaviour, When caregiver moves closer than eight inches from the child's face, the child shows some subtle and/or potent disengagement cues, Child shows subtle and/or potent disengagement cues within five seconds after caregiver changes facial expression or body movement, Child shows subtle and/or potent disengagement cues within five seconds after caregiver's verbalisations
NCAST Total 8 Mths	8	As above

Note. NCAST – Nursing Child Assessment Teaching Scales

2.4 Procedure

Participants were visited at their home by a research assistant at 2 months and 8 months post birth. Mothers completed a questionnaire containing all measures described, as well as the NCAST teaching task with their infant video-recorded for later coding and analysis. Mothers chose the teaching task according to age-appropriateness, from a pre-determined list provided by the NCAST Manual.

2.5 Data Analysis

Following data screening and descriptive statistics to explore the study sample, Pearson's correlation was used to analyse hypotheses 1 to assess the association between social support at 2 months and parental self-efficacy at 8 months.

Paired Sample T-Tests were used to analyse hypothesis 2, to compare whether improvements in parental self-efficacy scores from 2 to 8 months were associated with decreases in depression scores from 2 to 8 months. Cohen's *d* for the paired comparisons were calculated using the means and standard deviations of each time interval, as recommended by Becker (1998).

Independent t-tests were used to analyse hypothesis 3, in order to compare infant responsiveness scores for mothers who report high or low levels of parental self-efficacy.

Pearson's correlation was also used to analyse hypotheses 4, to assess the association between parental self-efficacy at 2 months and infant responsiveness at 8 months.

CHAPTER 3

Results

3.1 Data Screening

Generated histograms found the distribution of data fell within a normal range on the NCAST Infant Total Scores, the Parenting Sense of Competence Scale, PSI Social Support, and PSI Competence.

However, the distribution of the EDPS scores at both 2 and 8 months were slightly skewed to the left. This was due to the inclusion criteria prescribing that scores were

typically clustered around the mild to moderate range in the scale, with a few outliers at 22 and 26, and no lower than 2. This lower score range was due to some EPDS scores changing between inclusion assessment at approximately 1 month, and the study baseline assessment several weeks later at 2 months. The Shapiro-Wilk values for the distribution graphs are (.930 $p = .002$, and .928 $p = .002$ respectively) indicating the distributions significantly differ from a normal distribution. The data will not however be transformed as firstly, the scores need to be retained in their original format for meaningful interpretability, and secondly, the statistical techniques being used for analysis are considered robust to violations of normality such as this, and the sample size is large enough to withstand mild skewness (Pallant, 2001).

3.2 Descriptive Statistics

All mother-infant dyads were from two-parent families bar three single mothers, with an average age of 32.4 years and a range between 19 to 44 years old. The majority of mothers had a university education (74%). Most mothers were having their first child (71%), and there was a fairly even distribution of male and female infants. For the two month postpartum time interval, total participants were $n = 61$. Participant numbers differed for some analyses due to missing data resulting in 8 and 12 exclusions in the NCAST measure at 2 and 8 month postpartum respectively, with attrition of three participants at 8 months ($n = 58$). Descriptive statistics for study participants are set out in Table 3 below.

Table 3

Demographic statistics of Participants and Score Means (Standard Deviations) for Study Measures.

	2 month assessment M (SD) or n (%)	n	8 month assessment M (SD) or %	n
Mother's Age (years)	32.4 (4.56)	61	-	-
Mothers Education Level				
University degree	45 (73.8%)	61	-	-
Trade or technical school	8 (13.1%)			
All years of high school	59 (96.7%)		-	-
Parental Relationship		61	-	-
Single	3 (4.9%)			
Partnered	58 (95.1%)			
Infant Aboriginal/ Torres Strait Islander	1 (1.6%)	61	-	-
Infant Gender		61	-	-
Female	32 (52.5%)			
Male	29 (47.5%)			
First time Baby	43 (70.5%)	61	-	-
EPDS Scores	9.4 (4.8)	61	8.7 (4.6)	58
PSCO Scores	61.9 (9.6)	61	65.0(8.2)	58
PSI Competence Scores	28.9 (5.7)	61	25.9 (5.3)	58
PSI Social Support Total Scores	30.8 (9.2)	61	30.7 (9.1)	58
NCAST Infant Total Scores	12.1 (3.34)	53	17.1 (2.7)	49

Note. All EPDS scores were ≥ 7 at initial recruitment, with some mothers improving < 7 when tested 1-2 weeks later at 2 months baseline assessment. EPDS – Edinburgh Postnatal Depression Scale. NCAST – Nursing Child Assessment Teaching Scale. PSCO – Parenting Sense of Competence Scale. PSI – Parenting Stress Index.

3.3 Association between Social Support at 2 Months Postpartum and Parental

Competence Measures at 8 Months

The relationship between the PSI Social Support measure at 2 months, and the Parental Competence measures at 8 months ($n = 58$) was examined using Pearson's correlation. There was a medium positive correlation between social support and the PSI Competence scale ($r = .45$, $n = 58$, $p = .001$), indicating that as social support increases, parental competence improved. This correlation was medium and reached statistical

significance (Pallant, 2001). Similarly, there was a medium correlation for the PSCO measure, although this was negative ($r = -.45$, $n = 58$, $p = .00$). The correlation for the Parenting Competence Scale was negative due to the reverse scoring of the PSI Social Support scale, with a lower score indicating greater support. Therefore this correlation similarly indicates that as social support increases, parental competence improves. These findings indicate a positive association between parenting self-efficacy and social support.

3.4 Changes in Parental Self-Efficacy in association with Postnatal Depression

The second hypothesis aimed to compare EPDS depression scores for mothers whose parental self-efficacy assessments increased or decreased between 2 and 8 months postpartum. Parental self-efficacy scores for both the PSCO and PSI measures at 2 and 8 months were examined in order to identify mothers who experienced at least a small increase or decrease in parental self-efficacy between ages 2 and 8 months. For this analysis the difference between 2 month and 8 month parental self-efficacy scores were calculated, and used to group participants into increased and decreased groups of parental self-efficacy for both measures. To calculate these groups, the standard deviation for the scores on each measure was examined and a change associated with a small effect (as defined by a Cohen's d of 0.2) was defined as representing an increase or decrease. As such mothers whose scores did not change were defined as those whose score changes fell in the range of -1 to 1, representing only a small change between the 2 and 8 month assessment. Mothers whose scores increased or decreased more than 2 points between 2 and 8 months were categorised into the 'Increase' and 'Decrease' groups, representing those whose scores show greater than a small standard deviation change between 2 and 8 months.

Paired Samples t -tests were used to compare the change in postnatal depression scores from 2 to 8 months for mothers in the 'Increase' versus 'Decrease' Parental Self-Efficacy measures groups (see Table 4).

Table 4

Depression Scores according to Change in Self-Efficacy groups.

Change in Competence	2 Month		8 Month		t (df), p	Cohen's d
	n	M (SD)	n	M (SD)		
PSCO Increase	33	10.76 (4.78)	33	9.76 (4.80)	1.48 (32), .15	.21
PSCO Decrease	15	7.80 (4.99)	15	7.33 (3.92)	.72 (14), .48	.10
PSI Increase	38	10.53 (5.39)	38	8.66 (5.29)	3.42 (37), .002	.35
PSI Decrease	10	6.70 (2.45)	10	8.20 (2.70)	-1.34 (9), .21	-.58

Note. EPDS – Edinburgh Postnatal Depression Scale. PSCO – Parenting Sense of Competence Scale. PSI – Parenting Stress Index.

There was a statistically significant decrease in EPDS depression scores for the PSI 'Increase' group, with Cohen's d (.35) indicating a small effect. This result was reflected by the PSCO measure 'Increase' group, although the decrease in depression scores was not statistically significant. Cohen's d (.21) for this measure also indicates a small effect. These findings indicate that a change in parental self-efficacy is associated with a small but non-significant decrease in depression scores.

For the PSI 'Decrease' group, there was an increase in EPDS depression scores as expected, however this was not statistically significant. Cohen's d (-.58) indicates a medium effect size. This result supports the hypothesis that a decrease in the measures of competence will be associated with increases in depression scores. In contrast, however, the PSCO 'Decrease' group had a small decrease in EPDS depression scores, but this was not statistically significant and the Cohen's d (.10) indicates no effect for this group. The effect sizes for the Parenting Competence measures excepting the PSCO 'Decrease' group, indicate a true association between the EPDS scores and the change in Parental

competence groups, however the low sample sizes may contribute to this analysis not having sufficient statistical power.

3.5 Associations between Parental Self-Efficacy Measures and Infant responsiveness

Independent t-tests were used to examine whether there were differences in the NCAST infant responsiveness scores at age 2 and 8 months between mothers who were grouped into high versus low competence at 2 and 8 months on the Parenting Sense of Competence and Parenting Stress Index scales (see Table 5).

Table 5

Results of NCAST social responsiveness scores at infant age 2 and 8 months for mothers who scored high versus low on the Parenting Sense of Competence Scale and the Parenting Stress Index competence subscale at 2 and 8 months post-birth.

Measure	High Competence n	M (SD)	Low Competence n	M (SD)	t (df), p	Cohen's d
NCAST Infant Scores 2 Months						
PSCO 2 months	26	11.92 (3.84)	27	12.26 (2.85)	-.36 (51), .72	-.10
PSI 2 months	24	12.96 (3.80)	29	11.38 (2.78)	1.75 (51), .09	.47
NCAST Infant Scores 8 Months						
PSCO 8 months	24	17.25 (2.33)	25	16.92 (3.12)	.418 (47), .68	.12
PSI 8 months	22	17.18 (2.63)	27	17.00 (2.87)	.229 (47), .82	.07

Note. NCAST - Nursing Child Assessment Teaching Scale. PSCO - Parenting Sense of Competence Scale. PSI - Parenting Stress Index.

There was a difference in NCAST infant scores for the PSI Competence scale at 2 months, between the 'High' and 'Low' Competence groups. This was approaching statistical significance ($p = .09$) with Cohen's d (.47) indicating a medium effect. This indicates that infant responsiveness scores are higher for mothers who have higher scores

of competence on the PSI scale. In contrast, there was no association found between the NCAST infant scores and the 'High' and 'Low' Competence groups in the PSCO measure at 2 or 8 months, or with the PSI Competence measure at 8 months. All these comparisons had Cohen's d effect sizes of less than .2, which is the value indicating a small effect (Pallant, 2001). Unsurprisingly these did not reach statistical significance. These results indicate there is no association between the NCAST infant responsiveness scores, and a mother's level of competence according to these measures. Furthermore, the means of the infant scores were marginally lower for the high parental self-efficacy group on the PSCO measure at 2 months, which was unexpected. Overall, these findings indicate that there is minimal association between infant responsiveness scores on the NCAST and mothers competence when grouped into 'High' and 'Low' for both competence measures. As the PSI is a measure of stress, the association found with this measure indicates that infant responsiveness may depend on the level of stress experienced by the mother at 2 months postpartum rather than competence, and that this association is not found at 8 months.

3.6 Association between Parental Self-efficacy at 2 months and Infant response at 8 Months

Pearson's correlation were used to examine if there was an association between the parental self-efficacy scores at 2 months on both the PSI Competence and Parenting Sense of Competence measures and the NCAST Infant Scores at 8 months. Both competence measures used pair-wise matching ($n = 49$), with 4 participants with data available on the NCAST Infant Scale missing data on the self-efficacy measures and therefore unable to be included in the analyses. For the Parenting Sense of Competence scale scores at 2 months there was a small positive correlation with scores on the NCAST Infant Scale ($r = .16$, $n = 49$, $p = .28$) suggesting that as competence scores increased and improved, so did the NCAST infant scores. This correlation was small and did not reach statistical significance

(Pallant, 2001). There was a minimal negative correlation between the PSI Competence scores at 2 months and the NCAST infant responsiveness scores at 8 months ($r = -.09$, $n = 49$, $p = .53$). According to Cohen's guidelines (Pallant, 2001), this was not large enough to be considered an effect ($< .10$). These findings suggest there was little association between the parental self-efficacy measures at 2 months and the NCAST infant scale at 8 months.

CHAPTER 4

Discussion

This study sought to investigate whether a mother's parental self-efficacy was associated with the responsiveness of her infant during routine teaching interactions. Using a longitudinal design spanning a 6 month duration and encompassing postpartum depression peak times (Gavin et al., 2005), variable associations were tested for mothers with mild to moderate depressive symptoms.

4.1 Positive association between Social Support and Parental Self-efficacy

This study was able to confirm the hypothesis that there was a positive moderate association between parental self-efficacy, as measured by the competence scales, and social support. These findings support previous research by Zhang and Jin (2016), and Zheng, Morrell and Watts (2018ab) whose studies also found a positive association between social support and parental self-efficacy in populations of mothers who experience postnatal depression. Reasons for social support contributing to higher levels of parental self-efficacy include transfer of knowledge from peer and family members regarding caring for an infant, feedback and encouragement on the competence of the mothers care activities, physical support to aid in the burden of care and household activities, and emotional reinforcement, reducing the burden and demands on the mother (Leahy-Warren, McCarthy, & Corcoran, 2011).

This study's findings add to current research to confirm that this positive association also exists when mothers are experiencing mild to moderate depressive symptoms. Furthermore, by analysing the association between the two variables at different time points, there appears to be a long-term predictive element to social support, where higher levels of social support at two months postpartum, are positively associated with higher levels of parental self-efficacy six months later. This extends findings by Gao, Sun and Chan (2014) who found positive associations between social support and parental self-efficacy at antenatal, 6 weeks and 3 month time periods, although these findings did not include postnatal depression as a factor. These findings highlight the relevance of social support, particularly from the partner as measured by the PSI Spousal Support subscale, for new mothers presenting with mild to moderate depressive symptoms, in contributing to mothers' greater self-efficacy and reducing adverse postnatal depression outcomes for mothers and infants. A strength of this study was its longitudinal design to facilitate examination of long-term associations between parental self-efficacy and social support.

4.2 Increases in Parental Self-Efficacy associated with Improvements in Postnatal Depression

The study findings confirm a relationship between parental self-efficacy and postnatal depression. Specifically, when a mother's parental self-efficacy increased over a 6 month period, there was a small significant decrease in depression scores over the same period. There was also an indication that conversely, a decrease in a mother's parental self-efficacy over a 6 month period corresponded with a moderate increase in depression scores for the same period. These findings support the expected outcomes for the study. Furthermore, the differences in group means demonstrate that changes in parental self-efficacy for mothers who are experiencing mild to moderate depressive symptoms, are

related to severity of depressive symptoms. These findings corroborate previous research that has found a negative association between parental self-efficacy and depression (Kohlhoff & Barnett, 2013; Reck, Noe, Gerstenlauer, & Stehle, 2012). Importantly, this study further demonstrates a long-term association between parental self-efficacy and postnatal depression, whereby changes in parental self-efficacy are associated with changes in postnatal depression. These findings indicate that interventions which aim to increase parental self-efficacy will likely result in a reduction in postnatal depression. Examining this relationship further would be of particular use for developing interventions that not only seek to improve parenting self-efficacy per se, but also improve mild to moderate depression which is so prevalent amongst postpartum mothers.

4.3 Parental Self-Efficacy and its association with Infant Responsiveness

For the association between parental self-efficacy and infant responsiveness, study results were mixed. The majority of comparisons found no association between the variables and therefore did not support the hypotheses of a relationship. However, there was a moderate, non-significant difference in infant responsiveness between the 'High' competency and 'Low' competency groups at the 2 month assessment on the PSI measure. This indicates that infants with mothers who had higher levels of parental self-efficacy, were more responsive in routine interactions than infants whose mothers had lower parental self-efficacy. Additionally, parental self-efficacy at 2 months was associated with a small, positive correlation with infant responsiveness at 8 months. This second finding suggests that mothers with higher parental self-efficacy at 2 months, have infants who are more responsive at 8 months, indicating a long-term effect for mothers with higher parental self-efficacy may have more responsive infants 6 months later. These two findings are interesting as they indicate a mother's level of parental self-efficacy can effect the responsiveness of the infant, both in direct and future routine interactions.

There are a number of possible explanations for the mixed findings. A number of prior studies (Cassé, Oosterman, & Schuengel, 2016; Martins & Gaffan, 2000; Mastergeorge, Paschall, Loeb, & Dixon, 2014) have used a stress-inducing assessment to measure the relationship between maternal factors and infant behaviour, whereas this study used a routine teaching task. It is possible that an association may be better detected within more stressful conditions, and that a mother's parental self-efficacy has less of an effect on routine infant responsiveness during routine activities.

Given that results indicating an association with parental self-efficacy was measured at the 2 month period, this may indicate that higher parental self-efficacy levels at this time period have more effect on infant responsiveness than at other times. If this is so, this may explain why no association was found at the 8 month assessment. Further investigation is warranted as to whether 2 months is an influential time period for parental self-efficacy effects on infant responsiveness, given that Gavin and colleagues (2005) also found 2 months postpartum to be a peak depression time.

Thirdly, the interaction between parental self-efficacy and postnatal depression in effecting infant's responsiveness may have more of an impact when both these factors are more pronounced. Both these factors in this study were of mild symptomology, possibly resulting in limited effect. Consequently, the influence of changes in a mother's parental self-efficacy on infant responsiveness may be stronger when symptoms of depression are greater or parental self-efficacy higher. Due to the limited research in this area, further research to investigate if the severity of depression influences the strength of effect of a mother's parental self-efficacy on infant responsiveness is suggested.

Finally, the reliability and inter-correlation coefficients of the NCAST Infant scale and in particular, the Clarity of Cues subscale which found sub-optimal internal reliability and minimal correlation between scale items are of analytical concern. The NCAST

manual similarly documents low internal reliability of the Clarity of Cues infant subscale (.50), with this coefficient being the lowest Cronbach alpha recorded of all the subscales (Oxford & Findlay, 2013).

A study by Britton, Gronwaldt and Britton (2001) analysed the NCAST domains (Parent, Infant and Total) for both the feeding and teaching scales for association with the Postpartum Parenting Behaviour Scale, which measured maternal behaviour toward the infant at birth. They found all NCAST subscales significantly correlated with maternal behaviour, except for child behaviour (measured until age 2), measured by the Infant domain on the Teaching Scale. This may indicate a lack of reliability with this particular part of the measure, given that other measures such as the Strange Situation have found associations between various maternal factors and infant behaviour in general.

Caldera, Burrell, Rodriguez, Shea Crowne, Rohde and Duggan, (2007) used the NCAST to specifically examine maternal self-efficacy and infant behaviour as part of a study of an intervention program in Alaska. Their results found no significant difference and no effect size between infant NCAST scores in the control and intervention groups, although maternal self-efficacy was significantly higher in the intervention group. Although there was no direct analysis between parental self-efficacy and infant behaviour, the results may indicate that the NCAST measure may not be adequate for analysing infant responsiveness in association with parental self-efficacy. Nevertheless, the NCAST is the best developed measure currently available.

4.4 Application of Findings

This study has demonstrated the long-term positive effects of higher levels of parental self-efficacy, as well as the effect of increasing parental self-efficacy on reducing postnatal depression and engaging infants in greater responsiveness. The long-term association between parental self-efficacy and postnatal depression indicates that

interventions which target improvements in self-efficacy may also lead to long-term improvements in postnatal depression, specifically for mothers with mild to moderate symptoms. Furthermore, social support has a medium strength association with parental self-efficacy over time, indicating the importance of social support in mother's mental health and coping during the postpartum period. Encouragement by health workers for mothers and their families to engage in strengthening support links would benefit mothers' parental self-efficacy and parenting, as well as reducing postnatal depression.

4.5 Limitations

Limitations to the study included small participant numbers, particularly when the analysis grouped participants according to levels or changes of parental self-efficacy. Some groups were thus reduced to ten participants making results susceptible to individual variation and limiting analysis in detecting any true group effect. Secondly, the NCAST Infant Domain measure had low internal reliability, bringing into question its effectiveness in detecting true associations between infant social responsiveness and parental self-efficacy.

4.6 Implications for Future research and Conclusions

Several suggestions for future research have been identified. Due to the mixed findings regarding the association between infant responsiveness and parental levels of self-efficacy, it is recommended that this relationship is further investigated. Additionally, it is also recommended that future studies use two or more measures of infant responsiveness for comparison and thoroughness, particularly in view of low internal reliability of the NCAST scale. Additionally, a review of the NCAST Infant domain scale would be useful in determining if the behavioural items are sufficient for assessing infant social responsiveness in association with parental self-efficacy.

This study has examined the effects of parental self-efficacy on a number of factors. Firstly, changes in parental self-efficacy were associated with changes in postnatal depression, indicating that increases in parental self-efficacy can lead to improvements in postnatal depression. Secondly, greater levels of social support were associated with higher parental self-efficacy. This has implications that increasing social support can contribute to higher self-efficacy, which in turn can assist in improving postnatal depression. Furthermore, mixed findings give some indication of an association between higher parental self-efficacy and greater infant responsiveness. Therefore, improving parental self-efficacy can lead to improvement of depressive symptoms experienced by mothers and may increase infants' responsiveness in interactions, indicating improved social functioning. Interventions with this focus can therefore improve outcomes for both mother and infant.

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