EMOTION DYSREGULATION DURING THE PERINATAL PERIOD

AN INVESTIGATION OF EMOTION DYSREGULATION DURING THE PERINATAL PERIOD: IMPLICATIONS FOR PERINATAL MENTAL HEALTH AND PSYCHOLOGICAL TREATMENTS

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TITLE: An investigation of emotion dysregulation during the perinatal period: Implications for perinatal mental health and psychological treatments

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ABSTRACT

Introduction: The perinatal period, which consists of pregnancy and up to one year postpartum, is considered a period of vulnerability. During this time, women are at higher risk than other times in their lives of developing a mental health disorder, particularly anxiety and depressive disorders. Perinatal mental health disorders have a tremendous negative impact on not only the mother, but also their children who may develop cognitive, behavioural, and emotional problems that last well into adulthood. Emotion dysregulation has been implicated in both anxiety and depressive disorders and, due to endocrine changes during the perinatal period, may play an important role in perinatal mental health. Perinatal emotion dysregulation has yet to be explored. The purpose of this thesis was to 1) better understand the link between emotion dysregulation and perinatal mental health, 2) assess whether current perinatal treatments effectively target emotion dysregulation, and 3) develop an effective psychological treatment protocol for perinatal emotion dysregulation.

Methods: We designed and conducted three studies to meet our research aims. The first study compared emotion reactivity and emotion regulation, two aspects of emotion dysregulation, in perinatal women with an anxiety and/or depressive disorder to better understand perinatal emotion dysregulation. The second study examined the bidirectional relationship between Cognitive Behavioural Therapy (CBT) for perinatal anxiety and emotion dysregulation to examine whether emotion dysregulation moderates CBT treatment outcomes and whether CBT is an effective treatment modality for perinatal emotion dysregulation. This was examined in two samples of participants: participants from a randomized controlled trial and routine clinical care. In the third study, we developed a novel Dialectical Behavioural Therapy (DBT) informed treatment program

for perinatal emotion dysregulation and examined the effectiveness of the program through a pilot study.

Results: Our research revealed several important findings. First, heightened emotional reactivity may be a protective factor during the perinatal period; less flexibility in emotional reactivity and difficulties with emotion regulation were associated with worse perinatal mental health, and relationship dissatisfaction. Second, CBT was an effective treatment for low levels of emotion dysregulation but not for moderate or severe perinatal emotion dysregulation. Only 16% of routine clinical care participants and 28% of participants from the randomized controlled trial demonstrated clinically reliable change in emotion dysregulation. Emotion dysregulation did not moderate CBT treatment outcomes on anxiety or depression. This suggest that emotion dysregulation appears to be a distinct factor that may warrant more specialized treatment. Third, our short term, DBT informed, skills group was effective in significantly reducing perinatal emotion dysregulation. The DBT informed treatment may be more effective in targeting perinatal emotion dysregulation than CBT as illustrated by 48% of participants demonstrating clinically reliable change compared to the 16%-28% in the CBT treatment.

Conclusions: This line of research allows us to have a better understanding of perinatal emotion dysregulation and may aid in the development of best practice assessment and treatment guidelines for emotion dysregulation during the perinatal period. Limitations and future directions are discussed.

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LIST OF ABBREVIATIONS

ACT: Acceptance and Commitment Therapy

ADAS: Abbreviated Dyadic Adjustment Scale

ANOVA: Analysis of Variance

BPD: Borderline Personality Disorder

BSL: Borderline Symptom Severity List

CBGT: Cognitive Behavioural Group Therapy

CBT: Cognitive Behavioural Therapy

DASS-21: Depression, Anxiety and Stress Scale –21

DBT: Dialectical Behavioural Therapy

DERS: Difficulties in Emotional Regulation Scale

DSM-5: Statistical Manual for Mental Disorders

ECG: Electrocardiogram

ED: Emotion Dysregulation

EDS: Emotion Dysregulation Scale

EPDS: Edinburgh Postnatal Depression Scale

ERQ: Emotion Regulation Questionnaire

HPA: Hypothalamus-Pituitary-Adrenal axis

IAPS: International Affective Picture System

IPT: Interpersonal Psychotherapy

MANOVA: Multivariate Analyses of Variance

MINI: Mini International Neuropsychiatric Interview

MLM: Mixed Linear Modelling

NA: Negative Affect

Null-HC: Nulliparous Healthy Control group

OCD: Obsessive Compulsive Disorder

PA: Positive Affect

PANAS: Positive and Negative Affect Schedule

PBQ: Postpartum Bonding Questionnaire

Peri-ERS: Perinatal Emotion Regulation Skills Group

Peri-Exp: Perinatal Experimental group

Peri-HC: Perinatal Healthy Control group

PHIPA: Personal Health Information Protection Act

PSOC: Parenting Sense of Competence Scale

PTSD: Post-Traumatic Stress Disorder

RCI: Reliable Change Index

RCT: Randomized Controlled Trial

REACT: Emotion Reactivity

REDCap: Research Electronic Data Capture

REG: Emotion Regulation

SES: Socioeconomic Status

SPS: Social Provisions Scale

STICSA: State-Trait Inventory for Cognitive and Somatic Anxiety

VAS: Visual Analogue Scale

WHCC: Women's Health Concerns Clinic, St. Joseph's Healthcare Hamilton

WL: Wait-List

DECLARATION OF ACADEMIC ACHIEVEMENT

Chapter 2: Study 1

Examining emotion dysregulation during the perinatal period: Implications for perinatal mental health. A. Agako was the primary contributor in study conceptualization and design, literature review, protocol development, data collection, data analysis, and manuscript preparation. S.M. Green was the primary investigator in the study and provided supervision throughout all stages of the project and aided in protocol development, data analysis and manuscript preparation. R.E. McCabe provided supervision throughout the project and aided in data analysis and manuscript preparation. C. Hallett and Z. Zheng aided in data collection, data analysis and manuscript preparation. This chapter, in its entirety, is currently ***under review*** in the **Journal of Behaviour Therapy and Experimental Psychiatry**.

Chapter 3: Study 2

The role of emotion dysregulation in cognitive behavioural group therapy for perinatal anxiety: Results from a randomized controlled trial and routine clinical care. A. Agako was the primary contributor in the literature review, data analysis, current study conceptualization and manuscript preparation. This project used pre-collected data from a larger randomized controlled trial. S.M. Green was the primary investigator in the original study, primary contributor in protocol development, and provided supervision throughout all stages of the current project including data analysis and manuscript preparation. E. Donegan, R.E. McCabe, D. Streiner and B.N Frey were co-investigators on the original project and provided supervision throughout the project, aided in

protocol development, as well as data analysis and manuscript preparation for the current project. This chapter, in its entirety, has been ***published*** in the **Journal of Affective Disorders**.

Chapter 4: Study 3

A pilot study examining the effectiveness of a short-term, DBT informed, skills group for emotion dysregulation during the perinatal period. A. Agako was the primary contributor in study conceptualization and design, literature review, protocol development, data collection, data analysis, and manuscript preparation. S.M. Green was the primary investigator in the study and provided research and clinical supervision throughout all stages of the project and aided in data analysis and manuscript preparation. L. Burckell provided clinical supervision and aided in the development of the treatment protocol and manuscript preparation. R.E. McCabe and B.N. Frey provided additional supervision throughout the project and aided in data analysis and manuscript preparation. E. Barrett and K. Silang aided in data collection and manuscript preparation. This chapter, in its entirety, has been ***published*** in the **Psychological Services** journal.

CHAPTER 1: General Introduction

This thesis examines emotion dysregulation within the perinatal period. We studied the implications of emotion dysregulation for perinatal anxiety and depressive disorders and evaluated the effectiveness of current treatments for perinatal emotion dysregulation. We also developed a novel psychological treatment for emotion dysregulation and present pilot data on its effectiveness. This chapter provides an overview of what the perinatal period is, why it is considered a time of vulnerability for mental health concerns and why we chose to focus on perinatal anxiety and depressive disorders. We also provide an overview of emotion dysregulation and its relevance towards perinatal anxiety and depressive disorders. In addition, a review of current treatments for perinatal anxiety, depression and emotion dysregulation is included. The aims of each of the studies included in this thesis are discussed at the end of the chapter.

1.1 What is the perinatal period?

The perinatal period typically consists of pregnancy and up to 12-months postpartum (Austin, 2003). The timeframe of how far along the postpartum is still considered the perinatal period, however, is up for debate with some definitions only including one to three months following delivery (O'Hara & Wisner, 2014). For the purposes of the current thesis, the perinatal period refers to the time from conception and up until 12-months postpartum as it is more commonly used (Austin, 2003).

1.2 Perinatal vulnerability & mental health concerns

The perinatal period is considered a period of vulnerability in a woman's life as research suggests that women are at an increased risk of experiencing mental health difficulties (Accortt et al., 2008; Grigoriadis & Robinson, 2007). Indeed, during this time, one to two women in 1000 require psychiatric hospital admission due to new or recurrent mental health disorders and are 22

times more likely to require hospitalization compared to pre-pregnancy (Howard & Khalifeh, 2020). A recent prevalence study conducted in Canada revealed that compared to childbearing age non-perinatal females, women who were postpartum, particularly those who had complications during pregnancy or delivery, had increased odds for being diagnosed with a psychiatric disorder in the past year (Sommer et al., 2021). The most common perinatal psychiatric disorders include depressive disorders, bipolar disorder, anxiety disorders, puerperal psychosis and substance use disorders (Paschetta et al., 2014). These disorders can arise at any point within or before the perinatal period and can persist after the 12-month postpartum mark (O'Hara & Wisner, 2014). Thus, examining factors that may contribute to our understanding of this risk period for mental health concerns is an important research pursuit.

1.2.1 Biological vulnerabilities

During pregnancy and the postpartum, there are multiple biological changes that take place to ensure a healthy pregnancy. Endocrine changes such as estradiol and changes in progesterone during pregnancy and postpartum may be implicated in the development of a mental health disorders during this time (Bloch et al., 2003). Further, endocrine changes throughout the perinatal period have also been associated with a disruption in the hypothalamus-pituitary-adrenal (HPA) axis (Dickens & Pawluski, 2019). The HPA axis is implicated in the stress response and therefore disruptions to the HPA may be associated with a heightened vulnerability for perinatal mental health disorders (Redpath et al., 2019). There is a wide range of possible mechanisms such as genetic, epigenetic, inflammatory, microbial and biochemical processes that regulate the HPA axis, all of which may be associated with a vulnerability to mental illness (Dickens & Pawluski, 2019; Gelman et al., 2015). Further research is needed to better understand the link between endocrine changes and perinatal mental health. Research examining this link is just emerging and

most studies have been conducted primarily in animal models and they have yet to be well validated in humans (Dickens & Pawluski, 2019).

1.2.2 Psychosocial vulnerabilities

In addition to the biological changes, the perinatal period comes with psychological and social changes. During this time, mothers can experience joy and happiness towards having a new child as well as stress due to the multiple changes that having a new baby brings. For example, women may experience more financial stressors, relationship and identity stressors that may come from adjusting to the role of motherhood, and stressors related to childcare, all of which can increase vulnerability towards developing a mental health disorder (Green et al., 2019). Research suggests that factors such as marital status, socioeconomic status (SES), number of children, and poor relationship satisfaction are all linked to worse mental health outcomes during the perinatal period (Cantwell & Smith, 2009; Emmanuel et al., 2012; Milgrom et al., 2019; Segre et al., 2007). Of particular risk are migrant perinatal women due to factors related to low social support, low SES, lack of proficiency in host country's language and refugee or asylum-seeking status (Anderson et al., 2017). Due to the aforementioned factors being associated with poorer perinatal mental health, screening for them in early pregnancy is crucial for prevention and increasing access to treatment.

1.2.3 Perinatal anxiety and depressive disorders

As noted above, anxiety and depressive disorders are the most common disorders during the perinatal period (Howard & Khalifeh, 2020). The most recent systematic reviews estimate that during the perinatal period up to 25.4% of women develop an anxiety disorder and up to 11.9% develop a depressive disorder, and often times these disorders are comorbid (Fawcett et al., 2019; Woody et al., 2017). Perinatal anxiety disorders are defined as the presence of panic disorder,

agoraphobia, specific phobias, acute stress disorder, generalized anxiety disorder, social anxiety disorder, posttraumatic stress disorder (PTSD) and/or obsessive compulsive stress disorder (OCD) within the perinatal period (Fairbrother et al., 2016; Fawcett et al., 2019). Perinatal depressive disorder is the presence of a major depressive disorder during pregnancy or postpartum (Van Niel & Payne, 2020). According to the Diagnostic and Statistical Manual for Mental Disorders (DSM-5), perinatal anxiety and depressive disorders must have a perinatal onset (American Psychiatric Association, 2013); however, in the literature they are often defined as the *presence* of an anxiety or depressive disorder during the perinatal period regardless of onset (Furtado et al., 2018). For the purposes of this thesis, we chose to focus specifically on perinatal anxiety and depressive disorders due to their high prevalance and comorbidity. To be consistent with previous research, we are also defining perinatal anxiety and depressive disorders as the *presence* of these diagnoses during the perinatal period, regardless of onset. Although in the literature PTSD and OCD are included in perinatal anxiety disorders, we chose not to include them to be consistent with the DSM-5 conceptualization of anxiety disorders (vs. anxiety-related disorders). The DSM-5 conceptualizes OCD and PTSD as having a separate etiology from other anxiety disorders (American Psychiatric Association, 2013). Therefore, when we refer to perinatal anxiety disorders we include the presence of panic disorder, agoraphobia, specific phobias, acute stress disorder, generalized anxiety disorder, social anxiety disorder and other specified and unspecified anxiety disorder. When we refer to depressive disorders, we include the presence of a major depressive disorder, and other specified and unspecified depressive disorders.

1.2.4 Implications for maternal and child outcomes

Anxiety and depressive disorders during the perinatal period have negative consequences for both mothers and their children. For the mother, the presence of an anxiety and/or depressive

disorder is associated with a heightened risk of suicide (Orsolini et al., 2016). Suicide is becoming a leading cause of maternal death during the perinatal period in Canada (Grigoriadis et al., 2017) illustrating how debilitating and dangerous these disorders can be. Further, perinatal anxiety and depressive disorders are associated with a decrease in a number of maternal behaviours that impact the baby including maternal bonding, responsiveness, sensitivity, and breastfeeding (Grigoriadis et al., 2013; Tietz et al., 2014). For children, maternal anxiety and depressive disorders are associated with acute negative health outcomes such as premature delivery and low birth weight (Grigoriadis et al., 2013; Jarde et al., 2016). Long term, these disorders lead to cognitive, emotional, social, and behavioural difficulties for the children that can last well into adulthood (Austin & Priest, 2005; Kingston & Tough, 2014). Due to the negative effects perinatal anxiety and depressive disorders have on both mothers and babies, research into better understanding their etiology, prevention, assessment and treatment is of crucial importance.

1.3 Emotion dysregulation

Emotion dysregulation has been conceptualized to underlie many psychopathological conditions including anxiety and depressive disorders (Gross & Jazaieri, 2014). It has been associated with poorer psychosocial functioning, lower quality of life and mental health distress, making it an important clinical variable (Bradley et al., 2011; Ball et al., 2013; Juretić, 2018; Rottenberg et al., 2002). This section provides an overview of the definition of emotion dysregulation, its role in anxiety and depressive disorders in general adult populations, and presents research on emotion dysregulation during the perinatal period.

1.3.1 Overview of emotion dysregulation

Emotion dysregulation is an elusive construct to define, particularly because of disagreements in the literature relating to the definition of emotion. There are four main schools of emotion theories, that define this process in different ways, all of which are further outlined in a review by Gross and Barrett (2011). Basic emotion theorists posit that emotions can be reduced to purely biological states that have measurable outcomes (Ekman, 1992; Gross & Barrett, 2011; LeDoux, 1995). Appraisal theorists propose that cognition is an important aspect of emotion and emotions cannot exist without an appraisal process (Gross & Barrett, 2011; Lazarus, 1982). Psychological construction theories postulate that emotions are psychological states that involve the use of other basic systems (e.g., physiology, cognition), rather than having their own specific system (Gross & Feldman Barret, 2011; Lange & James, 1922; Schachter & Singer, 1962). Social construction theories suggest that emotions are constructs that arise from sociocultural experiences and that emotions do not exist outside of the sociocultural realm (Harré, 1986; Solomon, 2007; Gross & Barrett, 2011). These theories can be conceptualized on a spectrum with basic emotion theories being on the far left and social construction theories on the far right (Gross & Barrett, 2011).

Due to the different views on what constitutes emotions, emotion dysregulation may also be conceptualized in different ways. The conceptualization that we will be focusing on for the purposes of this thesis, is the one by Gross and Jazaieri (2014). This stance was chosen as it is among the more widely used conceptualizations in the literature. The Gross and Jazaieri (2014) conceptualization falls in the middle of the continuum mentioned above, among the overlap between appraisal and psychological construction theories (Gross & Barrett, 2011; Gross & Jazaieri, 2014). This theory suggests that emotion dysregulation is an umbrella term that includes both maladaptive emotion reactivity and maladaptive emotion regulation (Gross & Jazaieri, 2014).

1.3.1.1 Maladaptive emotion reactivity

Once an emotion is activated, physiological, behavioural, and experiential changes arise in a process termed emotional reactivity (Gross & Jazaieri, 2014). These changes may look different when different emotions are activated (e.g., fear vs. sadness). In the case of fear, we may notice the *feeling* of fear (experiential), an activation of the sympathetic nervous system (physiology) and an urge to run away or stay and fight (behaviour; Agako et al., 2021). Individual differences in emotional reactivity have been conceptualized to define our personality (Plutchik, 1997) and tend to start early in development (Thompson, 1994). What differentiates adaptive versus maladaptive emotion reactivity is the threshold for reactivity, peak amplitude, rise time to peak and recovery time (Cole et al., 2004; Davidson, 1998). For example, maladaptive reactivity may include problematic emotional intensity (either too high or too low), emotion duration (too long or too short), emotion frequency (too often or too infrequently) and the appropriateness of the emotion given the situation (Gross & Jazaieri, 2014). Generally, maladaptive emotion reactivity may be managed with effective emotion regulation responses and not lead to difficulties for an individual. However, it becomes problematic when the emotion regulation responses employed are also maladaptive (Gross & Jazaieri, 2014; Linehan, 1993).

1.3.1.2 Maladaptive emotion regulation

Emotion regulation refers to strategies used by an individual to influence the process of emotion generation. These strategies may be implicit or explicit and their aim is to change the intensity or duration of the emotion (Cole et al., 2004; Gross & Jazaieri, 2014). There are different steps to adaptive emotion regulation. The first step, includes an awareness of the emotion and of the short- and long-term goals relevant to the situation. For example, if anger arises during an

argument, first the individual needs to be aware of the emotion, the goal of standing up for themselves (short-term goal) and the goal of wanting to maintain the relationship with the other person (long-term goal). In the second step, the individual needs to be able to select and implement the regulation strategy that is best suited to aid them in getting from their current state to their desired goal (Gross & Jazaieri, 2014; Sheppes et al., 2015; Thompson, 1994). Gross and Jazaieri (2014) propose the following emotion regulation processes: situation selection, situation modification, attentional deployment, cognitive change, and response modulation. Based on the strategy selection and how helpful the chosen strategy is given the situational context; the response can be either adaptive or maladaptive. Maladaptive emotion regulation refers to the selection of an inappropriate regulatory strategy; either when an individual does not use a regulatory strategy when needed or there is a mismatch between the strategy selected and the situational demands (Gross & Jazaieri, 2014). There are multiple factors that may influence the strategy selection process including neurophysiological processes, attention processes, interpretation of situations, encoding of physical cues, social functioning, coping resources, self-efficacy and beliefs about the changeability of emotions (Goldin et al., 2009; Harmon-Jones et al., 2011; Thompson, 1994). Thus, adaptive versus maladaptive emotion regulation is a highly individualized process and proper assessment and understanding of context are important.

1.3.2 Implications for anxiety and depressive disorders

Emotion dysregulation has been proposed to be at the core of anxiety and depressive disorders with symptoms from these disorders being conceptualized through an emotion dysregulation lens (Gross & Jazaieri, 2014; Gross & Barrett, 2011; Gross & Muñoz, 1995; Hofmann et al., 2012; Mennin et al., 2005; Sheppes et al., 2015; Werner & Gross, 2010). Recent research suggests that most mental health disorders may be explained by a single higher order factor, also known as the

"psychopathology" factor or p-factor (Caspi et al., 2013). Although more research is needed to know whether emotion dysregulation could be this factor, this line of research does partially support Gross and Jazaieri's (2014) theory. Using the conceptualization presented by Gross and Jazaieri (2014), anxiety disorders can be thought of as a hyper-reactivity to fearful stimuli and an insufficient regulation of emotional responses (Agako et al., 2021). The fearful stimuli would vary across anxiety disorders (e.g., in social anxiety the fearful stimuli would be social situations, in OCD it would be distressing, intrusive thoughts), differentiating between them. Depressive disorders, on the other hand, can be conceptualized as both a hyper-reactivity to negative emotions (i.e., sadness, guilt) and a hypo-reactivity of positive emotions (i.e., joy, excitement) and having insufficient strategies to up or down regulate these problematic emotional responses (Gross & Jazaieri, 2014).

Although Gross and Jazaieri (2014) postulate that emotion dysregulation underlies anxiety and depressive disorders, some research suggests that it may be a separate construct altogether. Preliminary evidence suggests that emotion dysregulation remains even when the anxiety and depressive disorder has been treated and is present even when controlling for anxiety and depressive symptoms (Asnaani et al., 2020; Fergus et al., 2010; Moscovitch et al., 2008; Pasquini et al., 2004). These findings suggest that we may still not fully understand the relationship between emotion dysregulation and anxiety and depressive disorders.

1.3.3 Perinatal emotion dysregulation

Despite emotion dysregulation being implicated in anxiety and depressive disorders, the literature on perinatal emotion dysregulation is sparse. With the little research on perinatal emotion dysregulation, the primary focus has been related to outcomes of children while significantly

ignoring the mother (Binion & Zalewski, 2018; Davis & Sandman, 2010; Morelen et al., 2014). Findings thus far suggests that perinatal emotion dysregulation is associated with a decrease in supportive parenting, child emotion dysregulation, and behavioural and adjustment issues for children (Binion & Zalewski, 2018; Davis & Sandman, 2010; Morelen et al., 2014). As such, a need exists for more research to better understand perinatal emotion dysregulation in mothers.

As mentioned above, during the perinatal period women experience significant endocrine changes that are also associated with changes in the functioning of the HPA axis and the nervous system (Dickens & Pawluski, 2019). The autonomic nervous system and adrenocortical activity are also heavily implicated in emotion dysregulation (Agako et al., 2021). Measuring changes in these systems serves as a proxy for capturing emotion dysregulation and has been commonly used in research (Agako et al., 2021). Given the link between emotion dysregulation and anxiety and depressive disorders as well as emotion dysregulation and HPA axis, it can be asserted that emotion dysregulation may play an important role during the perinatal period specifically. This area warrants further study.

There is some research looking at emotion reactivity within the perinatal period using samples of perinatal women in the general population. Limited research suggests that women during the perinatal period, particularly postpartum, may experience heightened emotional reactivity towards both pleasant and unpleasant stimuli (Rosebrock et al., 2015; Wilkinson, 1998) and may experience greater daily fluctuations in their emotions compared to nulliparous women (Bowen et al., 2012; Li et al., 2020). However, there is still very few studies conducted on this topic, as demonstrated by a recent systematic review (Li et al., 2020), and emotion dysregulation within the perinatal period and its relationship to mental health remains yet to be understood.

1.4 Treatments for perinatal anxiety and depressive disorders

Treatments for perinatal mental health include pharmacological treatments, psychological treatments and often a combination of the two. This section reviews the literature on both forms of treatment and discusses potential implications for perinatal emotion dysregulation.

1.4.1 Pharmacological treatments

When considering medication for perinatal anxiety and depressive disorders, best practice guidelines recommend using the lowest effective dose to minimize fetal exposure while maximizing drug efficacy (Craig & Abel, 2001). With respect to treatment of depressive disorders, an international review of best practice guidelines around the world suggests that non-pharmacological treatments are initially recommended, and pharmacological treatments are reserved for more severe presentations (Molenaar et al., 2018). Preferred medications during breastfeeding include sertraline and citalopram due to being associated with less side effects for the infants (Molenaar et al., 2018). There are fewer guidelines on psychotropic medications for perinatal anxiety disorders than there are for perinatal depression. A review from the United Kingdom (UK), suggests that benzodiazepines and antihistamines (due to their simple hypnotic with anxiolytic properties) are often prescribed for perinatal anxiety disorders, however shorter-acting compounds are preferred as they might accumulate in breastmilk (Craig & Abel, 2001). Canada does not have best practice guidelines for pharmacological treatments during the perinatal period. The Women's Health Concerns Clinic, St. Joseph's Healthcare Hamilton, where the current research took place, follows the UK recommendations.

Psychotropic medications may have negative impacts on infants with respect to speech, language and motor difficulties (Malm et al., 2016; Weikum et al., 2012). However, research into

psychotropic medications for perinatal anxiety and depressive disorders is sparse due to difficulties in conducting randomized controlled trials with perinatal populations. However more randomized controlled trials need to be conducted to determine best practice guidelines (Craig & Abel, 2001; Molenaar et al., 2018). The pros and cons of using psychotropic medication during the perinatal period must be compared to the pros and cons of living with perinatal anxiety and depressive disorders and the impact of these mental health disorders on the mother, her infant and her family and there is no "one size fits all" approach (Craig & Abel, 2001). As perinatal emotion dysregulation has yet to be studied, there are no best practice guidelines related to it that have been developed. The first line treatment for perinatal anxiety and depressive disorders appears to be psychological treatment (Craig & Abel, 2001). Therefore, research into effective psychological treatments is imperative.

1.4.2 Psychological treatments

There are a number of psychological treatments being offered for perinatal anxiety and depressive disorders including Cognitive Behavioural Therapy (CBT; Green et al., 2019; Li et al., 2020; Stuart & Koleva, 2014), Interpersonal Psychotherapy (IPT; Sockol, 2018), Acceptance and Commitment Therapy (ACT; Bonacquisti et al., 2017; Waters et al., 2020) and Mindfulness-based approaches (Hall et al., 2016). CBT and IPT are the most common approaches and the ones that have been found to be the most effective for perinatal anxiety and depressive disorders (Li et al., 2020; Nillni et al., 2018; Sockol, 2018). Although some research suggests there is insufficient evidence for IPT related to perinatal anxiety outcomes (Sockol, 2018). ACT approaches are still very novel with little evidence regarding their effectiveness for perinatal anxiety and depressive disorders (Bonacquisti et al., 2017; Waters et al., 2020). With respect to Mindfulness-based approaches, recent systematic reviews and meta-analyses suggest there is not sufficient evidence

related to effectiveness (Dhillon et al., 2017; Hall et al., 2016; Taylor et al., 2016). This is due to study factors such as deviations from protocol, small sample sizes, exclusion of participants with mental health disorders and lack of statistically significant effects (Dhillon et al., 2017; Hall et al., 2016; Taylor et al., 2016).

Dialectical Behavioural Therapy (DBT) is the most widely used and evidence-based treatment for emotion dysregulation in the general adult population (Linehan, 1993; Neacsiu et al., 2014). Although DBT is an extensive, structured treatment requiring both individual therapy and skills group, there is evidence that DBT skills group alone is efficacious. DBT skills groups with various lengths have been adapted for use with different mental health conditions (e.g., depression, emotion dysregulation, eating disorders, substance use) and have been shown to be effective (Valentine et al., 2015). However, to date, the research on treatments for perinatal emotion dysregulation is sparse. Currently, there are only two published studies that examine the effectiveness of DBT skills group during the perinatal period (Kleiber et al., 2017; Wilson & Donachie, 2018). Both of these treatment studies had high drop-out rates and did not use standardized measures of emotion dysregulation, making results related to effectiveness difficult to interpret. Thus, more research is needed into evidence-based, effective treatments for emotion dysregulation during the perinatal period.

1.5 Main Aims

Based on the research presented in this chapter, we can conclude that there are three major gaps in the literature related to perinatal emotion dysregulation. This thesis aims to fill these gaps in the following ways:

- First, we do not know enough about emotion dysregulation during the perinatal period and how it relates to anxiety and depressive disorders during this time. Study 1, presented in Chapter 2, aims to shed more light into perinatal emotion dysregulation by studying emotion reactivity and emotion regulation in perinatal women with anxiety and depressive disorders compared to perinatal healthy controls and nulliparous healthy controls. This study will allow us to gain a better understanding of adaptive and maladaptive emotion reactivity and regulation in this population.
- Second, we do not know whether current treatments that are widely used for perinatal anxiety and depressive disorders effectively target emotion dysregulation. Study 2, presented in Chapter 3, looks at the bidirectional relationship between perinatal CBT and emotion dysregulation. We examine whether CBT for perinatal anxiety and depressive disorders is effective in treating emotion dysregulation and if perinatal emotion dysregulation impacts treatment outcomes. This study will allow us to determine whether any changes or adaptions are needed to our current treatment programs to effectively target emotion dysregulation.
- Third, there is not enough research related to effective, evidence-based, DBT-informed treatments for perinatal emotion dysregulation (Hall et al., 2016). In study 3, presented in Chapter 4, we have developed a novel DBT-informed treatment program for perinatal emotion dysregulation and provide pilot data on the effectiveness of the program. The findings from this study will help guide future research into effective treatments for perinatal emotion dysregulation.
- Finally, we outline general directions for future research on perinatal emotion dysregulation and limitations of the current research in Chapter 5.

This line of research will help provide insight into emotion dysregulation during the perinatal period. The findings from this thesis will help guide clinical interventions for perinatal emotion dysregulation. This research is imperative in preventing, identifying and minimizing the risk that perinatal mental health disorders have on both mothers and their children.

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CHAPTER 2: Study 1

Examining emotion dysregulation during the perinatal period: Implications for perinatal mental health

Chapter link:

Agako, A., McCabe, R. E., Hallett, C., Zheng, Z. & Green, S.M. (Under Review). Examining emotion dysregulation during the perinatal period: Implications for perinatal mental health. *Journal of Behaviour Therapy and Experimental Psychiatry*.

2.1 Abstract

Background: Emotion dysregulation (ED), has been conceptualized to be at the core of anxiety and depressive disorders. Women in the perinatal period may be at increased risk of experiencing emotion dysregulation due to biological and social changes, which have not been previously studied. The current study investigated ED in relation to perinatal anxiety and/or depressive disorders and secondary psychosocial outcomes.

Methods: Two components of ED, reactivity (REACT) and regulation (REG), were compared across three groups of women: perinatal women with anxiety and/or depression (Peri-Exp), perinatal healthy controls (Peri-HC), and nulliparous healthy controls (Null-HC). REACT was captured through the use of self-report and physiological measures as participants went through an experimental, emotionally provoking paradigm using negative, neutral and positive pictorial stimuli. REG was assessed through self-report measures. Measures on relationship satisfaction, social support, bonding, and stress were also administered. Analysis of variance approaches and mixed linear modelling were used to analyze the data.

Results: The Peri-Exp group experienced a lower self-report baseline of positive affect, a higher self-report baseline of negative affect and lower self-reported emotional flexibility in the emotional provoking paradigm. The Peri-HC group exhibited higher self-reported REACT to both positive and negative stimuli. No differences were found in physiological REACT. The Peri-Exp group had the most difficulties with REG, which was associated with poorer relationship satisfaction.

Conclusions: Heightened REACT may be a protective, adaptive factor during the perinatal period.

Limitations: Limitations include low sample size, homogeneity of sample and mixed sample of both pregnant and postpartum populations.

Keywords: Perinatal period, Emotion Dysregulation, Emotion reactivity, Emotion regulation

2.2 Introduction

Anxiety and depressive disorders are the most prevalent mental health difficulties during pregnancy and postpartum, otherwise known as the perinatal period (Accortt et al., 2008; Grigoriadis & Robinson, 2007). Despite the high prevalence rates of these disorders during the perinatal period, where 11.9% of women develop depression (Woody et al., 2017) and 16.7% to 25.4% develop an anxiety disorder (Fawcett et al., 2019), research into contributing factors that may help explain these increased rates is sparse. This is problematic as perinatal anxiety and depression are associated with multiple negative outcomes for mothers and infants. For example, mothers are at an increased risk of suicide (Grigoriadis et al., 2017) and experience decreased bonding and responsiveness with the infant. In turn, the implications for infants include long-term emotional, cognitive, social and behavioural difficulties (Austin & Priest, 2005). Identifying contributing factors and gaining a better conceptualization of mental health difficulties experienced during this time could lead to adapting effective treatments accordingly.

Emotion dysregulation is a construct that has been conceptualized to be at the core of multiple psychopathological conditions in non-perinatal populations, including anxiety and depression (Gross & Muñoz, 1995; Hofmann et al., 2012; Mennin et al., 2005). There are two main components of emotion dysregulation: maladaptive emotion reactivity and maladaptive emotion regulation (Gross & Jazaieri, 2014). Problematic emotion reactivity is comprised of responding to a situation with heightened or attenuated emotional intensity whereas difficulties in emotion regulation include factors such as a poor understanding of emotions, negative reactivity to emotional states, and ineffective emotional management responses (Gross & Jazaieri, 2014; Linehan, 1993; Mennin et al., 2007).

To date, experimental research on perinatal emotion dysregulation focuses exclusively on the impact that maternal emotion dysregulation has on children and largely ignores the impact on mothers. Research on the impact of maternal emotion dysregulation on infants indicates that maternal emotion dysregulation may lead to a decrease in supportive parenting and can lead to emotion dysregulation in infants as well as behavioural and adjustment problems for children later in life (Binion & Zalewski, 2018; Davis et al., 2014; Morelen et al., 2014). Further research is needed to examine the impact of emotion dysregulation on the mother. Limited research examining emotions in perinatal populations with no known mental health disorders suggests that perinatal women may experience a heightened emotional reactivity towards both pleasant and unpleasant stimuli, and experience more daily fluctuations in emotions, compared to nulliparous women (Bowen et al., 2012; Li et al., 2020; Rosebrock et al., 2015; Wilkinson, 1998). The link between these emotional differences and perinatal mental health, however, has yet to be studied. Due to endocrine changes associated with the perinatal period and changes in the HPA axis (Dickens & Pawluski, 2019), women may be at increased risk for experiencing emotion dysregulation during this time. Further, our team recently conducted a study that found that rates of emotion dysregulation in treatment-seeking perinatal populations with anxiety and depressive disorders may be higher compared to non-perinatal populations (Agako et al., 2021). Therefore, a better understanding of this construct in the perinatal population is necessary to better conceptualize the perinatal period as a period of vulnerability as well as to improve treatment planning.

The goal of the current study was to examine emotion dysregulation within the perinatal period. We aimed to investigate differences in emotion reactivity and emotion regulation in three distinct groups: perinatal women with an anxiety and/or depressive disorder, perinatal healthy controls and nulliparous healthy controls. We hypothesized that there would be differences in both

emotion reactivity and emotion regulation across the three groups. Specifically, we hypothesized that 1) women in both perinatal groups would have heightened emotional reactivity compared to nulliparous controls due to the biological changes associated with pregnancy and postpartum and as seen in previous research (Klein & Pich, 2003; Mahendru et al., 2014; Rosebrock et al., 2015; Wilkinson, 1998); 2) perinatal women with anxiety and/or depression would have greater difficulties with emotion regulation specifically, compared to perinatal healthy controls and nulliparous controls; and 3) difficulties with emotion regulation will be associated with worse outcomes related to relationship satisfaction, parenting confidence, social support, and bonding with infants, particularly in women with anxiety and/or depressive disorders. The results of this study will help us understand the positive and negative emotional correlates for common mental health disorders during the perinatal period. Ultimately, this may be useful in informing assessment and treatment recommendations.

2.3 Methods

2.3.1 Participants

N = 52 participants were recruited for this study across three different groups: perinatal women with an anxiety and/or depressive disorder (Peri-Exp; n = 18), perinatal healthy controls (Peri-HC; n = 14) and nulliparous healthy controls (Null-HC; n = 18). Two participants did not meet eligibility criteria following screening and therefore were excluded from the study. Participants were recruited from the Women's Health Concerns Clinic, St. Joseph's Healthcare Hamilton from lists of patients who had consented to be contacted for research as well as from the Hamilton, Ontario community through flyers and social media. Participants in the Peri-Exp group were deemed to be eligible if they: 1) were in the perinatal period (pregnant or up to 12 months

postpartum); 2) were between ages 18-45; and 3) met criteria for a diagnosis of an anxiety and/or depressive disorder based on the Mini International Neuropsychiatric Interview (MINI; Sheehan et al., 1998). Peri-Exp participants were excluded if they had a history of bipolar disorder, schizophrenia or other psychotic disorder, substance use disorder or acute suicidal risk. Participants in the Peri-HC group were considered eligible for the study if they 1) were in the perinatal period; 2) were between the ages of 18-45; and 3) did not meet criteria for a current psychiatric disorder based on the MINI. Participants in the Null-HC group were eligible for the study if they 1) were nulliparous (i.e., never had children or been pregnant); 2) were between ages 18-45; and 3) did not meet criteria for a current psychiatric disorder based on the MINI. See Table I for demographic information.

Table I.

Participant demographics and clinical characteristics of samples

Baseline Characteristic	Peri-Exp	Peri-HC	Null-HC
	n = 18	n = 14	n = 18
	n (%)	n (%)	n (%)
Age Mean in years (SD)	30.7 (5.0)	30.3 (4.9)	30.5 (5.1)

Ethnicity			
Native American	2 (11.1%)	0 (0%)	0 (0%)
Hispanic/Latin American	1 (5.6%)	0 (0%)	0 (0%)
White/European	13 (72%)	10 (71.4%)	11 (61.1%)
African American	1 (5.6%)	1 (7.1%)	2 (11.1%)
Asian/Pacific Islander	0 (0%)	2 (14.2%)	3 (16.7%)
Other	1 (5.6%)	1 (7.1%)	2 (11.1%)
Marital Status			
Single	3 (16.7%)	2 (14.2%)	15 (83.3%)
Married/Common-Law	15 (83.3%)	12 (85.7%)	3 (16.7%)
Education Level			
High School	1 (5.6%)	0 (0%)	1 (5.6%)
Certificate/professional diploma	5 (27.8%)	2 (14.2%)	3 (16.7%)
Bachelor’s degree or higher	11 (61.1%)	12 (85.7%)	12 (66.7%)
Other	1 (5.6%)	0 (0%)	2 (11.1%)

Employment			
Full-Time	11 (61.1%)	11 (78.6%)	10 (55.6%)
Part-Time	3 (16.7%)	0 (0%)	6 (33.3%)
Unemployed	4 (22.2%)	3 (21.4%)	1 (5.6%)
Unreported	n.a.	n.a.	1 (5.6%)
Maternal Status			
Pregnant	2 (11.1%)	6 (42.3%)	n.a.
Postpartum	16 (88.9%)	8 (57.1%)	n.a.
Number of children Mean (SD)	1 (1.1)	0.9 (1.1)	n.a.
Taking psychotropic medication	5 (27.8%)	n.a.	n.a.
Psychiatric Diagnoses			
Major Depressive Disorder	7 (38.9%)	n.a.	n.a.
Panic Disorder	2 (11.1%)		
Agoraphobia	4 (22.2%)		

Social Anxiety Disorder	8 (44.4%)
Generalized Anxiety Disorder	18 (100%)
Obsessive Compulsive Disorder	1 (5.6%)
Post-Traumatic Stress Disorder	1 (5.6%)

2.3.2 Stimuli

Sixty emotionally provoking pictures were selected from the International Affective Picture System (IAPS; Lang et al., 1997). Pictures were divided into three sets (Negative, Neutral, Positive) based on their standardized valence ratings. Each set consisted of 20 pictures varying in valence and arousal levels. Each set also contained pictures with perinatal-themed content (e.g., family, babies, children) as well as non-perinatal content. The stimuli were presented for 6 seconds, consistent with the procedural guidelines by (Lang et al., 1997). The stimuli were presented on a 13-inch laptop screen using PsychoPy V3 (Pierce & MacAskill, 2018).

2.3.3 Measures

Polar V800 watch with H7 heart rate band was used to capture physiological reactivity throughout the emotional reactivity experimental paradigm. The Polar V800 has been shown to be comparable with an Electrocardiogram (ECG) and was therefore used to capture heart rate reactivity (Giles et al., 2015).

Visual Analogue Scale (VAS) was utilized to capture emotional reactivity following the presentation of each IAPS picture. Participants were asked to rate how they *currently* felt in response to each picture from -10 (very negative) to 10 (very positive) with 0 being neutral.

The Mini International Neuropsychiatric Interview (MINI; Sheehan et al., 1998) is a structured diagnostic interview that is consistent with diagnostic criteria based on the DSM-5 and ICD. It has been extensively studied and it presents good reliability and validity (Sheehan et al., 1998). The MINI was administered to determine the presence of mental health disorders in the current study.

Positive and Negative Affect Schedule (PANAS; Watson et al., 1988) is a 20-item self-report scale of different positive and negative emotions, such as "Excited", "Scared", and "Attentive". Participants rate the extent to which they are experiencing each emotion in the present moment on a scale from 1 (Very slightly or not at all) to 5 (Extremely). The PANAS is divided into two subscales, Positive Affect (PA) and Negative Affect (NA). The PANAS is widely used and has strong psychometric properties. The internal reliability is good for both the PA (α = .89) and NA (α = .85) scales (Crawford & Henry, 2004). In addition, there is support for the validity of the PANAS. The PA subscale correlates negatively with measures of anxiety and depression while the NA subscale correlates positively with measures of anxiety and depression (Crawford & Henry, 2004). This questionnaire was used to capture emotional reactivity across different emotions in response to each set of stimuli (Negative, Positive, Neutral) as well as to capture participants' baseline affect prior to experimental manipulation.

Emotion Regulation Questionnaire (ERQ; Gross & John, 2003) is a 10-item self-report measure of emotional regulation strategies. Examples of items include "I keep my emotions to

myself" and "I control my emotions by changing the way I think about the situation I'm in". Participants rate how much each statement applies to them on a scale from 1 (Strongly disagree) to 7 (Strongly agree). The ERQ has two subscales: Re-appraisal and Suppression. Re-appraisal is considered an adaptive emotional regulation strategy while Suppression is considered to be a maladaptive one. Both Re-appraisal and Suppression subscales are high in reliability with alpha coefficients of .79 and .73 respectively (Gross & John, 2003). In addition, there is support for the validity of the ERQ. As expected, the Re-appraisal subscale correlates positively with positive affect, mood repair, and life satisfaction while the Suppression subscale correlates negatively with positive affect, mood repair, and life satisfaction (Gross & John, 2003). In the present study, the ERQ was used to capture the strategies that participants identify using to regulate their emotional experiences.

Difficulties in Emotional Regulation Scale (DERS; Gratz & Roemer, 2004) is a 36-item self-report questionnaire that captures various emotion regulation difficulties. Examples of items include "I pay attention to how I feel" and "When I'm upset, I feel out of control". Participants rate how much each item applies to them on a scale from 1 (Almost never) to 5 (Almost always). The DERS is divided into six subscales assessing emotion regulation difficulties including Non-acceptance of Emotional Responses, Difficulty Engaging in Goal Directed Behaviour, Impulse Control Difficulties, Lack of Emotional Awareness, Limited Access to Emotion Regulation Strategies, and Lack of Emotional Clarity. The DERS total scale has excellent internal reliability with a coefficient alpha value of .93 (Gratz & Roemer, 2004). Each of the subscales has a coefficient alpha above .80 (Gratz & Roemer, 2004). Furthermore, there is ample evidence to support the validity of the DERS. The DERS correlates positively with other measures of emotion regulation, measures of experiential avoidance, and measures of emotional expressivity (Gratz &

Roemer, 2004). The DERS was used in the present study to assess difficulties in emotion regulation experienced by the three participant samples.

Abbreviated Dyadic Adjustment Scale (ADAS; Sharpley & Rogers, 1984) is a 7-item self-report questionnaire that examines relationship satisfaction in marital adjustment. Some examples of items include "How good is your relationship compared to most?" and "How much do you love your partner?". Participants rate how much each item applies to their relationship on a scale from 1 (Low) to 5 (High). The ADAS is a valid and reliable measure with a coefficient alpha of .76 (Sharpley et al., 1984). Furthermore, the ADAS has been shown to correlate well with other measures of marital adjustment such as the Kansas Marital Satisfaction Scale and the Relationship Beliefs Inventory (Hunsley et al., 1995). For the present study, the ADAS was used to examine associations between emotion dysregulation and marital adjustment.

Parenting Sense of Competence Scale (PSOC; Gibaud, 1978) is a 17-item self-report questionnaire that assesses perceived competence in parenting for both mothers and fathers. It is divided into two subscales, Parental Satisfaction and Parental Self-Efficacy. Examples of items include "My mother was better prepared to be a good mother than I am" and "If anyone can find the answer to what is troubling my child, I am the one". Participants rate how much each item applies to them on a scale from 1 (Strongly disagree) to 6 (Strongly agree). When used with mothers, the PSOC has good internal reliability with coefficient alphas of .77 and .80 for the Parental Self-Efficacy and Parental Satisfaction subscales respectively (Ohan et al., 2000). Both subscales converge with other measures of family functioning such as the Child Behaviour Checklist, Child-rearing Practices Report, and Dyadic Adjustment Scale (Ohan et al., 2000). The PSOC was used to examine the relationship between emotion dysregulation and perceptions of parental competence.

Social Provisions Scale (SPS; Russell & Cutrona, 1984) is a 24-item self-report questionnaire that measures the availability of social support. It is divided into six subscales, including Attachment, Social Integration, Reassurance of Worth, Reliable Alliance, Guidance, and Opportunity for Nurturance. Examples of items include "There are people I can depend on to help me if I really need it", "There are people who depend on me for help", and "I feel part of a group of people who share my attitudes and beliefs". Participants rate how much each item applies to them on a scale from 1 (Strongly disagree) to 4 (Strongly agree). The SPS has good psychometric properties. It has excellent internal reliability for the overall score (α = .91) and acceptable reliability for each of the subscales (α = .65 - .76). Furthermore, the SPS correlates with other measures of support as well as measures of wellbeing (Cutrona & Russell, 1987). This measure was used to assess the relationship between emotion dysregulation and social support.

Postpartum Bonding Questionnaire (PBQ; Brockington & Fraser, 2006) is a 25-item self-report questionnaire measure of mother-infant bonding. It is divided into four subscales; Impaired Bonding, Rejection and Pathological Anger, Infant-Focused Anxiety, and Incipient Abuse. Some examples of items include "I feel close to my baby", "I am afraid of my baby", and "I feel like hurting my baby". Participants rate how much each statement applies to them on a scale from 0 (Never) to 5 (Always). There are relatively few studies that have examined the internal reliability of the English version of the PBQ. Wittkowski, Wieck, and Mann (2007) found acceptable internal reliability (α = .76) for the overall PBQ. Estimates of internal reliability for the Impaired Bonding, Rejection and Pathological Anger, and Infant-Focused Anxiety subscales ranged from .63 - .79. Internal reliability could not be calculated for the Incipient Abuse subscale due to zero variance in the items. In addition, there is considerable evidence in support of the validity of the PBQ. The PBQ correlates with other measures of postpartum bonding such as the Mother-Infant Bonding

Scale as well as with measures of postpartum emotional difficulties such as the Kennerly Blues Scale (Wittkowski et al., 2007). Moreover, the PBQ has a sensitivity index of .82 for identifying disruptions in the mother-infant relationship. For the present study, the PBQ was used to examine the relationship between emotion dysregulation and bonding.

2.3.4 Procedure

This study received ethics approval from the Hamilton Integrated Research Ethics Board (HiREB). Participants who expressed interest in participating in the study were called by a trained research assistant and provided with information about the research and what their participation would entail. If interested, a quick screening was conducted on the phone to determine eligibility for one of the three groups (Peri-Exp, Peri-HC, Null-HC). If eligible, a study visit was booked. On the day of the visit, participants received more information about participating in the study by a trained research assistant to ensure informed consent. Following written consent, participants engaged in the MINI clinical interview (Sheehan et al., 1998) to determine eligibility. If eligible, a research assistant connected participants with the Polar V800 monitor and instructed them to sit still for a 10-minute period to obtain a baseline heart rate. Following baseline, they completed the PANAS to provide a measure of self-reported affect.

Instructions for the emotional reactivity experimental paradigm were then repeated to participants. Participants were shown three sets of stimuli on a laptop screen, each containing 20 pictures selected from IAPS (Lang et al., 1997; Lang et al., 1997). Following each picture, participants were asked to make a VAS rating on how they felt at that specific moment. At the end of each set, participants were asked to fill out the PANAS with instructions to rate the emotions based on their current level of emotion at that specific time. Participants had a five-minute break

in between each set to reduce carryover effects. The order of pictures and sets was counterbalanced to minimize carryover and order effects.

Next, participants were asked to fill out a questionnaire battery containing the measures stated above. At the end of the visit, participants were debriefed on the aims of the study. In addition, a research assistant offered to go through a mood improvement protocol should there be any remaining distress. All participants were provided with mental health resources and the number of the principal investigator, who is a clinical psychologist, should they experience distress following the study visit.

2.3.5 Data analysis

All data was analyzed using IBM SPSS Statistics Version 23.

Self-report baseline differences in affect. Baseline differences across groups in PANAS Negative and Positive Affect Subscales were analysed through a one-way analysis of variance (ANOVA).

Physiological Reactivity. Mean heart rate was used for Baseline as well as the time period when participants were shown the Negative, Neutral and Positive stimuli. A 3x3 mixed model ANOVA was conducted with group (Peri-Exp, Peri-HC, Null-HC) as the between-subject factor and set (Negative, Neutral, Positive) as the within-subject factor.

Emotional Reactivity Paradigm: VAS ratings. Mixed linear modelling (MLM) was used to examine differences in VAS ratings across sets and groups. MLM is recommended with clustered/multilevel data as it allows for more flexibility than traditional mixed model ANOVA approaches and can be used without needing to transform the data to meet the normality assumption. MLM allows for both fixed and random effects in the model and testing different

covariance structures to better fit the data which can preserve power (Yang et al., 2014). A random intercept model was used with set (Negative, Neutral, Positive) and group (Peri-Exp, Peri-HC, Null-HC) treated as fixed effects, participants as a random effect and IAPS pictures as a repeated effect. The Autoregressive covariance structure was used as it yielded the lowest Akaike information criterion (AIC) values and is often seen with repeated measures designs. Pairwise comparisons were conducted using a Least Significant Difference (LSD) approach. Another MLM model was run with picture content (perinatal vs. non-perinatal) added as a fixed variable in the model to examine whether content also influenced reactivity.

Emotional Reactivity Paradigm: PANAS. To capture emotion reactivity in response to the stimuli, changes in affect from baseline were used in the analyses rather than raw scores. Differences in Negative and Positive Affect Subscales across sets and groups were analyzed using a MLM approach with set (Negative, Neutral, Positive) and group (Peri-Exp, Peri-HC, Null-HC) treated as fixed effects and participants as a random effect. Pairwise comparisons were conducted using an LSD approach.

Emotion Regulation. To capture between group (Peri-Exp, Peri-HC, Null-HC) differences in emotion regulation, a one-way ANOVA was conducted with mean DERS scores, DERS subscales, and the ERQ Reappraisal and Expressive Suppression subscales.

Secondary Measures. A regression analysis with 5000 iteration bootstrapping was conducted in the three separate groups to determine whether difficulties in emotion dysregulation (DERS) as the independent variable, was associated with the following outcome variables: relationship satisfaction (ADAS), parenting sense of competence (PSOC), perceived support (SPS), and parental bonding.

2.4 Results

2.4.1 Self-report Baseline Differences in Affect

A one-way ANOVA revealed significant differences in baseline Positive Affect, as measured through PANAS, across groups $F(2,45) = 3.19$, $p = .05$ with the Peri-Exp group having lower ratings (M = 25.1; SD = 5.1) compared to the Null-HC (M = 29.8; SD = 9.3; $p = .06$) and the Peri-HC (M = 31.4; SD = 6.4; $p = .02$). There were also significant differences in baseline Negative Affect, as measured through PANAS, across groups $F(2,45) = 4.5$, $p = .02$ with the Peri-Exp group having similar ratings (M = 13.6; SD = 4.6) compared to the Peri-HC group (M = 13.3; SD = 4.2; $p = .33$), however higher ratings than the Null-HC group (M = 10.0; SD = 1.2; $p = .005$).

2.4.2 Physiological Reactivity

The results of the mixed model ANOVA demonstrated no statistically significant group x set interactions in mean heart rate reactivity $F(6,135) = 0.52$, $p = .79$. Refer to Figure 1 for a box plot of heart rate data.

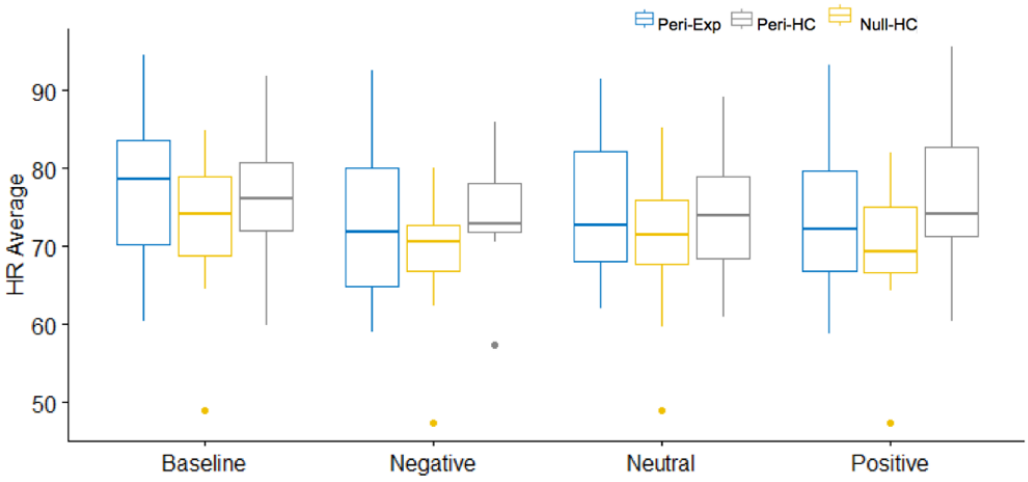

Figure 1. Box plot of heart rate reactivity data

2.4.3 Emotional Reactivity Paradigm: VAS ratings

The results of the MLM revealed a significant main effects of group $F(2,45) = 3.5$, $p = .04$ and the group x set interaction $F(4,2636.23) = 14.02$, $p < .001$. There were significant simple effects of group for negative $F(2,83.45) = 3.28$, $p = .04$, neutral $F(2,81.33) = 3.1$, $p = .05$, and positive sets $F(2,87.94) = 13.2$, $p < .001$. Estimated marginal means, and standard errors can be found in Figure 2.

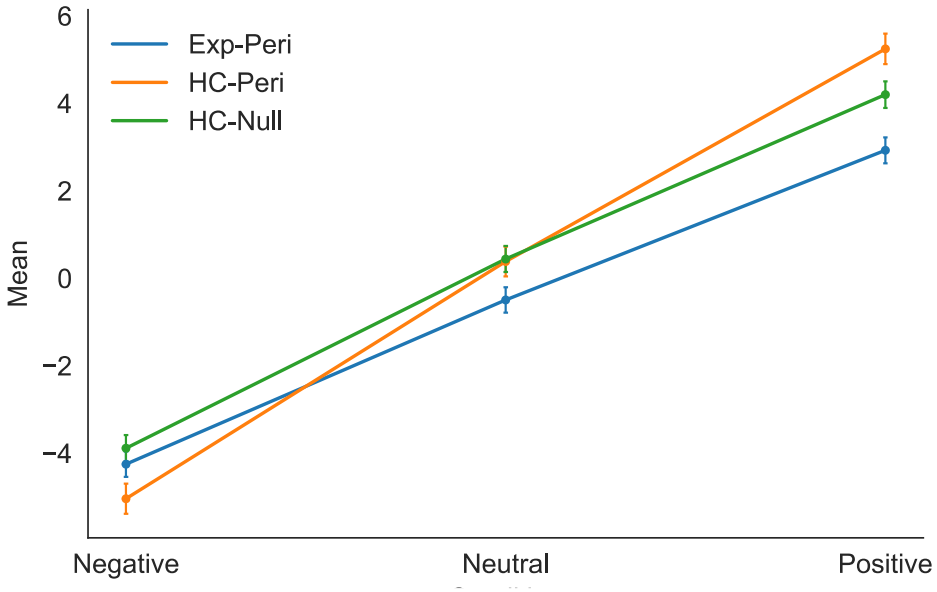

Figure 2. Estimated marginal means of group VAS ratings across sets

In the second model, which incorporated picture content (perinatal vs. non-perinatal), there was a significant three-way interaction between group x set x picture content $F(8,2498.25) = 4.40$, $p < .001$. There were significant simple effects of group for negative perinatal content $F(2,170.29) = 4.3$, $p = .02$, positive non-perinatal content $F(2,156.14) = 12.01$, $p < .001$ and positive perinatal content $F(2,218.07) = 5.92$, $p = .003$. There were no significant simple effects of group for negative non-perinatal content, neutral perinatal content or neutral non-perinatal content. Estimated marginal means and standard errors can be found in Figure 3.

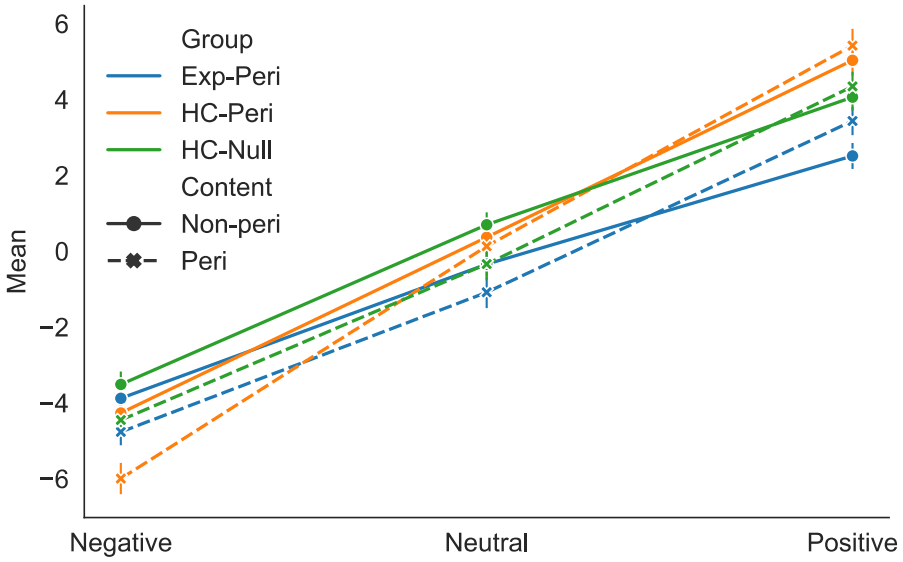

Figure 3. Estimated marginal means of group VAS ratings across sets separated by picture content

2.4.4 Emotional Reactivity Paradigm: PANAS

The MLM analysis revealed a significant group x set interaction in change in Positive Affect $F(4,88.71) = 2.9$, p = .02. The pairwise comparisons revealed that Peri-HC showed significantly more change in response to Negative Stimuli (M = -8.3; SD = 1.5) compared to Peri-Exp (M = -4.5; SD = 1.2; p = .06) and the Null-HC group (M = -4.2; SD = 1.6; p = .04).

The MLM analysis for the change in Negative Affect also revealed a statistically significant interaction effect of group x set $F(4,88.8) = 4.4$, p = .003. Similar to change in Positive Affect, change in Negative Affect was higher in Peri-HC (M = 8.1; SD = 1.3) compared to Peri-Exp (M = 4.0; SD = 1.0; p = .01) and Null-HC (M = 2.4; SD = 1.0; p = .001).

2.4.5 Emotion Regulation

Results of the one-way ANOVA can be found in Table II. There were significant between-group differences in the Reappraisal Subscale of ERQ and emotion dysregulation as assessed

through the DERS. There were also significant between-group differences in the following DERS subscales: non-acceptance of emotions, inability to engage in goal directed behaviours, impulsivity, lack of emotion regulation strategies and lack of emotional clarity.

Table II. Means, Standard Errors, and results of one-way ANOVA

	Exp-Peri		HC-Peri		HC-Null		ANOVA	
	M	*SE*	*M*	*SE*	*M*	*SE*	$F_{(2,46)}$	*p*
ERQ								
$ERQ_{Reappraisal}$	24.7	1.5	30.0	1.8	32.1	1.2	7.2	<.01
$ERQ_{Suppression}$	13.6	1.3	12.1	1.3	14.2	1.4	.6	.57
DERS								
$DERS_{Total}$	94.7	4.5	78.6	5.1	74.6	4.7	5.4	.01
$DERS_{Nonacceptance}$	16.1	1.2	13.2	1.0	14.7	1.9	.8	.45
$DERS_{Goals}$	16.2	1.3	15.4	1.2	12.8	.9	2.4	.11
$DERS_{Impulsivity}$	15.1	1.4	10.9	1.5	9.3	.7	6.2	<.01
$DERS_{Awareness}$	14.3	1.0	12.1	1.0	12.8	1.1	1.2	.31
$DERS_{Strategy}$	21.3	1.4	17.2	1.7	12.4	1.3	6.3	<.01

$DERS_{Clarity}$	11.8	0.9	9.7	0.6	10.7	0.8	1.7	.12

ERQ: Emotion Regulation Questionnaire; DERS: Difficulties with Emotion Regulation Scale

2.4.6 Secondary Measures

The results of the regression analysis reveal that emotion dysregulation (DERS) had a significant negative association with relationship satisfaction, as measured through ADAS (B = -.13, SE = .06, p = .03) in Peri-Exp but not in Peri-HC (B = -.13, SE = .08, p = .13) or Null-HC (B = .06, SE = .05, p = .20). Emotion dysregulation was not significantly associated with parenting sense of competence as captured through PSOC in Peri-Exp (B = -.20, SE = .16, p = .25) or Peri-HC group (B < -.01, SE = .20, p = .97). Emotion dysregulation was not significantly associated with perceived social support, as captured through SPS in Peri-Exp (B = -.17, SE = .14, p = .19), Peri-HC (B = -.05, SE = .15, p = .76), or Null-HC (B = -.15, SE = .10, p = .16). Emotion dysregulation was not significantly associated with bonding captured by the PBQ in Peri-Exp (B = .14, SE = .13, p = .19), or in Peri-HC (B = .03, SE = .12, p = .80).

2.5 Discussion

The current study aimed to investigate differences in emotion reactivity and emotion regulation in three distinct groups: perinatal women with an anxiety and/or depressive disorder, perinatal healthy controls and nulliparous healthy controls. To our knowledge, this study was the first to examine the relationship between emotion dysregulation during pregnancy and postpartum and mental health difficulties for mothers. There were multiple relevant findings from this experiment. Perinatal women with an anxiety and/or depression disorder (Exp-Peri) had a higher

baseline in negative affect and a lower baseline in positive affect compared to perinatal (HC-Peri) and nulliparous (HC-Null) healthy controls. They also had less flexibility in emotional reactivity compared to perinatal healthy controls, particularly for perinatal-themed negative content. Further, perinatal women with anxiety and/or depression disorders reported greater difficulties with emotion regulation despite lower reactivity. Emotion dysregulation in this group was also associated with poorer relationship satisfaction.

Baseline differences in emotional affect, suggest that perinatal women with anxiety and/or depression have a lower baseline in positive affect and a higher baseline in negative affect. This finding is consistent with previous literature suggesting that positive affect may be impaired in individuals with an anxiety and/or depressive disorder (Craske et al., 2019). This is relevant for treatment planning, as incorporating strategies that increase positive affect, rather than focusing solely on decreasing negative affect, may improve treatment outcomes in this population. For example, in non-perinatal adult populations with anxiety and/or depression, there is research to suggest that incorporating strategies in treatment that increase positive affect enhances treatment outcomes (Craske et al., 2019).

The results from the present study also suggest that flexibility of emotion reactivity may be a protective mechanism during the perinatal period specifically. Women in the HC-Peri group showed higher emotional reactivity to positive and negative stimuli compared to both Exp-Peri and HC-Null groups. This is partially consistent that previous research that perinatal women experience heightened emotional reactivity towards both pleasant and unpleasant stimuli (Rosebrock et al., 2015; Wilkinson, 1998). However, our findings suggest that this is specific to HC-Peri and the heightened reactivity theory doesn't hold for the Exp-Peri group. This difference in emotion reactivity was even more pronounced in perinatal-themed negative content. This

finding could be explained through an evolutionary lens. If the purpose of emotions is to motivate action (Gross & Jazaieri, 2014), having a heightened emotional reactivity during this time may be adaptive as it could lead to increased awareness of threats in the environment. Thus, this ensures the protection of the baby, as well as being more attentive and responsive to the baby's needs. Difficulties with emotional flexibility may also help explain why research has found that mothers who experience anxiety and/or depression during this time have difficulties with bonding and responding to their babies (Austin & Priest, 2005). As these results were based on self-report data rather than objective data, another alternative explanation is that women in the Exp-Peri group may be less aware of their emotional intensity. It is worth noting that there were no differences in emotional awareness as captured through the DERS. However, this subscale has been criticized for its low internal consistency (Hallion et al., 2018) and may not be an accurate measure. Nonetheless, these results underscore the importance of incorporating skills in current perinatal treatments that may enhance emotional experiencing such as mindfulness of emotion, recognizing emotional avoidance, and increasing emotional awareness.

In terms of emotion regulation, the findings from this study are in line with our hypothesis that women in the Exp-Peri group would have the most difficulties with emotion regulation. The areas that were specifically impacted included an inability to engage in adaptive reappraisal, an increase in impulsivity and a perceived lack of emotional management strategies. Emotion dysregulation in the current study was also associated with relationship difficulties for women in the Peri-Exp group, which is in line with previous research in non-perinatal populations (Kim et al., 2009). Targeting this variable in treatment may be warranted as parental relationship conflict not only increases stress for mothers but also predicts attachment difficulties and interpersonal conflict in children (Kim et al., 2009). Emotion dysregulation was not associated with parenting

confidence, social support, or mother-infant bonding despite these variables being associated with perinatal anxiety and depression (Affrunti & Ginsburg, 2011; Austin & Priest, 2005; Milgrom et al., 2019). This could be a result of our small sample size or it is possible that these difficulties are better explained by symptoms of anxiety and/or depression rather than emotion dysregulation specifically.

In the current study, we found no differences across groups in physiological reactivity. This is likely due to the methodology used. Although the Polar V800 has been validated for use in research (Giles et al., 2015), the research has focused on capturing RR intervals and calculating heart rate variability rather than capturing heart rate reactivity. It is possible that in our study design participants were presented with the stimuli for too short a time period to see physiological changes as assessed by the Polar V800. Further research in this area would benefit from using more established physiological measures with better emotion recognition algorithms (Jang et al., 2011).

Limitations & Future directions

Although the findings from the current study are important as they provide us with more insight into the profile of emotion dysregulation during the perinatal period, there are multiple limitations in the current study that we would like to acknowledge. The main limitation was our small sample size and the equipment used for the physiological data. Although we chose statistical analyses, such as MLM, to preserve power, interpretations based on small data need to be approached with caution. Our sample also included a mixed group of pregnant and postpartum participants and therefore this study may not be capturing differences in emotion regulation and reactivity between pregnancy and postpartum should these differences exist. Future research would benefit from examining these groups separately. Our study sample was also homogenous

in that the majority of participants were white, married women with university education. Research suggests that there are differences in emotional experience based on ethnicity and socioeconomic background (Durik et al., 2006; Vrana & Rollock, 2010) therefore these findings may not be generalizable to other perinatal populations that do not fit this profile. Lastly, the extent of emotion dysregulation in the Peri-ERS sample was lower compared to a previous study by our team (Agako et al., 2021). It could be that women with more severe emotion dysregulation may not have been willing to participate in experimental research, either due to resources or not wanting to partake in an emotionally provoking task. Of utmost importance, future research will need to focus on replicating these results with a larger, more heterogeneous sample. Further research will be needed to increase the representation of minority groups in research, particularly in this current field. Future research would also benefit from examining potential differences in emotional responses in pregnancy vs. postpartum, should a difference exist, and examine whether the same trends are seen in perinatal women who experience more severe emotion dysregulation. Based on the current findings, future treatment protocols in perinatal populations may also benefit from incorporating skills that focus on increasing reappraisal, decreasing impulsivity and adding a toolkit of different strategies focused on emotion regulation.

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CHAPTER 3: Study 2

The role of emotion dysregulation in cognitive behavioural group therapy for perinatal anxiety: Results from a randomized controlled trial and routine clinical care

Chapter link:

Agako, A., Donegan, E., McCabe, R. E., Frey, B. N., Streiner, D., & Green, S. (2021). The role of emotion dysregulation in cognitive behavioural group therapy for perinatal anxiety: Results from a randomized controlled trial and routine clinical care. *Journal of Affective Disorders. 291*. 517-525. doi: 10.1016/j.jad.2021.05.084

3.1 Abstract

Background: Emotion dysregulation (ED) has been implicated in anxiety disorders and may play an important role in perinatal anxiety Cognitive Behavioural Therapy (CBT) treatment outcomes although there is a dearth of research in this area. The current study investigated the role of ED in perinatal anxiety treatment outcome to determine whether it impacts CBT treatment outcomes and whether CBT reduces ED.

Methods: Secondary analyses were run on a sample of $N = 75$ women participating in a CBT for perinatal anxiety randomized controlled trial (RCT), and $N = 47$ women who received the treatment as part of routine clinical care. Participants completed measures of anxiety, depression and ED at baseline, post-CBT/post-waitlist and 3-month follow-up (CBT-RCT group only). MANOVAs were conducted to determine if level of ED moderates treatment outcomes and whether CBT reduces ED. Reliable and clinically meaningful change was calculated.

Results: Baseline level of ED did not moderate treatment outcomes. There were significant changes in some ED subscales over time in the CBT group compared to waitlist. Changes were reliable and clinically meaningful in 28.6% (RCT) and 16% (routine clinical care) of participants. Participants with high ED at baseline remained in the high range at post-treatment.

Limitations: Limitations include low sample size; homogeneity of sample, use of measures not validated in perinatal populations.

Conclusions: These findings suggest that ED during the perinatal period may be a stand-alone factor that will need to be separately addressed in psychological treatment.

Keywords: Perinatal period, CBT, Anxiety, Emotion Dysregulation

3.2 Introduction

The perinatal period, which is defined as pregnancy and up to 12 months postpartum (Austin, 2003), is a vulnerable time during which women are more likely to experience mental health concerns, particularly anxiety and depressive disorders. In the perinatal period overall, the prevalence rates for an anxiety disorder range from 16.7% to 25.4% (Fawcett et al., 2019). With respect to depressive disorders, the prevalence of depression can be as high as 13.1% during the perinatal period (Woody et al., 2017). Anxiety and depressive disorders have negative consequences for both mothers and their infants. In addition to significant distress, they cause impaired functioning and an increased risk of suicide in the mother (Grigoriadis et al., 2017) and can lead to a decrease in maternal bonding, responsiveness and sensitivity (Tietz et al., 2014). Furthermore, maternal anxiety and depressive disorders can also lead to long-term negative outcomes for the infant including cognitive, emotional, social and behavioural difficulties which can persist into adulthood (Austin & Priest, 2005; Kingston & Tough, 2014). Fortunately, research suggests that several interventions tailored to the perinatal period can help reduce the adverse outcomes of mental health disorders for both mothers and their infants (Austin & Priest, 2005; Grant et al., 2008).

The most common forms of intervention for perinatal mental health include medication and psychological treatments. Psychotropic medication, although effective, is associated with potential negative side effects for both the mother and the baby and, therefore, many women choose not to take this form of treatment during pregnancy and while breastfeeding (Austin & Priest, 2005; Chabrol et al., 2010; Pearlstein, 2008). Considering the negative impact of untreated mental health disorders during the perinatal period, effective psychological treatments are imperative.

The most commonly researched psychological treatments for anxiety and depressive disorders during the perinatal period are Cognitive Behavioral Therapy (CBT) and Interpersonal Psychotherapy (IPT; Loughnan et al., 2018; Nillni et al., 2018; Sockol, 2018). Of these therapies, research has focused on post-partum depression whereas perinatal anxiety research is very sparse, even though anxiety disorders are more prevalent than depressive disorders during this time. The most recent systematic review revealed only five published treatment studies for perinatal anxiety disorders (Loughnan et al., 2018). Three studies examined the effectiveness of in-person group CBT (Green et al., 2015; Lilliecreutz et al., 2010; Misri et al., 2004), one examined internet-based CBT (Nieminen et al., 2016) and one study assessed mindfulness-based cognitive therapy (Goodman et al., 2014). Since 2018, only one more treatment study was published involving an RCT evaluating CBT for perinatal anxiety (Green et al., 2020). All studies have found promising results in targeting perinatal anxiety although a subset of participants across studies did not significantly improve following treatment. Considering the high prevalence of anxiety disorders during the perinatal period and the lack of research, it is critical to focus on factors that may be impacting treatment outcomes to increase treatment effectiveness.

One factor that has been found to contribute to treatment outcomes in non-perinatal populations is emotion dysregulation. Emotion dysregulation is typically used as an umbrella term that describes multiple emotional difficulties including problematic emotion reactivity (i.e., responding to a stimulus with a heightened or attenuated emotional intensity) as well as problematic regulation of emotions (i.e., poor understanding of emotions, negative reactivity to one's emotional state, and maladaptive emotional management responses (Gross & Jazaieri, 2014; Linehan, 1993; Mennin et al., 2007). Emotion dysregulation has been conceptualized to be at the core of both anxiety and depressive disorders, (Gross & Muñoz, 1995; Hofmann et al., 2012;

Mennin et al., 2005; Mennin et al., 2007) and is found to be implicated in treatment outcomes in non-perinatal samples. Specifically, research suggests that emotion dysregulation can negatively impact CBT treatment outcomes. For example, a study on social anxiety disorder by Jazaieri and colleagues (2016) demonstrated that although CBT was effective in increasing adaptive emotion regulation use, it did not have an impact on maladaptive emotion regulation. In addition, they found that maladaptive emotion regulation was a predictor of life satisfaction following treatment (Jazaieri et al., 2016). Emotion regulation (particularly impulse control) has also been found to be a mediator of CBT treatment outcomes for anxiety-related disorders in naturalistic treatment settings (Asnaani et al., 2020), suggesting that adequately targeting emotion dysregulation is important in treating anxiety disorders in general adult populations. In fact, studies have started to show that adding emotion regulation skills in traditional CBT treatments can help enhance treatment outcomes, reinforcing the need for more research in this area (Berking et al., 2013; Fehlinger et al., 2013). This is particularly important with CBT programs that take a more cognitive approach compared to behavioural, as some research suggests that emotion dysregulation is associated with worse treatment outcomes during the cognitive stages of treatment (Aldao et al., 2014). Interestingly, some research demonstrates emotion dysregulation (particularly with respect to anger, irritability, shame and guilt) is a distinct factor that may remain present even when controlling for anxiety and depressive symptoms (Fergus et al., 2010; Moscovitch et al., 2008; Pasquini et al., 2004). These findings suggest that CBT may not be adequate in treating emotion dysregulation in women with perinatal anxiety and there may be a need to incorporate emotion regulation skills into current treatments for perinatal anxiety.

To date, there is no known research on emotion dysregulation and perinatal anxiety. The goal of the current study is to determine 1) the level of emotion dysregulation present in perinatal

anxiety samples, 2) if the severity of emotion dysregulation at baseline moderates treatment outcomes, 3) if CBT is effective in reducing emotion dysregulation in women with perinatal anxiety, and 4) whether changes in emotion dysregulation during CBT are reliable and clinically meaningful.

3.3 Methods

A secondary analysis was conducted on data collected from a randomized controlled trial (RCT) examining the effectiveness of a 6-session Cognitive Behavioural Group Therapy (CBGT) protocol for perinatal anxiety which took place between September 2016 and January 2019 (for RCT results see Green et al., 2020). In addition, pre-post data collected from an emotion dysregulation measure in CBGT for perinatal anxiety treatment offered as part of regular clinical care that took place between January 2019 and May 2020 was also analyzed. This was done to determine whether the results from the RCT were also consistent and generalizable within a more naturalistic setting. Both studies received approval by the Hamilton Integrated Research Ethics Board. Participants from both samples were referred to the treatment program by their clinicians at the Women's Health Concerns Clinic (WHCC) St. Joseph's Healthcare Hamilton – a clinic that specializes in the assessment and treatment of women's mental health during reproductive milestones. Participants provided informed consent for either the RCT or having their data collected for the purposes of research in the routine clinical care groups prior to starting their participation in the CBGT program. In the RCT stream, following a baseline visit, participants were randomized to either the 6-session CBGT condition or the 6-week waitlist condition. Participants completed an assessment again immediately post-treatment/post-waitlist and again at 3-month follow up (for the CBGT condition only).

Data from the routine clinical care sample was collected during the participants' pre- and post-CBGT participation. Patients who are referred to the CBGT program go through a consultation appointment as part of routine clinical procedure to provide them with information about the program and assess goodness of fit. During this appointment, participants consented for their data to be used for the purpose of this study and filled out appropriate questionnaires. Data from questionnaires was also collected shortly after completing the CBGT program.

3.3.1 Participants

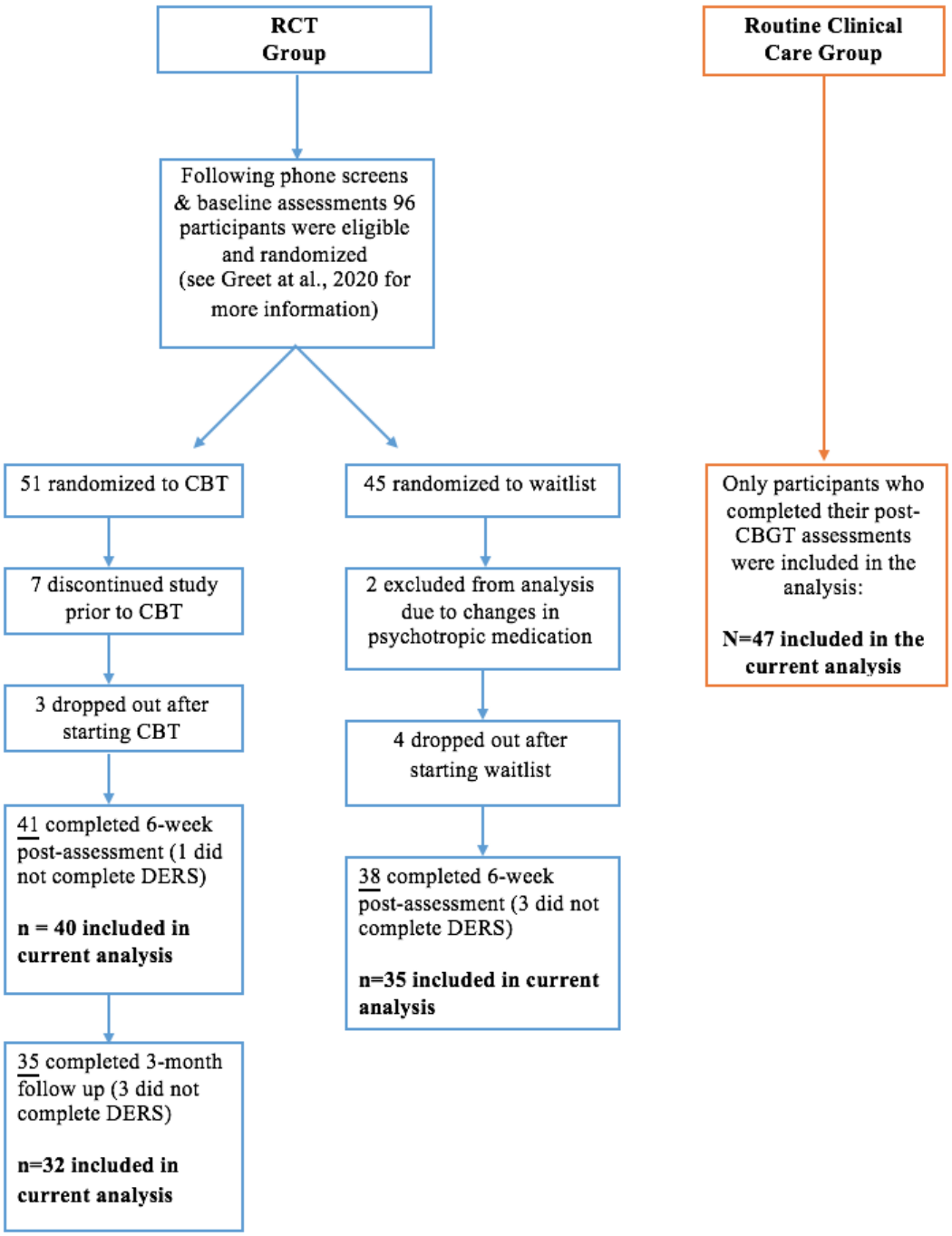

Figure 1: Participant flowchart for RCT and routine clinical care group samples

In the RCT sample, N=96 people were randomized to either CBGT (n=51) or waitlist (n=45). Regarding attrition from the RCT, n=10 participants discontinued the study in the CBGT group (n=7 discontinued prior to starting treatment and n=3 dropped out of CBGT), n=1 did not complete the post-group assessment. In terms of the 3-month follow-up, n=35 completed the assessment and n=3 did not complete the emotion dysregulation measures. In the waitlist condition, n=2 were excluded from analyses due to changes in psychotropic medication, n=4 dropped out during the waitlist period and n=3 did not fill out emotion dysregulation measures at the post-waitlist assessment. No data on attrition was available for the routine clinical care groups. Participants included in the analyses were N = 75 women from the CBGT RCT (n = 40 in the CBGT condition with n = 32 completing the 3 month follow-up; n = 35 in the waitlist condition) and N = 47 women from the CBGT routine clinical care treatment. A completers-only sample was used for the purposes of this paper for both RCT and routine clinical care samples. Participants in the RCT met the following eligibility criteria: (1) 18-45 years old; (2) pregnant or within the first 6 months post-partum; (3) a primary diagnosis of an anxiety disorder with or without co-morbid depressive disorder as determined through the Structured Clinical Interview for *Diagnostic and Statistical Manual of Mental Disorders* (4th ed. DSM-IV; First et al., 1995) with all diagnoses being checked against the Diagnostic and Statistical Manual of Mental Disorders (5th ed. DSM-5; APA, 2013); (4) not taking psychotropic medication or, if taking medication, no change in dose and type of medication for a minimum of 6 weeks before the baseline assessment; (5) no changes in psychotropic medication during the treatment or waitlist period; (6) not receiving concurrent psychological treatment; (7) fluent in English. Participants were excluded if they exhibited: (1) active suicidal ideation and (2) current psychosis and/or substance use disorder. Participants who took part in the RCT were randomized to the CBGT condition (n=40) or the waitlist condition

(n=35) using block randomization with 1:1 allocation ratio and a computer-generated assignment sequence prepared before the beginning of the trial. Participants who discontinued the study, dropped out during CBGT or waitlist period, and participants with missing data, were excluded from the current analyses. Participants in the routine clinical care sample were assessed through a psychiatric interview by their psychiatrists in the WHCC and were eligible if they met the following criteria (1) had a diagnosed anxiety disorder or had anxiety severe enough to warrant treatment as determined by their psychiatrists. Participants were excluded if they exhibited (1) active suicidal ideation and (2) current psychosis and/or substance use disorder.

Table I.

Baseline demographics and clinical characteristics of samples

Baseline Characteristic	RCT N=75 (N_{CBT}=40; N_{WL}=35 n (%)	Routine Clinical Care N=47 n (%)
Age Mean in years (SD)	32.14 (3.67)	30.91 (7.67)
Ethnicity		
African American	1 (1.4%)	n.a.
Asian/Pacific Islander	1 (1.4%)	n.a.
Hispanic/Latin American	2 (2.7%)	n.a.
White/European	68 (90.4%)	36 (76.6%)
Other	3 (4.1%)	4 (8.5%)
Unreported	n.a.	7 (17.5%)
Marital Status		

Single	6 (8.2%)	3 (6.4%)
Married/Common-Law	69 (91.8%)	42 (89.4%)
Unreported	n.a.	2 (4.3%)
Education Level		
High School	7 (9.6%)	2 (4.3%)
Certificate/professional diploma	24 (31.5%)	15 (31.9%)
Bachelor's degree or higher	44 (58.9%)	26 (55.3%)
Unreported	n.a.	4 (8.5%)
Maternal Status		
Pregnant	29 (38.4%)	6 (12.7%)
Postpartum	46 (61.6%)	39 (83.0%)
Unreported	n.a.	2 (45.0%)
Taking psychotropic medication	23 (31.1%)	22 (42.6%)
Psychiatric Diagnoses		
Primary		n.a.
Generalized Anxiety Disorder	65 (86.7%)	
Social Anxiety Disorder	5 (6.8%)	
Panic Disorder	2 (2.7%)	
Other Specified Anxiety Disorder	3 (4.1%)	
Secondary		
Major Depressive Disorder	25 (33.3%)	
Generalized Anxiety Disorder	29 (38.4%)	n.a.
Social Anxiety Disorder	15 (20.3%)	
Panic Disorder	5 (6.8%)	
Agoraphobia	7 (9.5%)	
Obsessive-Compulsive Disorder	1 (1.3%)	
Post-Traumatic Stress Disorder	2 (2.7%)	
Specific Phobia	2 (2.7%)	
Health Anxiety Disorder	1 (1.4%)	

3.3.2 Measures

Baseline characteristics including age, ethnicity, education, marital status, perinatal status (i.e., pregnant, postpartum) and psychotropic medication use were collected at the baseline appointment (see Table I). The following measures were administered during all three time points (baseline, post CBGT/waitlist, 3-month follow up) in the RCT. Only the DERS was used for the routine clinical care CBGT groups at baseline and post-treatment.

Difficulties in Emotion Regulation Scale (DERS; Gratz & Roemer, 2004) is a 36-item self-report questionnaire which captures various emotion regulation difficulties. It is divided into 6 subscales including Nonacceptance of emotional responses, difficulty engaging in goal directed behaviour (Goals), impulse control difficulties (Impulsivity), lack of emotional awareness (Awareness), limited access to emotion regulation strategies (Strategies), and lack of emotional clarity (Clarity). This measure has high reliability with a coefficient alpha value of .93 (Gratz & L. Roemer, 2004). All subscales have high reliability with coefficient alpha values all being higher than .80 (Gratz & Roemer, 2004). Although the DERS does not have official cut-off scores, a cut-off score of 97 has previously been used in the literature to indicate high emotion dysregulation (Neacsiu et al., 2014). This score was derived as it is one standard deviation from the grand mean of control groups in studies using the DERS published prior to 2010 (Neacsiu, 2012) and was used for the purposes of the current analyses. The DERS had a Cronbach's alpha of .83 and .80 in the RCT and routine clinical care samples respectively. The subscale alpha coefficients' for the routine clinical care sample are .91 for Nonacceptance, .82 for Goals, .85 for Impulsivity, .83 for Awareness, .82 for Strategies and .75 for Clarity. The subscale alpha coefficients for the RCT

group are .88 for Nonacceptance, .84 for Goals, .87 for Impulsivity, .83 for Awareness, .78 for Strategies and .77 for Clarity

Emotion Regulation Questionnaire (ERQ; Gross & John, 2003) is a 10-item self-report measure of emotion regulation strategies with two subscales: Re-appraisal and Expressive Suppression. Both subscales are high in reliability with alpha coefficients of .79 and .73 respectively (Gross & John, 2003). The Re-appraisal subscale is associated with greater positive emotion and less negative emotion compared to the Expressive Suppression subscale. Furthermore, the Re-appraisal subscale is positively related to functioning and well-being whereas the Expressive Suppression subscale is negatively related to this factor (Gross & John, 2003). In the RCT sample, the subscales of reappraisal and Expressive Suppression have Cronbach's alpha scores of .89 and .73 respectively.

State-Trait Inventory for Cognitive and Somatic Anxiety (STICSA; Ree et al., 2008) is a 21-item self-report measure of cognitive and somatic anxiety. It is a reliable and valid measure that has been validated in anxiety disorders samples (Ree et al., 2008). It has good internal consistency with alpha coefficients of .88 for the cognitive and somatic subscales and .87 for the overall questionnaire (Gros et al., 2007). A cut-off score of 40 is used as a threshold for potential clinical levels of anxiety (Van Dam, Gros, Earleywine, & Antony, 2013). Cronbach's alpha of the STICSA in the current RCT sample is .91.

Edinburgh Postnatal Depression Scale (EPDS; Cox et al., 1987) is a 10-item self-report measure of depression specifically during the perinatal period. This measure is high in both sensitivity (86%) and specificity (78%) and has a positive predictive value of 73% in a perinatal sample (Cox et al., 1987). A cut-off score of 13 or more is used to indicate probable major

depression in perinatal women (Matthey, Henshaw, Elliott, & Barnett, 2006). Cronbach's alpha of the EPDS in the current RCT sample is .77.

3.3.3 Intervention

The CBGT for perinatal anxiety protocol is a weekly two-hour, 6-session transdiagnostic evidence based group treatment (Green et al., 2020; Green et al., 2019; Green et al., 2015). The cognitive and behavioural strategies included in the treatment were chosen and adapted to address the unique needs of the perinatal population. CBGT includes psychoeducation on perinatal anxiety, cognitive restructuring, problem solving, exposure-based behavioural experiments, behavioural activation, paced breathing, and assertive communication techniques. For a more detailed description of session-by-session content refer to the published protocol/manual (Green et al., 2019)

3.3.4 Statistical Analysis

All data were analyzed using IBM SPSS Statistics Version 23.

Goal 1. Our first goal was to establish level of emotion dysregulation in the current population. Means and standard deviations based on the DERS are reported for both the RCT and routine clinical care samples.

Goal 2. Our second goal was to determine whether emotion dysregulation level at baseline moderates CBGT treatment outcomes on anxiety and depression. This analysis was conducted using the data from the RCT sample. Visual binning allows the creation of categorical variables from a continuous scale variable by equally dividing the sample in each group. This was used to divide baseline scores of DERS into three levels of emotion dysregulation (Low, Moderate, High)

in order to run the following analyses. The conversion of the DERS scores from continuous to a categorical variable with three categories was done in order to 1) allow us to draw more precise conclusions from the results as using three categories preserves power to a greater extent, and 2) allow us to create a visual representation of the data. A 2x2x3 multivariate analysis of variance (MANOVA) was run on the STICSA and EPDS with time (baseline, post-CBGT/Waitlist) as the within-subject variable, and condition (CBGT, waitlist) and level of emotion dysregulation (Low, Moderate, High) as the between-subject variables. All assumptions were met for the MANOVA. The scores for the STICSA were transformed using log10 to meet the normality assumption.

Goal 3. Our third goal was to determine the impact of CBGT on emotion dysregulation as captured through the DERS and ERQ in the RCT sample and the DERS in the routine clinical care sample. In the RCT sample, a 2x2 mixed model ANOVA was run on the TOTAL DERS scores with group (CBGT, waitlist) as the between-subject variable and time (baseline, Post-CBGT/waitlist) as the within-subject variable. The same analysis was conducted using the DERS subscales and this is now reported in Table IV. All data met the assumptions for ANOVA except for the IMPULSIVITY and CLARITY subscales in the RCT sample. The log10 transformation was used to transform the data for these two subscales in order to meet the normality assumption. Since the ERQ did not meet normality assumptions, a non-parametric Friedman test was used to analyze changes in the Re-appraisal and emotion Expressive Suppression subscales in both the CBGT and the waitlist conditions. In the routine clinical care sample, a repeated measures ANOVA was conducted to examine change over time in DERS through treatment.

Goal 4. Our fourth goal was to determine whether changes in emotion dysregulation as captured through the TOTAL DERS score were statistically reliable using the reliable change index (RCI) as outlined by (Jacobson & Truax, 1991) and clinically meaningful using a cut-off

score of 97 on the DERS to indicate high emotion dysregulation (Neacsiu et al., 2014) in both the RCT and routine clinical care samples.

3.4 Results

Goal 1: Establishing level of emotion dysregulation in perinatal anxiety. Refer to Table II for means, standard deviations and the percentage of participants who scored above the 97 cut-off on the DERS. The DERS scores in the current perinatal samples are slightly higher compared to other observed means in samples of adults with anxiety disorders such as: M=82.12; SD=22.21 (Roemer et al., 2009); M=94.81, SD=22. 96 (Salters-Pedneault et al., 2006) but not as high as in adults with Borderline Personality Disorder (BPD) which is characterized as an emotion dysregulation disorder (Linehan, 1993; Glen & Klonsky, 2009). For BPD samples, some observed DERS means are M=120.5 SD=24.2 (Goodman et al., 2014) and M=109.73 SD=24.95 (Osborne et al., 2017).

Table II.

Baseline DERS means, standard deviation, observed range, and percentage scoring above cut-off for both samples

	M	*SD*	Observed Range	Hypothetical Range	% scoring above 97 cut-off
RCT Sample	97.9	21.8	60-140	0-180	53%
Routine Clinical Care Sample	112.2	25.6	70-170	0-180	66%

Goal 2: Emotion dysregulation as a moderator of CBGT treatment outcomes of anxiety, and depression in the RCT sample. There were significant two-way interaction effects of Time (Baseline or Post CBGT/Waitlist) x Condition (CGBT or Waitlist) on the STICSA ($F_{2,70}$ =13.22; p=.001) and on the EPDS ($F_{2,70}$ =18.60; p<.001). In other words, participants in CBGT showed significantly greater reductions on the STICSA and EPDS compared to women in the waitlist condition. There were no significant three-way interaction effects of baseline levels of DERS severity (Low, Moderate, High) x Time (Baseline or Post CBGT/Waitlist) x Condition (CGBT or Waitlist) on the STICSA ($F_{2,70}$=1.89; p=.15), or the EPDS ($F_{2,70}$=.193; p=.83). This suggests participants in the RCT had similar rates of improvement in anxiety and depression through treatment regardless of level of severity of emotion dysregulation at baseline.

Goal 3: Changes in emotion dysregulation over time in CBGT. In the RCT group, a MANOVA was conducted to examine changes in DERS and its subscales with results reported in Table IV. There was a significantly greater improvement in emotion dysregulation severity in the Total DERS score and the Nonacceptance, Goals, Strategies and Clarity subscales in the CBGT group compared to the waitlist condition. There were no significant improvements in the Impulsivity and Awareness subscales over time in CBGT compared to waitlist. Participants with higher emotion dysregulation at baseline continued to score above the high emotion dysregulation cut-off at post-treatment and only slightly below cut-off at 3-month follow-up compared to participants with moderate or low levels of emotion dysregulation at baseline (see Figure 2).

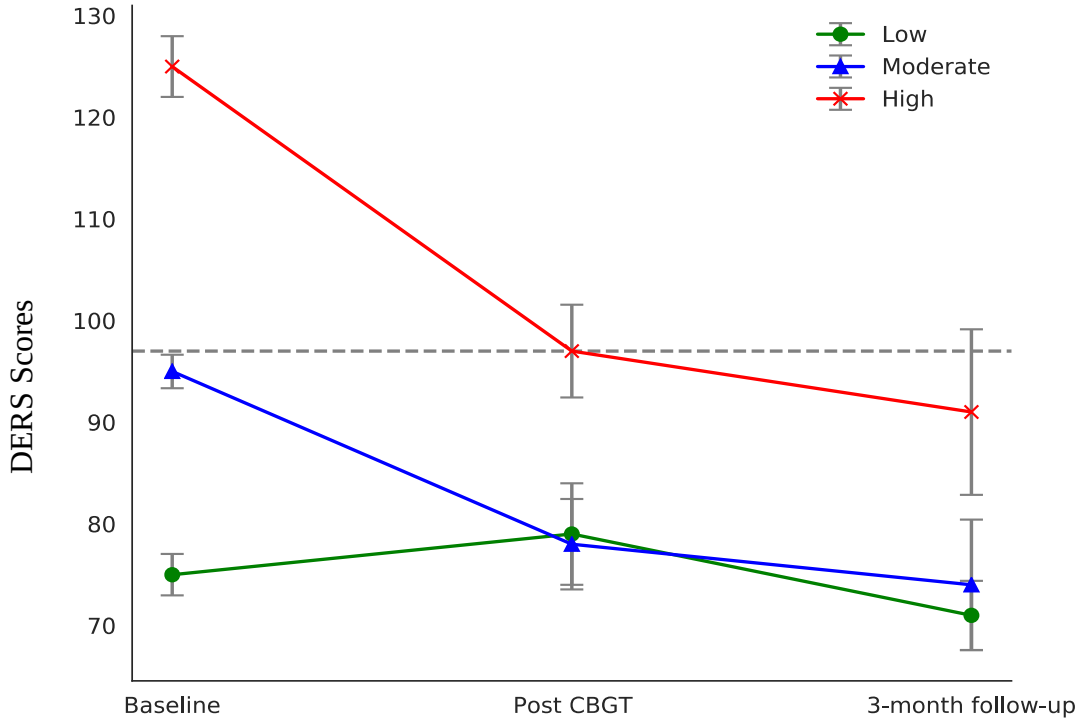

Figure 2: Treatment trajectory of DERS means over time by level emotion dysregulation (Low, Moderate, High) in the RCT group. The horizontal line represents a cut-off score of 97 indicating high emotion dysregulation.

A non-parametric Friedman test of differences was conducted with the ERQ results from the RCT sample. For the *Re-appraisal subscale*, there were significant increases in scores in the CBGT group over time but not in the waitlist condition. Similarly, with respect to the *Expressive Suppression subscale* there were significant decreases in the CBGT group over time and no changes in the waitlist condition. See Table III for results.

Table III.

Friedman test of differences from baseline to post-treatment for ERQ reappraisal and Expressive Suppression scales

	$M(SD)_{Baseline}$	$M(SD)_{post}$	*df*	χ^2	*p*
CBT					
$ERQ_{Reappraisal}$	23.11 (9.0)	30.57 (5.1)	1,28	8.33	.004
$ERQ_{Suppression}$	12.38 (5.6)	10.24 (4.4)	1,42	9.53	.002
Waitlist					
$ERQ_{Reappraisal}$	25.91 (6.5)	25.00 (6.7)	1,22	.05	.83
$ERQ_{Suppression}$	10.46 (4.7)	10.50 (5.4)	1,32	.04	.83

In the routine clinical care sample, a repeated measures ANOVA was conducted to examine changes in DERS over time. There were significant decreases in DERS scores from pre to post-treatment ($M_{Baseline}$= 112.19, $SD_{Baseline}$= 25.64; M_{post}= 96.68, SD_{Post} =19.19 ; F^2 (1,46)= 20.54, p<.001, $\eta^2_{partial}$=.31). Figure 3 plots DERS scores over time separated by level of emotion dysregulation. As illustrated, although there are significant differences in DERS scores pre to post-treatment, participants with moderate-to–high emotion dysregulation at baseline continued to score above the high emotion dysregulation cut-off at post-treatment compared to participants with low of emotion dysregulation at baseline (see Figure 3).

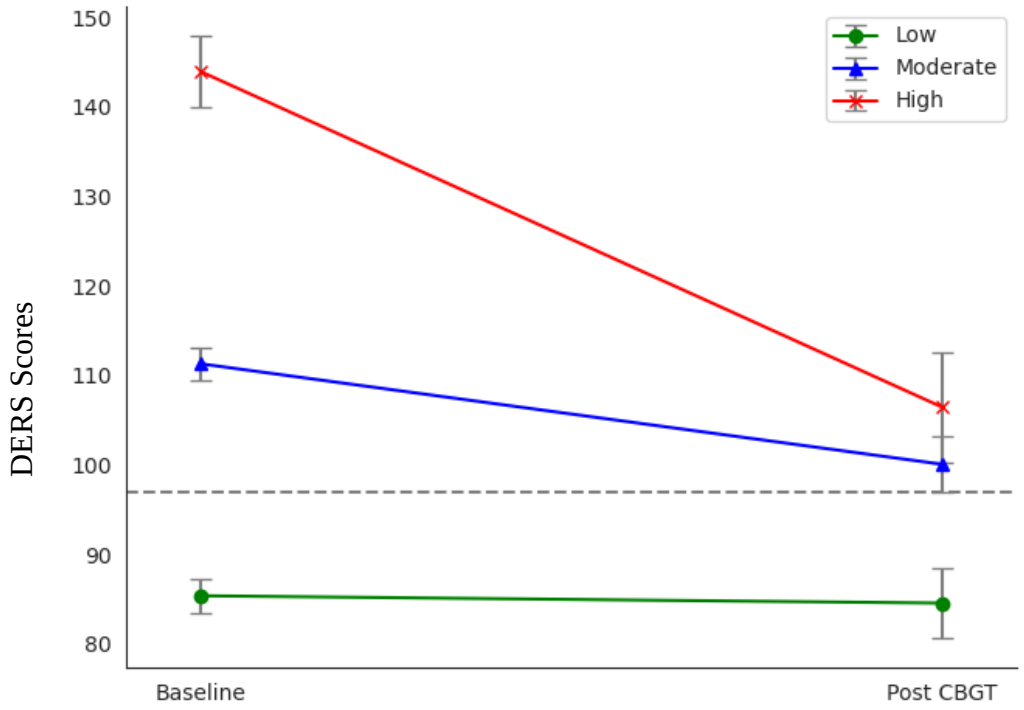

Figure 3: Treatment trajectory of DERS means over time by level of emotion dysregulation (Low, Moderate, High) in the routine clinical care sample. The horizontal line represents a cut-off score of 97 indicating high emotion

Goal 4: Reliable and clinical change in emotion dysregulation in the RCT and routine clinical care samples. To determine whether changes in DERS through treatment were both statistically reliable and clinically meaningful, the clinically reliable change index (RCI) was calculated as in Jacobson & Truax (1991). This calculation uses the consistency of the sample and the standard error of the difference scores to derive reliable change. An RCI score of 27 points or greater was calculated to capture reliable change in the DERS for the RCT which is summarized in Figure 4. Using an RCI of 27 points in the RCT-CBGT group, 20% showed a reliable improvement, 77.5% of participants showed no reliable change, and 2.5% showed a reliable worsening in their symptoms. Furthermore, a reliable clinical change was defined as an RCI score of 27 and scoring below a cut-off score of 97 at post-treatment. 15% of the total sample showed

reliable clinical change in DERS scores following CBGT in the RCT sample. When examining participants who scored above the clinical cut-off at baseline in the RCT sample (n=21, 53%), 28.6% showed reliable and clinical improvement. In the routine clinical care sample, an RCI score of 31 points was calculated to capture reliable change. 12.8% displayed reliable and clinical improvement and 87.2% of participants displayed no change. In the routine clinical care sample, *n*=31 (66%) scored above the clinical cut-off at baseline, and 16% of those participants demonstrated both reliable and clinical change.

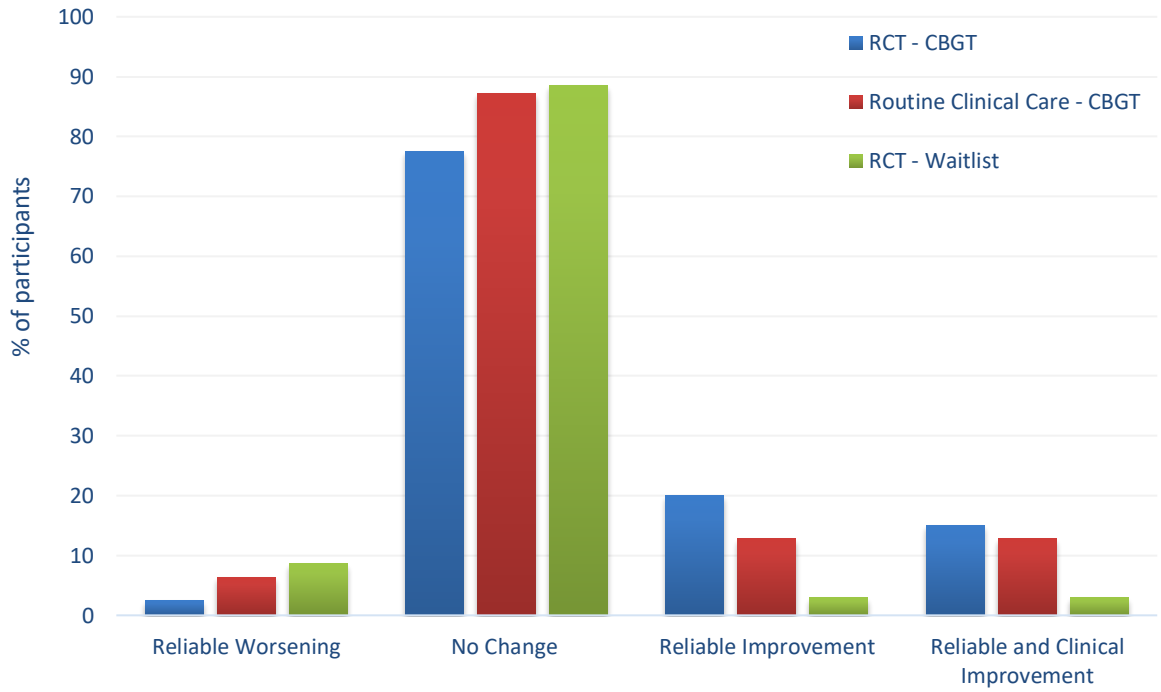

Figure 4: Reliable and clinical change in DERS scores in RCT and routine clinical care samples

Table IV.

Mixed Model ANOVA comparing CBGT (n=40) to waitlist (n=35) on outcomes from baseline to post CBGT/waitlist in the RCT.

	CBGT		Waitlist					
	Baseline *M*(*SD*)	Post-CBGT *M*(*SD*)	Baseline *M*(*SD*)	Post-Waitlist *M*(*SD*)		*F*(1,73)	*p*-value	η^2_p
DERS Total Score	100 (22.6)	85.10 (18.9)	95.43 (20.9)	97.50 (22.8)	Time	8.14	<.01	.10
					GroupXTime	14.20	<.001	.16
Nonacceptance	17.40 (5.7)	13.25 (4.5)	15.97 (5.2)	16.40 (6.0)	Time	8.84	<.01	.11
					GroupXTime	13.39	<.001	.16
Goals	16.55 (4.1)	14.42 (4.6)	15.51 (4.6)	16.57 (4.2)	Time	1.31	.26	.02
					GroupXTime	11.63	<.01	.14
Impulsivity	14.58 (5.1)	13.38 (6.3)	12.63 (4.8)	12.64 (4.7)	Time	.805	.37	.01
					GroupXTime	.853	.36	.01
Awareness	14.38 (4.4)	13.02 (4.3)	15.51 (4.3)	15.20 (4.6)	Time	4.37	.04	.06

					GroupXTime	1.69	.20	.02
Strategies	20.55 (6.3)	17.17 (4.6)	19.40 (5.5)	19.85 (6.3)	Time	5.37	.03	.07
					GroupXTime	9.26	<.01	.11
Clarity	11.3 (3.4)	9.4 (2.4)	11.05 (3.2)	11.23 (3.6)	Time	5.70	.02	.08
					GroupXTime	8.3	<.01	.10

ANOVA: analysis of variance; CBGT: group cognitive behavioural therapy for perinatal anxiety; η^2_p: partial eta-squared; DERS: Difficulties in Emotion Regulation Scale. The analyses on DERS Total Score and subscales were conducted separately.

3.5 Discussion

To our knowledge, this is the first study to examine emotion dysregulation in the context of perinatal anxiety and on treatment outcomes among women receiving cognitive behavioural therapy for perinatal anxiety. The results suggest that severity of emotion dysregulation prior to treatment does not have an impact on CBGT for perinatal anxiety treatment outcomes. Women had similar improvement rates in anxiety and depressive symptoms regardless of the severity of their emotion dysregulation at baseline. This is a promising result as women with a primary anxiety disorder in the perinatal period, regardless of their level of emotion dysregulation, will likely benefit from CBGT treatment and find relief from anxiety and depressive symptoms. This is particularly important because clinicians may possibly be more inclined to refer women with perinatal anxiety to a DBT skills groups instead of CBGT for perinatal anxiety, if presenting with high levels of emotion dysregulation, which is problematic due to the longer waitlists for these programs in healthcare settings.

When examining the impact of CBGT on emotion dysregulation, overall it appears that CBGT had a positive impact on perinatal women's ability to regulate emotion compared to no treatment. Specifically, by the end of CBGT perinatal women were using more adaptive emotion regulation strategies (e.g., Re-appraisal of emotionally provoking situations) and experienced a reduction in maladaptive emotion regulation strategies (e.g., the Expressive Suppression of emotions) compared to the waitlist condition. Furthermore, women who participated in CBGT demonstrated a significant increase in acceptance of emotions and goal directed behaviour while experiencing high emotions, as well as reporting having access to more emotion regulation strategies and more clarity in their emotions compared to no-treatment. These findings suggest that

CBGT may have a positive impact on emotion dysregulation in women experiencing perinatal anxiety. If emotion dysregulation is at the core of anxiety disorders as has been previously proposed (Gross & Muñoz, 1995; Hofmann et al., 2012; Mennin et al., 2005; Mennin et al., 2007) then treating the emotion dysregulation may also lead to changes in anxiety. More research is needed to understand this relationship and whether changes in anxiety and depression through CBGT for perinatal anxiety are a result of treating the emotion dysregulation.

Although there were statistically significant differences in emotion dysregulation in the CBGT group compared to waitlist, however, the improvements in the CBGT condition were not large enough to be statistically reliable or clinically meaningful for the majority of participants. In the subset of participants who scored above the cut-off on the DERS at baseline, 28.6% showed reliable and clinically meaningful improvement in the RCT sample. This percentage was even lower in the routine clinical care sample where only 12.8% of participants with high emotion dysregulation demonstrated reliable and clinically meaningful change. This suggests that further treatment is warranted to target emotion dysregulation, particularly in routine clinical care, where the presence of co-morbidities may add unique challenges in delivering the treatment and impact outcomes.

Additionally, participants did not show any significant improvements in subscales of Awareness of emotion or Impulsivity when scoring above the clinical cut off on the DERS. The Awareness subscale of the DERS has been previously criticized for its low internal consistency and has been proposed to be removed from the questionnaire (Hallion et al., 2018). The reliability of the subscale could be impacting the results of this subscale, although this subscale showed acceptable reliability in our samples. These findings do support the idea that more skills are needed to properly address impulsivity and emotional awareness in the perinatal population. Finally, when

participants were separated into low, moderate and high emotion dysregulation groups, women in the high emotion dysregulation group remained above the clinical cut-off at post-treatment. There was a slight improvement in emotion dysregulation from post-treatment to the 3-month follow up in women with high emotion dysregulation at baseline, suggesting that with more practice of the CBT techniques, women can more effectively use these strategies to regulate emotions. Additionally, on average, women who experienced high emotion dysregulation at baseline still scored very close to the clinical cut-off at the 3-month mark suggesting that they may need more effective strategies for regulating emotions than what CBGT provides. This is especially important in routine clinical care where the baseline emotion dysregulation is even higher than in the RCT. Therefore, for women with more severe emotion dysregulation during the perinatal period, CBT for perinatal anxiety alone appears not to be sufficient to provide relief from emotion dysregulation.

These findings are consistent with research that suggest that emotion dysregulation may be a stand-alone factor (Fergus et al., 2010; Moscovitch et al., 2008; Pasquini et al., 2004) as it remains present and continues to contribute to distress even when the primary disorder has been adequately treated. This is problematic as difficulties with emotion dysregulation are associated with poorer psychosocial functioning, quality of life, and psychiatric distress (Ball et al., 2013; Bradley et al., 2011; Hennin et al., 2007; Juretić, 2018; Rottenberg et al., 2002) Even though women are improving in their primary anxiety symptoms, they may continue to struggle in other important areas of functioning. These findings support the need for treatments that specifically target emotion dysregulation during the perinatal period to reduce distress and increase functionality.

A limitation to the current study is the low sample size. Our current sample is small for a moderation analysis and as such the null moderation results may be due to insufficient statistical power. Further research in larger samples is needed to rule out emotion dysregulation as a moderator of treatment outcomes in women with perinatal anxiety. Another limitation is that, we only included treatment completers in the current analyses. Further, the homogeneity of perinatal women in our current sample with respect to their socioeconomic and ethnic background is also a limitation. We do not have any information as to whether the results would translate to perinatal women outside of these backgrounds and therefore the generalizability of our study is limited. Other identified limitations with the current study include the sole examination of emotion dysregulation in the context of treatment for perinatal anxiety. The role of emotion dysregulation in treatment outcomes in other mental health disorders during the perinatal period, such as depressive disorders, remains unknown. Additional research is needed to understand whether emotion dysregulation is truly a stand-alone factor (i.e., distinct from symptoms of anxiety and depression) in the perinatal period, as these results suggest, or whether it is a trans-diagnostic risk factor that contributes to the development of anxiety and depressive disorders during this time. Further, the DERS, which was our main measure of emotion dysregulation, has not been validated in perinatal populations. As a result, the cut-offs and norms that have been found in other validation studies, and used here, may not be accurately representative of the perinatal population. In addition, quality of life or psychosocial functioning was not investigated. Although research on emotion dysregulation and mental health in other populations suggests an important relationship between ED and impaired functioning (Ball et al., 2013; Bradley et al., 2011; Hennin et al., 2007; Juretić, 2018; Rottenberg et al., 2002), we do not know the role of emotion dysregulation and quality of life or functioning in a perinatal population specifically. Future research would benefit from

examining this relationship in order to target it properly through treatment. Lastly, this paper only focused on psychological treatments, more specifically only CBT for perinatal anxiety. Further investigation is needed on how different evidence-based treatments for perinatal psychiatric disorders such as IPT or medication may impact emotion dysregulation in this population.

Conclusion

Overall, the current findings 1) suggest that women can benefit from CBT for perinatal anxiety regardless of level of emotion dysregulation, making it a treatment that can benefit a broad range of perinatal women, and 2) provide us with more insight on the effectiveness of CBT for perinatal anxiety on emotion dysregulation. The findings reported here also support the need to target emotion dysregulation as a separate factor in treatment of women with perinatal anxiety.

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CHAPTER 4: Study 3

A pilot study examining the effectiveness of a short-term, DBT informed, skills group for emotion dysregulation during the perinatal period

Chapter link:

Agako, A., Burckell, L., McCabe, R. E., Frey, B. N., Barrett, E., Silang, K., & Green, S.M. (2022). A pilot study examining the effectiveness of a short-term, DBT informed, skills group for emotion dysregulation during the perinatal period. *Psychological Services.* Advanced online publication. doi: 10.1037/ser0000662

4.1 Abstract

Background: The perinatal period (pregnancy and the first year postpartum) is a time of increased vulnerability to mental health difficulties including emotion dysregulation. Research conducted on treatments targeting emotion dysregulation during this time is limited. Dialectical Behavioural Treatment (DBT) skills groups are considered the gold standard for targeting emotion dysregulation. We developed and evaluated the effectiveness of a 7-session DBT informed skills group (Peri-ERS) tailored to meet the unique emotion dysregulation experienced by women within the perinatal period.

Methods: N=41 perinatal women participated in the Peri-ERS group within the Women's Health Concern's Clinic, St. Joseph's Healthcare Hamilton. Participants completed a semi-structured assessment to determine eligibility. They completed self-report symptom measures at baseline, sessions 1-6, and at post-treatment assessments. Paired samples t-tests, Cohen's *d* and Friedman's rank tests were run to examine change over time. Reliable and clinical change index (RCI) analysis was conducted on emotion dysregulation.

Results: Participants demonstrated significant improvements in all symptom domain measures. 48% of participants exhibited reliable clinical change on emotion dysregulation.

Conclusions: These findings suggest the Peri-ERS group is effective in reducing emotion dysregulation symptoms for perinatal women. These results are promising as this novel treatment addresses a gap in the literature and may potentially be implemented in women's health clinics as a way of improving overall perinatal care.

Keywords: Perinatal, DBT, Emotion Dysregulation, Skills Group

4.2 Impact Statement

The perinatal period, which encompasses pregnancy and postpartum, is a period of vulnerability during which women are more likely to experience mental health concerns including emotion dysregulation. There is a dearth of research into evidence based treatments for emotion regulation during this time which we aim to address in this study. Our short-term protocol for treating perinatal emotion dysregulation shows promise in its effectiveness and feasibility to be implemented in women's healthcare settings.

4.3 Introduction

Research suggests that women are at an increased risk of experiencing mental health difficulties during the perinatal period, which includes pregnancy and up to 12 months post-partum (Austin, 2003). Recent systematic reviews estimate that 16.7%-25.4% of perinatal women develop an anxiety disorder (Fawcett et al., 2019) and 11.9 develop depression (Woody et al., 2017). This is concerning as the presence of mental health difficulties during pregnancy and postpartum may lead to adverse outcomes in both mothers and infants. For instance, mental health difficulties during this time cause significant distress and impaired functioning in the mother, including an increased risk of suicide, and poorer maternal bonding, responsiveness and sensitivity (Grigoriadis et al., 2017; Tietz et al., 2014). Maternal mental health issues also have negative implications for the infant including cognitive, emotional, social, and behavioural difficulties with potential long-term outcomes persisting throughout adulthood (Austin & Priest, 2005). Considering the negative impact perinatal mental illnesses have on both mothers and their infants, treatment protocols that adequately target a broad range of mental health difficulties are imperative.

Although recently research has focused on treatments for common mental health conditions during this time such as perinatal depression (Stuart & Koleva, 2014) and perinatal anxiety (Green et al., 2020), research on emotion dysregulation is very sparse. This is problematic as often emotion dysregulation has been linked to various psychopathological disorders including anxiety and depression in the general adult population (Gross & Jazaieri, 2014; Mennin et al., 2007) and remains even after treatment for anxiety and depressive disorders (Fergus et al., 2010; Moscovitch et al., 2008; Pasquini et al., 2004). Emotion dysregulation has been used as the umbrella term for explaining various emotional difficulties, including problematic emotional reactivity (i.e., responding to a stimulus with a heightened or attenuated emotional intensity) and problematic

regulation of emotions (i.e., poor understanding of emotions, negative reactivity to one's emotional state, and maladaptive emotional management responses; (Gross & Jazaieri, 2014; Linehan, 1993; Mennin et al., 2007). The few studies that have examined emotion dysregulation during the perinatal period suggest that treatment-seeking women during this time may experience higher levels of emotion dysregulation than other treatment-seeking non-perinatal populations (Agako et al., 2021). Further, in addition to the significant distress experienced by the mother, emotion dysregulation also leads to a decrease in supportive parenting and can lead to emotion dysregulation in their children (Morelen et al., 2014). These findings underscore the important need for therapeutic interventions to address maternal mental health issues.

Cognitive Behavioural Therapy (CBT) is the first line treatment for a number of mental health difficulties (Stewart & Chambless, 2009). CBT is a psychological treatment that uses strategies such as cognitive restructuring, psychoeducation, exposures, behavioural experiments and problem solving to address symptoms associated with various psychiatric disorders (Wenzel, 2017). CBT based protocols have been recently developed to address the unique needs of women during the perinatal period including perinatal depression (Stuart & Koleva, 2014) and perinatal anxiety (Green et al., 2020). However, in non-perinatal adult populations, emotion dysregulation (particularly with respect to anger, irritability, shame and guilt) is a distinct factor that persists following CBT for anxiety and depressive disorders (Fergus et al., 2010; Moscovitch et al., 2008; Pasquini et al., 2004) suggesting that CBT may not be adequate in targeting emotion dysregulation. Further, a recent study examined changes in emotion dysregulation in the context of CBT for perinatal anxiety (Agako et al., 2021). The CBT for perinatal anxiety protocol used in this study was based on the published protocol by Green and colleagues (2019) and consists of six weekly sessions of CBT. The results from the study suggest that CBT may be effective in treating low to

moderate levels of perinatal emotion dysregulation, but not sufficient in addressing more severe presentations (Agako et al., 2021), although more research is needed to corroborate these results. These findings suggest that a specific treatment, outside of what current standard CBT-based programs for mood and anxiety symptoms provide, is warranted to effectively target high levels of emotion dysregulation during the perinatal period.

Currently, Dialectical Behavioural Therapy (DBT) is the most evidence-based treatment targeting emotion dysregulation and includes skills such as mindfulness, emotion regulation, distress tolerance, and interpersonal effectiveness (Linehan, 1993). Standard DBT was originally developed as a treatment for Borderline Personality Disorders and suicidal behaviours and it consists of weekly individual therapy, weekly skills group training, 24/7 phone coaching and a consultation team for the therapists (Linehan, 1993). Since its initial development, DBT has been adapted for use with multiple mental health conditions in which emotion dysregulation is present including post-traumatic stress disorder (Steil et al., 2011), eating disorders (Brown et al., 2020), and treatment resistant depression (Harley et al., 2008) among others. Additionally, the DBT skills group as a standalone treatment has been found to be sufficient in treating symptoms in individuals without a personality disorder and DBT skills groups have been adapted for use with different mental health conditions and consist of different lengths (Valentine et al., 2015). A systematic review was conducted by (Hall et al., 2016) on mindfulness interventions during the perinatal period and included DBT skills in their review. They found that no DBT informed treatment programs have been developed to be used with perinatal populations. Even with respect to mindfulness-based treatments, they concluded that due to a lack of high quality research no recommendations could be made about the effectiveness of mindfulness to promote perinatal mental health.

Since this review, two studies have been published examining the effectiveness of a DBT informed skills group within the perinatal period. The first study examined a 12 week, stand-alone DBT skills group delivered to 21 women in the perinatal period who were experiencing transdiagnostic emotion dysregulation (Wilson & Donachie, 2018). Measures of distress and emotion regulation were given to participants before and after the group. Fourteen (67%) participants completed the group and the findings demonstrated a decrease in emotion dysregulation and distress. The second study examined the effectiveness of a 13-week DBT informed skills group for treating depression in perinatal adolescent (Mean Age=19.24; SD=1.30) women (Kleiber et al., 2017). A total of 13 of the 25 (52%) women completed the group with results showing treatment was helpful in reducing depressive symptoms. These studies are promising as they demonstrate that DBT informed protocols may be effective in improving depression, emotion regulation and distress in the perinatal period. However, both studies have a major design flaw in that they did not use standard, well-validated measures to capture emotion dysregulation, making the findings difficult to interpret and generalize. Further, both studies had a high dropout rate in these programs, and one explanation for this is potentially the length of the treatment group. Research suggests that clients are likely to underestimate the number of sessions needed and, if their expectations are for a shorter treatment, it can lead to drop-out (Mueller & Pekarik, 2000). It is worth noting that the reasons for the adolescent sample dropout rates may be slightly different and include other factors. However, we do know that the greatest barrier for treatment of perinatal women specifically is "lack of time," which 65% of women report (Goodman, 2009). Despite the length of the groups in both the studies mentioned above being shorter than the standard 26-session DBT skills group, participants may have still found the 12 and

13 week treatments as not feasible during this time. This may highlight the need for a shorter, yet effective, and evidence-based treatment option, which may be more feasible with this population.

Therefore, the goal of the current pilot study was to examine the effectiveness and feasibility of a short-term, 7-session DBT informed perinatal emotion regulation skills group (Peri-ERS Group), in treating transdiagnostic perinatal emotion dysregulation. This study took place within the Women's Health Concerns Clinic, a specialized outpatient women's mental health clinic. The WHCC is a publicly funded, multidisciplinary clinic within St. Joseph's Healthcare, Hamilton, a teaching hospital that specializes in the assessment and treatment of women's mental health during reproductive milestones (e.g., perinatal period, menopausal transition, menstrual cycle). In addition to the clinical services offered, the WHCC provides clinical training and has an active research program (Caropreso et al., 2020). Specifically, we were interested in examining the impact of the Peri-ERS intervention on symptoms of emotion dysregulation as well as levels of anxiety and depression. We hypothesized that participants who went through the Peri-ERS treatment would demonstrate significant improvements in emotion dysregulation and other symptoms measures. We also hypothesized that a higher percentage of participants would demonstrate reliable clinical change in emotion dysregulation compared to what is previously seen with perinatal CBT treatments (Agako et al., 2021). As the COVID-19 pandemic occurred over the course of this study, a secondary aim of this study was to examine the effect of shifting treatment format from in-person group therapy to virtual group therapy on treatment outcomes. In-line with previous research, we hypothesized no differences in effectiveness between the in-person groups and the virtual groups (Fernandez et al., 2021) The results from the study will aid in program development within the WHCC clinic, as it may allow for the inclusion of an evidenced-based treatment protocol for emotion dysregulation during the perinatal period, a service not

previously provided. These results may also be relevant for other perinatal mental health programs more broadly, since emotion dysregulation is commonly observed in perinatal mental health settings.

4.4 Methods

4.4.1 Procedure

This study took place within the Women's Health Concerns Clinic (WHCC), St. Joseph's Healthcare Hamilton between May 2019 and January 2021 and received approval by the Hamilton Integrated Research Ethics Board (HiREB). Pregnant and postpartum women were referred to the Peri-ERS group by their clinicians (e.g., psychiatrists, social workers, registered nurses,) within the WHCC. Patients first took part in a phone screen during which they were provided with information about the study and responded to brief questions to determine goodness of fit for group. Eligible patients (see below for eligibility criteria) were booked for an initial baseline appointment. During the baseline assessment, informed consent was obtained and the Mini International Neuropsychiatric Interview (Sheehan et al., 1998), a semi-structured clinical interview to capture psychiatric diagnosis was administered. If eligible, participants were then asked to complete a baseline questionnaire battery prior to starting the treatment group. Study data were collected and managed using REDCap (Research Electronic Data Capture) electronic data capture tools hosted at St. Joseph's Healthcare Hamilton (Harris et al., 2019; Harris et al., 2009). REDCap is a secure, web-based software platform designed to support data capture for research studies, providing 1) an intuitive interface for validated data capture; 2) audit trails for tracking data manipulation and export procedures; 3) automated export procedures for seamless data downloads to common statistical packages; and 4) procedures for data integration and

interoperability with external sources. Session-by-session measures were collected at sessions one to six and the same pre-treatment questionnaire battery was administered following session seven. Participants either filled out these questionnaires on paper which were then stored in REDCap or were emailed a link to the questionnaires through REDCap. An individual post-treatment assessment was conducted following group to evaluate progress and discuss strategies for maintaining treatment gains. The COVID-19 pandemic started halfway through our study and as a result, we switched from offering group treatment in person to a virtual platform that was compliant with the Personal Health Information Protection Act (PHIPA). As a result, the first three groups occurred in-person, one group was a hybrid of four sessions in-person and three sessions virtual, and the remaining three groups occurred virtually.

4.4.2 Participants

Participants (N=41) eligible for the trial were placed on the waitlist for the next available group. Six participants discontinued the study prior to starting the group primarily due to scheduling issues and four participants dropped out after starting the group. Of the total sample, 31 participants (refer to Table I for demographic information) completed the group and were included in the analyses (refer to Figure 1 for participant flow). Each group consisted of a range of three to seven participants. The group was capped at seven participants to ensure adequate time to problem solve skill use with each group member. Participants were included if they met the following criteria: 1) an outpatient at the Women's Health Concerns Clinic; 2) within the perinatal period (pregnant up to one year postpartum); 3) have significant difficulties with emotion dysregulation as determined through a semi-structured clinical interview at the baseline appointment (see below); and 4) sufficiently fluent in English to understand and actively participate in group discussion and complete written homework practice worksheets. Participants

were excluded if they 1) were clinically deemed at high risk of an imminent suicide attempt; 2) were in an active psychotic episode; and 3) had a history of drug or alcohol use disorder, particularly dependence, within the last 6 months prior to baseline. Participants who were on psychotropic medication prior to entering the study were asked to not make changes to their dose while in the study to minimize medication effects. Significant emotion dysregulation was defined as either difficulty with high emotional sensitivity, high emotional reactivity in response to emotionally provoking situations, prolonged return to emotional baseline or engaging in impulsive problematic behaviours in response to high emotions (Linehan, 1993). If these symptoms caused significant distress or impairments in functioning at the time of the baseline visit as assessed by the clinical interview, then participants were deemed eligible for the study. This definition was also presented to other referring clinicians in order for them to make the appropriate referrals.

4.4.3 Measures

Screening measures.

The Mini International Neurocognitive Interview (MINI; Sheehan et al., 1998) is a quick and structured diagnostic interview based on the DSM and ICD criteria for psychiatric disorders. It has good reliability and validity and it is preferred over other structured interview tools as it is faster to administer (Sheehan et al., 1998).

An Emotion Dysregulation semi-structured clinical interview was developed for the purposes of this study and administered to screen for the presence of emotion dysregulation. The clinical interview included structured questions about the type, frequency, duration, onset of emotional difficulties based on the Linehan (1993) definition of emotion dysregulation, as well as whether the difficulties caused clinically significant distress and impairments for participants.

Borderline Symptom Severity List (BSL; Bohus et al., 2007) is a 23-item measure which was used at the screening appointment to clinically assess risk and problematic behaviours as well as to capture possible symptoms borderline personality disorder within the sample. This measure has high internal reliability (*a* = .97), high test-retest reliability, and good validity. Moreover, it is a measure which is sensitive to changes in borderline symptom impairment. The mean score of items is taken and the following scale is used to interpret results: none or low: 0–0.3; mild: 0.3–0.7; moderate: 0.7–1.7; high: 1.7–2.7; very high: 2.7–3.5; and extremely high: 3.5–4. (Kleindienst et al., 2020). Those who score in the high to extremely high category are more likely to have experiences consistent with individuals diagnosed with BPD and were identified as such in Table I.

Measures delivered at baseline and post-treatment.

The following measures were selected as they are the mostly widely used, accepted, and reliable measures when it comes to capturing the constructs they represent.

State-Trait Inventory for Cognitive and Somatic Anxiety (STICSA; Ree et al., 2008) is a 21-item self-report measure of cognitive and somatic anxiety. This measure has excellent split-half reliability (*a* = .87 for the cognitive factor and *a* = 84 for the somatic factor) and adequate convergent and discriminant validity. This questionnaire was used to capture the cognitive and physiological/somatic symptoms of anxiety.

Edinburgh Postnatal Depression Scale (EPDS; Cox et al., 1987) is a 10-item self-report measure of depressive symptoms in the past week specifically used during the perinatal period. Higher scores on this measure indicate increased depressive symptoms, and scores of 13 or greater indicate the cut-off for probable depression in perinatal women. The measure has adequate split-

half reliability (a = .87), and it has been found to have good validity in perinatal populations (Beck & Gable, 2001; Kozinszky & Dudas, 2015). This questionnaire was used to measure whether the Peri-ERS group is associated with changes in depression symptoms.

Emotion Regulation Questionnaire (ERQ; Gross & John, 2003) is a 10-item self-report measure of two emotional regulation strategies: expressive suppression and reappraisal. The measure has been found to have acceptable internal reliability (a = .79 for Reappraisal and a = .73 for Suppression), good test-retest reliability, and acceptable convergent and divergent validity. This questionnaire was used to capture the strategies that participants have access to in order to regulate their emotional experiences and to measure whether the Peri-ERS group is associated with changes in these emotion regulation strategies.

Difficulties in Emotional Regulation Scale (DERS; Gratz & Roemer, 2004) is a 36-item self-report questionnaire which captures various emotion regulation difficulties. It is divided into 6 subscales which impair emotion regulation including non-acceptance of emotional responses, difficulty engaging in goal directed behaviour, impulse control difficulties, lack of emotional awareness, limited access to emotion regulation strategies, and lack of emotional clarity. The DERS has high internal consistency (a = .93), good test-retest reliability, and adequate construct and predictive validity. This questionnaire was used to assess changes in emotion dysregulation through the Peri-ERS group. A cut-off score of 97 or higher on the DERS was used for the analyses to indicate high emotion dysregulation (Neacsiu, 2012; Neacsiu et al., 2014).

Measures delivered at baseline, sessions one through six, and post-treatment.

Emotion Dysregulation Scale (EDS; Powers et al., 2015) is a 12-item measure of emotion dysregulation. It has a high internal consistency with Cronbach's alpha's ranging from .93 to .95

and good construct validity (Powers et al., 2015). Further, it is highly correlated with the DERS. We used this questionnaire as a session-by-session measure instead of the DERS because it is quicker to administer, causing less burden on the individuals in order to increase compliance.

Depression, Anxiety and Stress Scale – 21 (DASS-21; Lovibond & Lovibond, 1995) is a 21-item measure of anxiety, depression and stress symptoms. It has high internal consistency with Cronbach's alphas of .94 for Depression, .87 for Anxiety, and .91 for Stress in clinical populations (Antony et al., 1998). This measure was used to track these constructs on a session by session basis throughout group.

4.4.4 Perinatal Emotion Regulation Skills (Peri-ERS) Group

The Peri-ERS group is a seven-session weekly two-hour group aimed at increasing emotion regulation, distress tolerance, mindfulness and interpersonal skills in women during the perinatal period. The skills were chosen by the authors, who have both clinical experiences working with perinatal populations and extensive training in DBT, following discussions around the needs of the current population. The skills were chosen based on their relevance to this population and tailored to address the unique challenges experienced by women during the perinatal period. A trial group, not included in the analyses, was run first. Feedback from members of this trial group was collected and considered for future group protocol planning. Initially the group was 6 sessions, however following feedback from the trial group, we added an additional session focused on interpersonal skills. In the current protocol, the first six sessions focus on emotion regulation skills, whereas the seventh session focuses on learning and practicing interpersonal skills. The groups were run by PhD level clinical psychology graduate students, psychologists, psychiatrists, and social workers. To ensure consistency in treatment delivery, the lead clinician for all groups was

the first author, who is a PhD level graduate student, under the supervision of the Principal Investigator, who is a clinical psychologist. Seven groups were run in total ranging from four to seven members. The group content and goals are described below and the step by step agenda described in Table 3. The group was run in accordance to the DBT skills group guidelines, except when perinatal content had to be discussed which is outlined below. The goals for the group are as followed:

- *Provide psychoeducation on perinatal emotion dysregulation*: In session one, information is provided on emotion dysregulation and how it presents in the perinatal context. Biological, hormonal, social and situational factors within the perinatal period are presented as creating a vulnerability towards experiencing emotion dysregulation during this time. Participants create a profile of what emotion dysregulation looks like for them and articulate specific goals they would like to work on throughout the course of treatment. These goals are reviewed and progress evaluated in session six.
- *Increase Mindfulness skills*: Each group begins with psychoeducation on mindfulness and an in-session mindfulness practice. Participants learn to be mindful of emotions, thoughts, physical sensations, and emotional triggers and learn to respond with effective behaviours versus react with less effective behaviours. States of mind and accessing wise mind is presented during the session one content. “What” and “How” mindfulness skills and other applications are delivered during the psychoeducation portion prior to the in-session practice. To adapt mindfulness practices to the perinatal population, options to include the baby in the exercises are provided to make it inclusive for women who bring their newborns to group.

- *Increase Distress tolerance strategies*: Participants learn to increase tolerance towards distressing moments and make it through emotionally provoking situations without engaging in problematic behaviours or making situations worse. The 'STOP' 'and 'TIP' skills are taught in session two and distracting with wise mind 'ACCEPTS' and Self-soothe skills are introduced in session three. They also learn to work through emotionally provoking situations without engaging in problem behaviours that may make situations worse. Women are provided with examples on how to use these skills in a way that can incorporate their babies (e.g., using the baby to distract, activating five senses using baby to self-soothe) whenever possible.
- *Increase Self-validation*: Participants learn to validate their own emotional experience in order to decrease their emotional intensity, reduce emotional distress, and prevent emotions from escalating. This is formally introduced in session four, however participants are coached to self-validate during all sessions, specifically when reviewing homework. To adapt this skill to the perinatal period, psychoeducation is included on how the perinatal period can increase emotional vulnerability (e.g., biological/hormonal changes, identity role changes, increased stressors, lack of sleep), stressing the importance of validating these vulnerabilities in addition to the emotion distress.
- *Reduce emotional vulnerability*: Participants learn to recognize the factors that increase their vulnerability towards experiencing intense emotions and work on reducing emotional vulnerability. The 'PLEASE' skill is introduced in session five. To adapt it to the perinatal context, 'SMART' goal setting is used to problem solve and reduce any barriers. Strategies such as sleep sharing with partner, meal prepping, exercises that include babies are also discussed.

- *Increase Interpersonal effectiveness (IE) skills:* Participants learn to navigate interpersonal conflict more effectively by using IE skills that increase their chances of getting what they want while preserving and improving relationships with others and increasing self-respect. To learn multiple IE skills in a short period of time, this last session is run in a workshop style where skills are briefly explained to participants, they practice in-session with each other, and group leaders observe and provide feedback. Relevant examples to the perinatal period are used to increase applicability (e.g., asking partner for help with childcare/cleaning, resolving conflict with in-laws). To increase applicability of the material and make the session more efficient, participants are asked to bring in examples of interpersonal conflict that they would like to navigate in a more effective way the week prior so that they can work on these examples in-session

4.4.5 Statistical Analyses

All data were analyzed using IBM SPSS Statistics Version 23. Our first goal was to examine change in symptoms over time at multiple time points throughout the study. Session-by-session measures were administered throughout the trial using the DASS-21 and EDS. The data for the DASS-21 and EDS did not meet the normality assumptions and therefore a non-parametric Friedman Rank Test was used to examine change over time. A completers-only sample was used for the analysis (Streiner, 2015) and a last-observation carried forward approach was used with random missing data.

Our second goal was to determine whether Peri-ERS group was effective in leading to change in symptom variables such as emotion dysregulation, anxiety and depression. A paired samples t-test was used to examine changes in symptom variables from baseline to post-treatment.

A log-10 transformation was used on variables that did not initially meet the normality assumption of the analysis. A completers-only sample was used (Streiner, 2015). Cohen's *d* power analysis was calculated.

Our third goal was to examine whether changes in emotion dysregulation, as captured through the DERS were statistically and clinically reliable. This was completed using the reliable change index (RCI) as outlined by (Jacobson & Truax, 1991). A clinically meaningful cut-off score of 97 on the DERS was used to indicate high emotion dysregulation (Neacsiu, 2012; Neacsiu et al., 2014).

Lastly, as the COVID-19 pandemic occurred in the middle of the current study, an exploratory goal was to assess whether group format (in person versus virtual) impacted treatment. An independent samples t-test on DERS pre- and post- treatment difference scores was conducted.

4.5 Results

As determined by the Friedman Rank Test on the session-by-session data, there was a significant improvement in symptoms as captured by the EDS ($\chi^2(7) = 63.18$, $p < .001$; Figure 4), the Stress subscale of the DASS ($\chi^2(7) = 25.53$, $p = .001$), the Anxiety subscale of the DASS ($\chi^2(7) = 16.68$, $p = .02$), and the Depression subscale of the DASS ($\chi^2(7) = 18.66$, $p = .009$; Figure 2).

Refer to Table II for results of paired samples t-test

The RCI calculation as outlined by (Jacobson & Truax, 1991) using DERS scores yielded a reliable change score of 26.6 points. Out of 25 participants, 56% of participants showed reliable change in emotion dysregulation through participating in the Peri-ERS group, and 48% of participants exhibited both reliable and clinically meaningful change.

An independent samples t-test on Pre-COVID-19 vs. During COVID-19, DERS pre-post difference scores, demonstrates no significant differences in symptoms change, $t(23) = 1.1$, $p=.3$), in groups held in-person prior to the COVID-19 pandemic ($M = -36.0$, $SD = 13.6$, $n=8$) and groups held virtually during the pandemic ($M = -26.8$, $SD = 22.7$, $n = 17$).

4.6 Discussion

Previous research suggests that emotion dysregulation may be a standalone factor that traditional CBT treatments do not adequately address (Fergus et al., 2010; Moscovitch et al., 2008; Pasquini et al., 2004). The current study aimed to evaluate the effectiveness of a short term, DBT informed skills group, specifically designed to address emotion dysregulation within the perinatal period.

Our findings suggest that the seven-session Peri-ERS group is an effective treatment in addressing perinatal emotion dysregulation. This is illustrated by the significant decrease in emotion dysregulation, as well as anxiety and depressive symptoms in women who participated in the treatment program. These results are promising as this provides support for a novel short-term treatment for women struggling with emotion dysregulation during the perinatal period. Further, approximately half the women in the Peri-ERS group showed statistically and clinically meaningful change. This is a significant improvement when comparing our findings to perinatal CBT treatment outcomes in which only 16% of women demonstrated statistically reliable and clinically meaningful change in emotion dysregulation in groups offered as part of routine clinical care (Agako et al., 2021). The other studies examining the effectiveness of DBT informed skills group within a perinatal population (Kleiber et al., 2017; Wilson & Donachie, 2018) did not examine reliable clinical change therefore we cannot draw comparisons. Interestingly, following

other DBT informed treatment programs in non-perinatal adult populations, participants continue to demonstrate improvements following treatment and into the follow-up period (Fleischhaker et al., 2011; Gibson et al., 2014). A limitation for the current pilot study is that there is no follow-up post treatment and therefore it would be beneficial for future research to focus on addressing this limitation to examine whether women who participate in the Peri-ERS maintain improvement post-treatment or what the clinical profile looks like after treatment ends. The Peri-ERS group experienced drop-out rates of less than 25% when considering the intent-to-treat sample and a drop-out rate of 11% after the start of group. This is in line with dropout rates of other first-line treatments for disorders also characterized by emotion dysregulation such as PTSD and BPD (Swift & Greenberg, 2014) and may demonstrate the acceptability of the length of the treatment program, although further research is needed to confirm this. Although there were significant differences in participants using reappraisal strategies more effectively by post-treatment, a significant change in emotion expressive suppression was not observed. This is concerning as expressive suppression, which is the inhibition of overt emotional expressive behaviour, has been associated with negative outcomes and is considered a maladaptive emotion regulation strategy (Gross & John, 2003). This finding could be a result of the treatment program focusing primarily on change strategies compared to acceptance strategies. The theoretical stance of DBT is that a balance must be maintained between change and acceptance strategies (Linehan, 1993) and therefore including more acceptance strategies in the Peri-ERS group to maintain this balance may be beneficial. As it is the variable of expressive suppression that is not improving, we recommend that future perinatal DBT skills groups include skills such as acceptance of emotion, labelling and observing emotions, and on mindfulness of emotion to target this variable.

Limitations and Future Directions

Although the results of this pilot Peri-ERS group are encouraging for the effective regulation of emotion during the perinatal period, there are several limitations associated with the current study. First, as this is a pilot study the sample size was small and the lack of a control group does not allow us to compare results to participants who did not receive the treatment. To further establish the Peri-ERS group as an effective treatment an important next step would be to conduct a large scale randomized controlled trial. Additionally, the current study did not include a long-term follow-up period (e.g., three months' post-treatment) to determine that any treatment gains made are maintained. Further, future research with larger sample size, would benefit from looking at demographic variables as potential mediators of drop-out rate, treatment effectiveness, and relapse. A particularly important mediator to consider that is specific to the perinatal period is sleep. There is research to suggest that emotion regulation mediates the relationship between sleep problems and depressive symptoms (Kirschbaum-Lesch et al., 2021). Since sleep problems are common during the perinatal period (Sweet et al., 2020) more research needs to be conducted in understanding the link between sleep and emotion dysregulation in this population. Secondly, another potential mediator that may need to be explored is the presence of infants of some participants in the group. Moreover, the COVID-19 pandemic began in the middle of the current study and the format that the treatment had to be switched from in-person to a virtual. Although there were no statistical differences in treatment changes in women who participated in the group before the pandemic compared to those who participated during the pandemic, it is unclear whether this outcome was due to the small sample size of virtual versus in person groups. Further research will need to be conducted to evaluate whether the method of delivery plays a role in treatment

effectiveness. Lastly, the sample in this study was too small to control for cohort effects and this is something that will need to be further explored in future research.

4.7 Conclusion

The Peri-ERS group is overall effective at reducing severity of emotion dysregulation and other symptoms during the perinatal period. The findings from this study are promising as perinatal emotion dysregulation is an understudied field and this novel treatment addresses an important gap in the literature. Further, considering the negative effects of perinatal emotion dysregulation on both the mother and their infants, evidence-based and effective treatments are crucial. The findings from this study may potentially be used to effectively implement Peri-ERS treatments in women's health clinics and other mental health settings as a way of alleviating perinatal emotion dysregulation symptoms and improving overall perinatal care.

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4.9 Tables and Figures

Table I
Baseline demographics and clinical characteristics of samples

Baseline Characteristic	Treatment Completers N=31 *n* (%)	Treatment Dropouts N=*4* *n (%)*	Treatment Refusers N=6 *n* (%)	Total N=41 n (%)
Mean age in years (SD)	29.32 (5.29)	26.00 (7.26)	27.17 (5.78)	28.68 (5.52)
Ethnicity				
Asian/Pacific Islander	1 (3.2%)	n.a.	1 (16.7%)	2 (4.9%)
Hispanic/Latin American	1 (3.2%)	n.a.	n.a.	1 (2.4%)
White/European	27 (87.1%)	4 (100.0%)	4 (66.7%)	35 (85.4%)
Other	2 (6.5%)	n.a.	1 (16.7%)	3 (7.3%)
Marital Status				
Single	5 (16.1%)	3 (75.0%)	3 (50.0%)	11 (26.8%)
Married/Common-Law	26 (83.9%)	1 (25.0%)	3 (50.0%)	30 (73.2%)
Education Level				
High School	8 (25.8)	n.a.	3 (50.0%)	11(26.8%)
Certificate/professional diploma	12 (38.7%)	1 (25.0%)	2 (33.3%)	15 (36.6%)
Bachelor's degree or higher	9 (29.0%)	1 (25.0%)	1 (16.7%)	11 (26.8%)
Other	2 (6.5%)	2 (50.0%)	n.a.	4 (9.8)
Maternal Status				
Pregnant	7 (22.6%)	2 (50.0%)	2 (33.3%)	11 (26.8%)
Postpartum	24 (77.4%)	2 (50.0%)	4 (66.7%)	30 (73.2%)
Taking psychotropic medication	11 (35.5%)	1 (25.0%)	2 (33.3%)	14 (34.2%)
Screened positive for BPD as captured by BSL-23	10 (32%)	1 (25.0%)	1 (16.7%)	12 (29.3%)
Psychiatric Diagnoses				
Generalized Anxiety Disorder	18 (58.1%)	2 (50.0%)	2 (33.3%)	22 (53.7%)
Generalized Anxiety Disorder (in partial remission) Social	1 (3.2%)	n.a.	n.a.	1 (10.3%)
Anxiety Disorder	12 (38.7%)	1 (25.0%)	2 (33.3%)	15 (36.6%)
Panic Disorder	2 (6.5%)	1 (25.0%)	n.a.	3 (7.3%)
OCD	1 (3.2%)	n.a.	n.a.	1 (2.4%)
Agoraphobia	1 (3.2%)	2 (50.0%)	n.a.	3 (7.3%)
Major Depressive Disorder	10 (32.3%)	3 (75.0%)	n.a.	13 (33.7%)

Major Depressive Disorder (in partial remission)	3 (9.7%)	n.a.	1 (16.7%)	4 (9.8%)
Bipolar Disorder	2 (6.5%)	n.a.	n.a.	2 (2.4%)
Eating Disorder	1 (3.2%)	n.a.	n.a.	1 (2.4%)
Post-Traumatic Stress Disorder	5 (16.1%)	n.a.	n.a.	5 (12.2%)
Substance Use Disorder (in remission)	1 (3.2%)	n.a.	n.a.	1 (2.4%)
Trauma Related	1 (3.2)	n.a.	n.a.	1 (2.4%)
No diagnosis but emotion dysregulation causing significant distress	5 (16.1%)	n.a.	n.a.	5 (12.2%)

Note: One participant dropped out of group and then returned to complete the group in the future. They were counted as both completer and drop-out.

Table II.
Means (M), Standard Deviations (SD) and results of paired samples t-test from the Peri-ERS group pre-post measures.

	Baseline M(SD)	Post-treatment M(SD)	*t*	*df*	*p*	*d*
DERS Total Score	121.8 (21.8)	92.1 (22.0)	7.3	24	<.001	1.5
Non-acceptance Subscale	22.5 (6.6)	16.5 (5.8)	5.9	24	<.001	1.2
Goals Subscale	20.4 (3.0)	15.6 (4.6)	5.9	24	<.001	1.2
Impulsivity Subscale	20.4 (5.4)	13.7 (5.3)	7.0	24	<.001	1.4
Awareness Subscale	16.8 (5.5)	14.7 (3.9)	2.2	24	.04	0.4
Strategies Subscale	27.5 (5.9)	19.7 (6.6)	6.6	24	<.001	1.2
Clarity Subscale	14.2 (4.6)	11.9 (3.3)	3.1	24	.005	0.6
ERQ						
Expressive Suppression	12.1 (5.0)	11.5 (5.5)	.7	23	.48	0.1
Re-appraisal	22.0 (7.6)	29.3 (4.9)	5.2	23	<.001	1.1
STICSA Total Score	50.7 (10.6)	43.1 (11.7)	4.9	23	<.001	1.0
Cognitive Subscale	26.6 (5.3)	22.6 (6.2)	4.5	23	<.001	0.9
Somatic Subscale	24.1 (6.4)	20.5 (6.5)	3.7	23	.001	0.7
EPDS	13.9 (6.0)	10.2 (5.6)	4.5	23	<.001	0.9

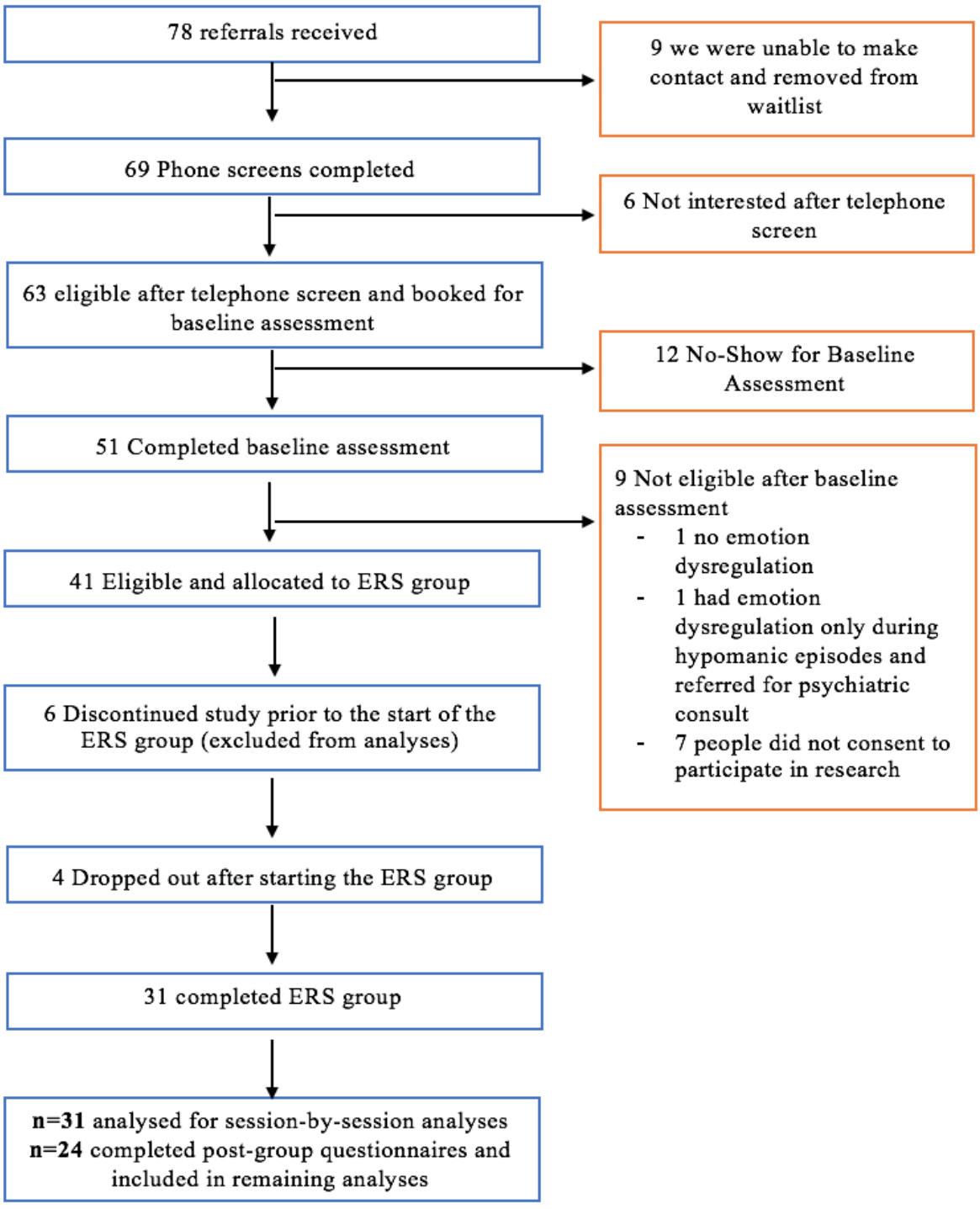
DERS: Difficulties in Emotion Regulation Scale; ERQ: Emotion Regulation Questionnaire; STICSA: State-Trait Inventory of Cognitive and Somatic Anxiety; EPDS: Edingburgh Postpartum Depression Scale

Table III.
Session-by-session content of the Peri-ERS group

Session One	Session Two	Session Three	Session Four	Session Five	Session Six	Session Seven
1. Introductions & group rules 2. Overview of mindfulness and 5 senses mindfulness exercise 3. Psychoeducation on emotion dysregulation during the perinatal period 4. Setting personal goals for group ***-Break-*** 5. New Teaching: States of Mind & Accessing Wise Mind 6. Debrief and Homework Assignment	1. Mindfulness Psychoeducation and Exercise: "What" Skill 2. Check in and homework review: Recognizing emotion mind and accessing Wise Mind 3. "Other" skills review ***-Break-*** 4. New Teaching: STOP & TIP 5. Debrief and Homework Assignment	1. Mindfulness Psychoeducation and Exercise: "How" Skill 2. Check in and homework review: STOP & TIP 3. "Other" skills review ***-Break-*** 4. New Teaching: Wise Mind ACCEPTS & Self-soothe 5. Debrief and Homework Assignment	1. Mindfulness Psychoeducation and Exercise: Self-Compassion 2. Check in and homework review: Wise Mind ACCEPTS & Self-soothe 3. "Other" skills review ***-Break-*** 4. New Teaching: Self-Validation 5. Debrief and Homework Assignment	1. Mindfulness Psychoeducation and Exercise: Mindfulness of Thought 2. Check in and homework review: Self-Validation 3. "Other" skills review ***-Break-*** 4. New Teaching: Reducing Emotional Vulnerability PLEASE Skill 5. Debrief and Homework Assignment	1. Mindfulness Psychoeducation and Exercise: Mindfulness of Emotion 2. Check in and homework review: Reducing Emotional Vulnerability PLEASE Skill 3. "Other" skills review ***-Break-*** 4. Check in with personal goals and setting new goals 5. New Teaching: Relapse Prevention & Coping ahead 6. Debrief and Homework Assignment	1. Mindfulness Psychoeducation and Exercise: Mindful Listening 2. Spectrum of intensity and Communication Styles: Passive, Aggressive, Passive-Aggressive, Assertive 3. Factors that get in the way of IE 4. Goals & Priorities 5. DEAR Script ***-Break-*** 6. MAN 7. GIVE 8. FAST 9. Debrief & Homework Assignment

Note: These skills were adapted from the DBT Skills Training Manual (Linehan, 2015)

Figure 1.
Participant Flowchart



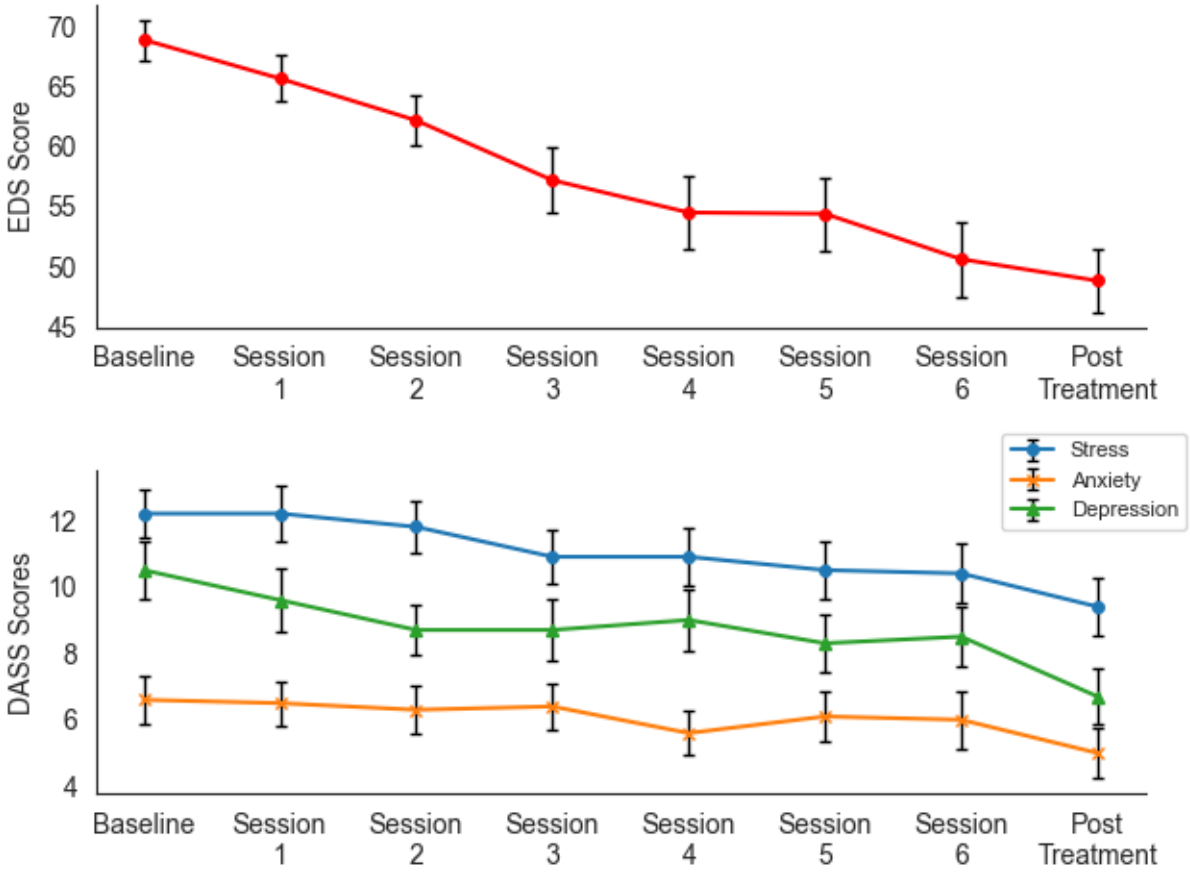


Figure 2. *EDS & DASS session-by-session mean scores and standard errors*

CHAPTER 5: General Discussion

This thesis examined emotion dysregulation during the perinatal period (i.e., pregnancy and up to 12 months postpartum; Austin, 2003). The perinatal period is a time of vulnerability for mental health concerns, particularly anxiety and depressive disorders (Accortt et al., 2008; Fawcett et al., 2019; Grigoriadis & Robinson, 2007; Woody et al., 2017), which could have long-lasting negative consequences for both mothers and their babies (Grigoriadis et al., 2013; Grigoriadis et al., 2017; Kingston & Tough, 2014; Tietz et al., 2014). More research is needed to aid our conceptualization of perinatal mental health and ensure we are providing adequate treatments. Endocrine changes associated with pregnancy and the postpartum leading to HPA disruption may be implicated with perinatal mental health (Dickens & Pawluski, 2019). Emotion dysregulation is associated with both HPA disruptions and anxiety and depressive disorders in the general population, and therefore may play a particularly important role within the perinatal period (Dickens & Pawluski, 2019; Gross & Jazaieri, 2014; Mennin et al., 2007; Redpath et al., 2019)

The aims of the current research were to 1) understand the profile of both perinatal emotion reactivity and emotion regulation - two aspects of emotion dysregulation - and how they might be related to perinatal mental health difficulties; 2) evaluate whether current treatments effectively target emotion dysregulation during the perinatal period; and 3) develop and evaluate the effectiveness of a novel treatment program for perinatal emotion dysregulation. We designed and conducted three studies to meet these aims. This chapter provides an overview of key findings and discusses the significance of the current line of research, clinical implications, limitations of this research, and future directions.

5.1 Summary of Findings

5.5.1 Study 1

This study examined differences in emotion reactivity and emotion regulation across three groups: perinatal women with an anxiety and/or depressive disorder (Exp-Peri), perinatal healthy controls (HC-Peri) and nulliparous healthy controls (HC-Null). Emotion reactivity was captured through the use of self-report questionnaires as well as self-report reactivity in response to emotionally provoking pictorial stimuli. The stimuli consisted of three groups of content: positive, negative, and neutral. Within each group, there were both perinatal themed content and non-perinatal themed content. Heart rate reactivity was collected as an objective measure of emotion reactivity. Emotion regulation and dysregulation were measured through the use of standardized self-report questionnaires.

There was a distinct difference in subjective emotion reactivity across the three groups. Participants in the Exp-Peri group had a higher baseline of negative affect and a lower baseline of positive affect compared to the other two groups. This is consistent with other literature suggesting that anxiety and depressive disorders are associated with impairments in positive affect (Craske et al., 2019). This may also suggest that heightened baseline negative affect and blunted baseline positive affect may be a trait of perinatal emotion dysregulation. Exp-Peri participants also had less flexibility in emotional reactivity compared to the other groups. Participants in the HC-Peri group had the highest subjective emotional reactivity for both positive and negative content, which is consistent with previous research (Rosebrock et al., 2015; Wilkinson, 1998). This difference was even more pronounced for perinatal-themed negative content, in which HC-Peri participants scored the highest. These findings may explain why mothers with an anxiety and/or depressive

disorder may have difficulties responding to and bonding with their babies (Austin & Priest, 2005). There were no across group differences in objective emotion reactivity via heart rate reactivity.

Concerning emotion regulation, our findings suggest that Exp-Peri participants have the most difficulties with emotion regulation, including an inability to engage in adaptive reappraisal, an increased impulsivity, and a lack of emotion management strategies. Emotion dysregulation was associated with relationship dissatisfaction in the Exp-Peri group only, likely due to this group being the one to struggle with emotion dysregulation. This finding is consistent with previous research on the link between emotion dysregulation and relationship satisfaction (Kim et al., 2009).

5.5.2 Study 2

This study examined the bidirectional relationship between Cognitive Behavioural Therapy (CBT) for perinatal anxiety and perinatal emotion dysregulation. Specifically, it aimed to determine: 1) if the severity of emotion dysregulation impacted CBT treatment outcomes; and 2) if CBT was effectively targeting perinatal emotion dysregulation, and 3) if these changes were reliable and clinically meaningful. Anxiety, depression and emotion dysregulation were measured using standardized self-report measures. Data from both a randomized controlled trial (RCT) and a routine clinical care group was analyzed.

Results from this study suggest that severity of emotion dysregulation at baseline does not impact CBT treatment outcomes with respect to anxiety and depression. Overall, CBT also had a positive impact on perinatal emotion dysregulation as illustrated by an increase in the use of adaptive regulation skills and a reduction in the use of maladaptive regulation skills. These findings support the theory that emotion dysregulation is a core feature of mental health disorders (Gross & Muñoz, 1995; Hofmann et al., 2012; Mennin, 2005; Mennin et al., 2007) as changes in emotion

regulation were associated with changes in anxiety and depression. However, these findings provide only partial support for this theory. When examining reliable and clinically meaningful change, only 28.6% of the RCT group and 12.8% of the routine clinical care group demonstrated reliable and clinically meaningful change in emotion dysregulation in response to treatment. Further, CBT was not effective in improving impulsiveness and awareness of emotions, which are two components of difficulties with emotion regulation. CBT appeared to be more effective for low levels of emotion dysregulation, while for moderate to severe emotion dysregulation it was not adequate to provide full relief. These results suggest that CBT alone may not be sufficient in targeting emotion dysregulation at high levels, and emotion dysregulation may be a standalone factor (Fergus et al., 2010; Moscovitch et al., 2008; Pasquini et al., 2004) during the perinatal period.

5.5.3 Study 3

Considering that CBT, the most widely used treatment modality for perinatal anxiety and depressive disorders (Li et al., 2020; Nillni et al., 2018; Sockol, 2018), is not sufficient in the treatment of perinatal emotion dysregulation, we aimed to develop a novel treatment that would better address this concern. Dialectical Behavioural Therapy (DBT) skills group, is the most widely used and evidence-based treatment for emotion dysregulation (Linehan, 2015; Valentine et al., 2015). For the purposes of this study, we developed a short-term, DBT-informed, skills group for emotion dysregulation that was tailored to target specific concerns during the perinatal period (Peri-ERS) and collected pilot data examining the effectiveness of the treatment program. Standardized questionnaires given before, during, and after treatment were used to examine treatment response.

The findings from this pilot study suggest that our novel Peri-ERS treatment program was effective in targeting emotion dysregulation. This was demonstrated by an improvement in emotion dysregulation skills and reduction in symptoms of anxiety and depression in participants who completed the treatment program. Findings also suggested thatthis treatment modality may be more efficacious than CBT at reducing as 48% of participants exhibited reliable and clinically meaningful change in emotion dysregulation, compared to 16-28.6% in the previous study, which examined CBT outcomes. Clinical recommendations arising from this study include suggestions for strategies to further increase the effectiveness of the treatment program. They include incorporating acceptance skills such as acceptance of emotion, labelling and observing emotions and mindfulness of emotion, as the Peri-ERS did not effectively target these components of emotion dysregulation.

5.2 Significance

The findings from this line of research are significant for two main reasons. First, this research provides us with more insight into the profile of emotion dysregulation in participants during the perinatal period, and why it is an important variable to be examined. It appears that difficulties with emotions such as increased baseline negative affect and decreased baseline positive affect are associated with perinatal emotion dysregulation. Further, heightened reactivity towards both positive and negative emotionally provoking events, particularly around themes related the perinatal period (e.g., children, family) may be adaptive. Conversely, less reactivity was associated with perinatal emotion dysregulation. These findings can be used to aid in the assessment and early identification of perinatal emotion dysregulation and guide future research on the topic.

Second, this research sheds light on what psychological treatment modalities are helpful to use in targeting perinatal emotion dysregulation, and which are not. We have learned that our current CBT focused treatments may not be sufficient in effectively treating perinatal emotion dysregulation and that using a DBT-informed treatment modality can help increase the effectiveness of targeting emotion dysregulation. It also appears that, consistent with research in other adult populations (Fergus et al., 2010; Moscovitch et al., 2008; Pasquini et al., 2004) perinatal emotion dysregulation may be a standalone factor from anxiety and depressive disorders that warrants a separate treatment. This knowledge allows us to begin implementing treatment programs, such as the Peri-ERS group, in clinics that specialize in women's health to provide more comprehensive care to perinatal women. As a result of this research, the Peri-ERS is group is now implemented as part of routine clinical care programming offered through the Women's Health Concerns Clinic (WHCC) at St. Joseph's Healthcare Hamilton.

5.3 Limitations and Future Directions

The specific limitations of each study can be found in their respective chapters. However, there are a few overlapping limitations from each study that are important to acknowledge. The principal limitation with the current projects is the use of a fairly homogenous sample. The majority of research participants in these three studies were primarily, white, married, cis-women holding a post-secondary degree. Research suggests that there are differences in emotional experience based on ethnicity and socioeconomic background (Durik et al., 2006; Vrana & Rollock, 2010) and therefore these findings may not apply to other perinatal populations that do not fit this demographic profile. As this research was conducted at the WHCC, it is consistent with the patient profile of the clinic (Caropreso et al., 2020). Thus the results may only be applicable

for this particular patient profile and may not be generalized to other patient populations. Individuals from a lower socioeconomic status, lower education, Black, Indigenous and People of Color (BIPOC), LGBTQ+, migrant, and other communities are not appropriately represented in this line of research as well as the WHCC clinic more broadly. This is an area of concern as we do not have enough information to know what emotion dysregulation may look like for these individuals and what treatment modalities may be the most effective. It may also mean that there are barriers for these individuals in seeking perinatal care services that we are also not adequately addressing in the clinic as well as in this line of research. It is crucial that future research ensures that more diverse samples are involved so that everyone is adequately represented, and also examines the specific barriers in place that do not allow individuals from these communities to seek perinatal mental health care at this specialized government funded clinic.

This body of research also had fairly small sample sizes, and as a result, these findings may not hold in larger samples or at the population level. It is recommended that future research replicates these studies with larger sample sizes to ensure the confirmation of our findings. Further, our research used a mix of both pregnant and postpartum participant samples. There is some research, although limited, to suggest that emotion reactivity may look different across the perinatal period (Li et al., 2020; Rosebrock et al., 2015). Another limitation to the current research is using a mixed sample. Future research would benefit from examining emotion dysregulation at specific (pregnancy or the postpartum) times during the perinatal period to examine whether there are changes in the profile of emotion reactivity and emotion regulation that may be related to perinatal mental health.

An additional limitation of the current studies is the overreliance on the use of self-report, standardized questionnaires. First, the measures we used to capture emotion reactivity, regulation,

and dysregulation, are not validated within perinatal samples. Future research would benefit from validating these measures within the perinatal period. Second, when conducting research in emotion dysregulation, it is recommended that a multi-method approach is taken to ensure that an accurate profile of emotion dysregulation is captured (Agako et al., 2021). Self-report questionnaires only provide a small picture of what emotion dysregulation looks like for this population. Further, due to the HPA changes during the perinatal period (Dickens & Pawluski, 2019), incorporating physiological measures of emotion dysregulation (Agako et al., 2021) and examining the relationship with self-report standardized questionnaires would help shed more light on the profile of perinatal emotion dysregulation.

5.4 Conclusions

This thesis examined perinatal emotion dysregulation. Our research findings suggest that emotion dysregulation is a construct that is implicated in perinatal anxiety and depressive disorders. A heightened emotion reactivity during the perinatal period is associated with more adaptive emotional responses. Our current psychological perinatal treatments may not adequately target emotion dysregulation, however, adding DBT-informed approaches into programming offered to perinatal women can aid in effectively treating emotion dysregulation. Despite the limitations of our research, these novel findings shed some light on the role of emotion dysregulation during the perinatal period and demonstrate that further research is needed in this field to fill in the gaps.

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