Maternal Mental Health, Emotion Regulation and Caesarean Section Delivery: Associations with Infant Development in a Sample Accessing Perinatal Mental Health Services

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Abstract

Background: Maternal mental health difficulties are a risk factor for poorer child development. Various factors are believed to contribute to this relationship, though there are substantial gaps in the literature. Furthermore, diagnostic approaches in mental health fail to adequately capture and address the complexities and nuances associated with perinatal mental health.

Aims: This study explores the relationship between moderate-to-severe perinatal mental health difficulties and infant development through the lens of social inequality and reproductive justice. Specifically, this study examines the role of transdiagnostic factors including emotion regulation (ER), birth mode, deprivation and marginalisation.

Participants: Data was taken from 352 mother-infant dyads participating in the COSI trial (Rosan et al., 2023). All mothers were accessing perinatal mental health services in the UK at the time of participation.

Methods: Data from baseline self-report questionnaires were analysed using correlational analyses, mediation analysis and moderated mediation analysis.

Results: Maternal psychological distress and difficulties in ER were associated with poorer infant social-emotional development. Furthermore, maternal ER mediated the relationship between severity of psychological distress and poorer social-emotional and global development. Mode of birth was not significantly associated with infant developmental outcomes in this sample. Despite low levels of marginalised identity characteristics (minoritised ethnicity, sexuality, gender identity) within the sample relative to the wider population, both deprivation and marginalisation demonstrated significant relationships with perinatal mental health difficulties. Furthermore deprivation was associated with poorer global infant development.

Conclusion: This study highlights the importance of transdiagnostic factors associated with social inequality on perinatal mental health and infant development. Implications for further research, clinical practice and policy are explored.

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Glossary of Acronyms and Abbreviations

ADHD Attention deficit hyperactivity disorder
APA American psychological association
ASD Autism spectrum disorder
ASQ-3 Ages and stages questionnaire
ASQ-SE Ages and stages questionnaire - social emotional
BPD Borderline personality disorder
BPS British psychological society
CBPR Community-based participatory research
CORE-OM Clinical outcomes in routine evaluation - outcome measure
COSI Circle of security intervention
COS-P Circle of security-parenting
CSD Caesarean section delivery
DERS Difficulties in emotion regulation scale
EBE Experts by experience
ER Emotion regulation
GAD Generalised anxiety disorder
IQ Intelligence quotient
LSE London school of economics
NHS National health service
NIHR National institute for health research
PBQ Postpartum bonding questionnaire
PMHS Perinatal mental health service
PTSD Post traumatic stress disorder
RJF Reproductive justice framework
RSA Respiratory sinus arrhythmia
SD Standard deviation
SDH Social determinants of health
SES Socioeconomic status
UEL University of east London
UK United Kingdom
US United States
VD Vaginal delivery
WHO World health organisation

Terminology

Early development & infant development

Throughout this thesis, ‘early development’ will refer to the learning of skills across a range of neurodevelopmental domains including social-emotional, cognitive, language, motor, and behaviour in the early years[1]. ‘Infant development’ is used specifically to denote the acquisition of these skills during the first 12 months of life.

Emotion regulation

This study conceptualises ‘emotion regulation’ (ER) as the broad process of managing the occurrence, duration, and intensity of feelings and related physiological responses (Thompson, 1994).

Ethnically minoritised

The phrase "ethnically minoritised" is used throughout to denote people from non-White British backgrounds. This phrase highlights the active process by which certain groups are marginalised within Western society and acknowledges that those from African, Asian, Latin American, and Indigenous backgrounds make up the global majority. Importantly, this terminology draws attention to the power imbalances and systemic discrimination that contribute to the marginalisation of certain ethnic groups.

Mothers

Throughout this thesis, the term 'mothers' will be employed as a broad descriptor encompassing any individual who gives birth.

Perinatal mental health difficulties & maternal mental health difficulties

This study conceptualises ‘perinatal mental health difficulties’ as a broad range of experiences characterised by maternal psychological distress during pregnancy and up to a year after the birth of a child. The term ‘maternal mental health difficulties’ is

[1] Although separated for the purpose of parsimony/clarity at points within this thesis, it is important to note that these facets of development are inextricably linked to one another.

adopted in a similar manner, though the latter term is not necessarily limited to mental health difficulties in the perinatal period.

1. INTRODUCTION

1.1. Chapter Overview

This chapter comprises a review of literature regarding transdiagnostic factors that influence infant development. Specifically, the chapter explores research regarding maternal mental health, emotion regulation (ER), mode of birth, deprivation and marginalisation. Theoretically underpinning the connection between these factors are models of social equality and reproductive justice. This chapter includes a broad review of the literature in each area as well as two focused scoping reviews.

The chapter begins by outlining the expected course of development in the first years of life. Next, an overview of literature exploring the relationship between maternal mental health and early development will be provided. Then, ER will be introduced as a potential pathway explaining the relationship between maternal mental health and early development. Next, emerging literature on the impact of birth mode, specifically caesarean section delivery (CSD) on early development will be examined. It will then be argued that adverse experiences of maternal mental health, ER, birth mode and early development largely stem from common underlying risk factors of social inequality, with a focus on deprivation and marginalisation. This claim will be supported by relevant theoretical models and research literature.

Given the scarcity of literature regarding the relationships between ER and CSD on development in infancy, two scoping reviews will be presented to map out the existing literature in these areas respectively. The chapter concludes by highlighting the research gaps which inform the rationale, research questions and hypotheses for the proposed study.

1.2. Early Development

In the first years of life, infants undergo a sequence of cognitive, social and emotional development which follows a reasonably predictable order (Malik & Marwaha, 2023). However, the pace and pattern of neurodevelopmental growth is influenced by a range of intrinsic and extrinsic forces, thereby creating variation in the rate at which developmental milestones are reached (Stiles & Jernigan, 2010).

Neurodevelopment begins in utero and the basic structure of the brain emerges before a child is born (Ackerman, 1992). Most basic sensory and perception functions are thought to be almost fully developed by around 3 years of age, though some cognitive functions such as memory, decision making, and affect continue to develop and become more sophisticated into late childhood and beyond (Gibb & Kovalchuk, 2018; Zeanah et al., 1997). This demonstrates the critical importance of early experiences and environmental stimuli in shaping the foundational architecture of the brain, laying the groundwork for development throughout life.

Development in infancy is unique for the rapidity and complexity of cognitive, social and emotional developmental changes that occur (Rosenblum et al., 2009). This is likely due to the unprecedented rates of synaptogenesis, synaptic pruning and brain plasticity (Tierney & Nelson, 2009; Vasung et al., 2019). Furthermore, at this stage, life experiences and environment can have a crucial influence on infant development (Stiles & Jernigan, 2010), thereby offering opportunities for prevention and early intervention. Indeed, it is widely agreed that the crucial foundations for adult development are formed during early childhood (e.g. Tierney & Nelson, 2009), thereby making infant development an important topic for research. Given this, an understanding of early development is of pivotal importance. The following sections will outline the typical progression of early development.

1.2.1. Typical developmental trajectories

There are three major periods of developmental transition in the first 2 years, occurring at 2-3 months, 7-9 months, and 18-20 months (Rosenblum et al., 2009; Zeanah et al., 1997). These transitions lead to shifts in both infant and caregiver behaviour as infants' level of interaction and independence increases.

The following paragraphs will outline some of the major milestones of development during these stages; however, it is important to note that these are trends rather than a concrete timeline. The dynamic and unique interaction between individuals and their environment mean that some variance in patterns and rates of development is to be expected (Scarr, 1992). Furthermore, developmental delays are not always a cause for concern; for example bilingual children tend to show delayed acquisition of language without any negative long-term impact (Choo et al., 2019). However,

having an understanding of typical development is important in contextualising the capabilities of young children because it provides a baseline against which to compare progress.

Neonatal period

Historically, neonates were conceptualised as helpless and passive beings. However, scientific literature demonstrates that newborns exhibit a range of functional cognitive, communicative, emotional, and social abilities (Gopnik, 2010; Streri et al., 2013; Zeanah et al., 1997). Table 1 outlines some of the typical skills demonstrated in the first two months of life.

Table 1

Typical Developmental Milestones from 0-2 Months

Cognitive	Physical	Language	Social	Emotional
· Recognition and response to caregiver voices ·Tracking movement of others · Looking at nearby objects/toys · Habituation	·Hands primarily closed · Able to hold head up briefly while on tummy	· Crying as a means of communication- different cries for pain and hunger · Startle response to voices/sounds · Cooing sounds begin	· Showing interest in faces · Demonstrating preference for mother's voice · Soothed when spoken to or picked up	· Able to demonstrate distress, contentment, and interest as discrete emotions

From 2-3 months

From around 2-3 months, infant language and affect begins to become more nuanced (Gratier & Devouche, 2017). For example, expressions of distress such as sadness, disgust and anger become differentiated (Zeanah et al., 1997). Around this time, infants begin to engage adults in reciprocal social interaction (Rosenblum et al., 2009). Table 2 outlines some of the typical developmental milestones that 2-3 month olds begin to demonstrate.

Table 2

Typical Developmental Milestones from 2-3 Months

Cognitive	Physical	Language	Social	Emotional
· Watching hands with interest · Anticipation of routines (e.g. opening mouth for feeding)	·Reaching and grasping toys · Bringing hands to mouth · Able to push self up onto elbows and forearms while on tummy	· Cooing becomes more responsive · Blowing raspberries · Early vocalisations appear and progress to babbling · Turning head towards the sound of mums voice	· Begins to chuckle · Moves and makes sounds to maintain caregiver attention	· Distress begins to become more nuanced, differentiating into sadness, disgust, and anger · Able to demonstrate joy, contentment, surprise

<u>From 7-9 months</u>

By 7-9 months infants demonstrate more relational behaviour such as stranger wariness, separation anxiety, and social referencing as a means to resolve emotional uncertainty (Bergelson & Swingley, 2012; Rosenblum et al., 2009; Roth-Hanania et al., 2011; Zeanah et al., 1997).

During this time, infants also begin to develop theory of mind (Hirshkowitz & Rutherford, 2021) and demonstrate understanding that their thoughts, feelings, and actions can be understood by another person (Zeanah et al., 1997). Table 3 outlines some of the typical developmental milestones that 7-9 month olds begin to demonstrate.

Table 3

Typical Developmental Milestones from 7-9 Months

Cognitive	Physical	Language	Social	Emotional
· Object permanence · Development of intersubjectivity · Tracking movement of objects (e.g. a ball falling to the ground) · Banging toys/objects together	· Using fingers to "rake" food closer to self · Moving objects from one hand to the other · Sitting without support · Beginning to crawl	· Intentional communication through vocalisation and gestures · Understanding of single words · Imitate and spontaneously produce sounds or words (without comprehension)	· Preferred attachment to caregivers · Stranger wariness and separation anxiety · Social referencing · Developing preferences for certain toys/objects · Laughing and smiling while playing	· Emotional expressions of smiling, pouting, and anger begin to be used instrumentally ·Affective sharing

From 18-20 months

Another major transitional period in development occurs around 18-20 months. At this time, infants begin to understand symbolic representation (Preissler & Carey, 2004), which is in turn associated with marked linguistic, emotional, and social advances (Zeanah et al., 1997). For example, manipulating subjective emotions by exaggerating or minimising expressions of emotion for social etiquette (Rosenblum et al., 2009). Table 4 outlines some of the typical developmental milestones that 18-20 month olds begin to demonstrate.

Table 4

Typical Developmental Milestones from 18-20 Months

Cognitive	Physical	Language	Social	Emotional
· Symbolic representation · Recognition of gender differences · Beginnings of imagination · Playing meaningfully with toys (e.g. feeding a doll, pushing a toy car)	· Walking · Scribbling · Using fingers to feed self · Use of cutlery · Climbing on and off a chair without help	· Expressive language: 2-3 word combinations ·Receptive language: understanding of words without contextual cues e.g. (“open door” without gestures)	· Enhanced capacity for expressing needs · Increased interest in peers · Interactive play · Sensitive to being excluded · Relationships with others become a reference point for self-appraisal	· “Social" emotions appear; e.g. embarrassment, empathy, and envy

1.2.2. Conclusion

This section has outlined the typical developmental trajectory of children in the early years of life. However, as alluded to, there exist a range of psychological, environmental and social factors and precursors to adverse development, such as maternal mental health, birth mode and social inequality; these factors which will be explored in further detail in the following sections.

1.3. Maternal Mental Health

Maternal mental health difficulties are increasingly gaining international recognition for their extensive and enduring impact on both parent and infant outcomes (Royal College of Psychiatrists, 2021). This section will provide an overview of literature regarding maternal mental health and outline research exploring the impact of maternal mental health difficulties on early development.

1.3.1. Mental health in the perinatal period

Pregnancy leads to a range of physiological, psychological, and social changes for expectant parents which require adaptation to shifts in lifestyle and relationships (Nyström & Öhrling, 2004). The intensity and rapidness of such transitions during the perinatal period can be experienced as challenging and distressing for expectant parents, and may contribute to the development of perinatal mental health difficulties (Staneva et al., 2015).

Estimates of the prevalence of perinatal mental health difficulties vary between 10-50% (Baron et al., 2016; Patel et al., 2004; Schmied et al., 2013), demonstrating rates potentially up to two times higher than in the general population (Daly et al., 2022). Furthermore, research consistently demonstrates that during the postnatal period, there is a substantially increased risk of severe mental health difficulties and psychiatric admission (Howard et al., 2014; Howard & Khalifeh, 2020; Jones et al., 2014).

Mothers with a history of mental health difficulties are at risk of relapse during the perinatal period (Royal College of Psychiatrists, 2021), particularly if medication has been paused or discontinued (Jones et al., 2014; Stevens et al., 2019; Viguera et al., 2007). However, research has demonstrated that even in the absence of a history of mental health difficulties, mothers have a higher likelihood of requiring psychiatric admission during the postnatal period than at any other phase in their life (Martin et al., 2016; Munk-Olsen et al., 2016). This is significant as the impact of mental health difficulties during the perinatal period can have severe consequences. For example, in the UK, maternal mental health difficulties are consistently found to be a leading cause of maternal death shortly following birth (Knight et al., 2014; Oates, 2003; Oates & Cantwell, 2011). Almost 15% of deaths during the perinatal period are by suicide and this risk is substantially higher in mothers who have experienced social inequality (Knight, 2019; Knight et al., 2014). The impact of social inequality on maternal mental health will be explored in more detail in Section 1.6.

In addition to affecting individuals, perinatal mental health difficulties can have significant societal level consequences. For example, a London School of Economics (LSE) report indicated that in the UK, failure to support perinatal mental

health results in an estimated cost of £8.1 billion for every annual cohort of births. Within this figure, 72% is attributed to the long-term impacts on the wellbeing of children (Bauer et al., 2014), thus highlighting the need to better understand the impact of maternal mental health on children. The LSE report also indicated that implementing perinatal care pathways aligned with national recommendations would save the NHS an estimated £920 million annually; this demonstrates the substantial financial impact of inadequate perinatal mental health support.

It is clear that the perinatal mental health difficulties affect a substantial proportion of individuals leading to an increased risk of severe mental health difficulties and maternal morbidity. Ethnic disparities in access to mental health services further compound the urgency of addressing these issues. The significant economic burden resulting from inadequate perinatal mental health care underscores the importance of further research and funding to improve our understanding of perinatal mental health difficulties.

1.3.2. The impact of maternal mental health difficulties on early development

Research demonstrates that as well as increasing the risk of adverse outcomes for mothers, perinatal mental health difficulties can also impact children. Indeed, research has shown that perinatal mental health difficulties can interfere with bonding, the adjustment to motherhood and caregiving responsibilities (Dolman et al., 2013) which can have an enduring impact on maternal self-esteem, partner and family relationships (Stein et al., 2014) as well as child development. The potential consequences of perinatal mental health difficulties for children include poorer cognitive, social and emotional development (Stein et al., 2014; Walker et al., 2020).

A meta-analysis of 191 studies, with a combined sample size of *n*= 195,751, found that maternal mental health difficulties predicted lower social-emotional, cognitive, language, motor and adaptive behaviour development in children and adolescents (Rogers et al., 2020). Longitudinal research corroborates this finding, demonstrating that perinatal mental health difficulties are associated with long-term adverse developmental outcomes for children, particularly when support is not offered (Netsi et al., 2018; Rees et al., 2019; Suri et al., 2014).

A range of mechanisms underlying the relationship between maternal mental health and infant development have been proposed which include a range of biopsychosocial pathways (Entringer et al., 2015; Glover, 2015). Importantly, factors that increase the likelihood of maternal mental health difficulties, including economic hardship, limited educational attainment, stress, lack of empowerment, and inadequate social support (Wachs et al., 2009), are also associated with adverse outcomes in early development. This indicates that the association between perinatal mental health difficulties and poorer developmental outcomes operates on multiple levels and is cumulative (Walker et al., 2011); this idea is explored further in Section 1.6.

1.3.3. A critical approach to understanding perinatal mental health

Mental health difficulties are commonly assessed and treated within a psychiatric diagnostic framework, which classifies mental health conditions into discrete categories based on symptom criteria from manuals such as the Diagnostic and Statistical Manual of Mental Disorders (DSM) and the International Classification of Diseases (ICD). This has long been a cornerstone of clinical practice and research, and has informed the development and structure of perinatal mental health services (PMHS) in the UK. However, more recently, criticisms of this approach have emerged. In this section, some of the main critiques of diagnostic approaches will be outlined with attention paid towards the relevance for perinatal populations. In turn, this will inform the transdiagnostic approach taken in the proposed research study.

One of the criticisms of the psychiatric approach is the categorisation of mental health conditions into discrete disorders. Critics argue that this oversimplifies the complexity of mental health and may not accurately capture the nuances of individuals' experiences (Pickersgill, 2014). This is problematic because it could potentially lead to individuals' needs being overlooked, reduced access to services for people who do not fit into the diagnostic criteria, and inadequate treatment. There is also considerable heterogeneity within diagnostic categories which can result in individuals with vastly different presentations being grouped together under the same diagnostic label, potentially obscuring meaningful differences in their experiences and needs (Johnstone & Boyle, 2018). This contributes to concerns regarding the validity and reliability of psychiatric diagnosis. Indeed, the reliability and validity of

psychiatric diagnoses has been found to be influenced by factors such as subjective interpretation of symptoms, diagnostic criteria changes across editions of diagnostic manuals, and variability in clinician training and expertise (Chmielewski et al., 2015; Clarke et al., 2012; Kirk et al., 2013). Therefore, it could be argued that a more personalised and comprehensive approach to mental health would better address the diverse needs and experiences of those seeking support. This could be particularly helpful to the perinatal population by helping improve identification of mothers at risk of experiencing mental health difficulties, given the already heightened vulnerabilities associated with the perinatal period.

Another criticism of the diagnostic approach is the significant prevalence of comorbidity. Many individuals diagnosed with one mental health disorder also meet criteria for other disorders (Aragona, 2009; Kirk et al., 2013; Moncrieff, 2016). Comorbidity can be extensive, and a high proportion of people with a diagnosis of general anxiety disorder also receive a diagnosis of a mood disorder (Brown & Barlow, 2009). Comorbidity also exists between mental and physical health difficulties, and is considered the ‘rule rather than an exception’ (Sartorius, 2018). The high rate of comorbidity suggests that diagnosis may not adequately capture the interconnected nature of mental health difficulties, suggesting a broader and more flexible approach may be more helpful, especially during the perinatal phase when instances of both physical and mental health symptoms are heightened.

A diagnostic approach to screening and identification of perinatal mental health risks missing important changes that may occur throughout the course of pregnancy. One study conducted on a cohort of 1813 mothers found elevated depression scores in up to 15% of mothers, depending on the trimester (Truijens et al., 2017). This study also found that the combination of history of mental health difficulties, unplanned pregnancy and multiparity was most predictive of enduring depressive symptoms. This highlights the importance of continued assessment of perinatal mental health and consideration of broader contextual risk factors. Indeed, qualitative research has identified that psychiatric screening tools during perinatal care are perceived by mothers as a ‘tick box exercise’ (Nagle & Farrelly, 2018); such tools are generally symptom checklists focusing on depression and anxiety, with little attention paid to other difficulties.

Critics have also argued that the diagnostic approach to mental health pathologises human experience and behaviour, potentially leading to the over medicialisation of individuals, and neglecting contextual factors. This can be particularly problematic in relation to the perinatal population due to the overlap of symptoms between pregnancy and common mental health disorders such as changes in appetite, weight, energy levels and sleep, which are symptomatic of conditions including major depressive disorder (MDD), generalised anxiety disorder (GAD) and post-traumatic stress disorder (PTSD) (Matthey & Ross-Hamid, 2011). For example, in a sample of 570 pregnant women, the inclusion of symptoms such as increased appetite and fatigue was found to lead to double the rate of diagnosis of MDD, despite being attributed to pregnancy rather than psychological distress (Klein & Essex, 1994). Similar research has corroborated these findings, as well as finding similar trends in relation to rates of anxiety in pregnancy according to DSM criteria (Matthey & Ross-Hamid, 2011). This demonstrates that over-reliance on DSM criteria could lead to erroneous conclusions in regards to perinatal mental health.

Importantly, diagnosis-based treatment approaches tend to prioritise symptom reduction over addressing underlying causes of difficulties or holistic well-being. There is also little evidence that diagnoses can improve treatment efficacy (Deacon, 2013; Kirk et al., 2013; Moncrieff, 2016). This may in part be due to the fact that the role of social, cultural, economic, and environmental factors is often overlooked. Additionally, there can be negative consequences of receiving a mental health diagnosis, including stigma, negative self-perception, and differential access to resources and opportunities (Ben-Zeev et al., 2010; Hazell et al., 2022; Huggett et al., 2018). Furthermore, research indicates unique stigma associated with perinatal mental health, engendering fear of judgement or punishment from being perceived as a bad mother, and wider societal silencing of the negative experiences of parenting (Law et al., 2021).

1.3.4. Conclusion

This section highlights the impact of maternal mental health difficulties on mothers, infants and wider society. Furthermore, this section outlines some of the problems associated with the traditional psychiatric approach to understanding maternal mental health. In light of these limitations, this study adopts a transdiagnostic

approach to perinatal mental health with the aim of allowing for a more nuanced understanding of psychological distress in the perinatal period. The following section will introduce the construct of ER as a potentially important transdiagnostic mechanism associated with maternal mental health and early development.

1.4. Emotion Regulation

In acknowledgment of the limitations of the diagnostic approach (see section 1.3.3), there is a call for exploring transdiagnostic factors in perinatal populations, such as ER (McNamara et al., 2019). This section begins by offering a definition of ER. The literature regarding the relationships between ER, maternal mental health and early development will then be presented.

1.4.1. Defining ER

This study conceptualises ER as the broad process of managing the occurrence, duration, and intensity of emotions (Thompson, 1994). It is important to note that there is no universally agreed upon definition of ER and as such, the concept has received critique relating to measurement limitations, heterogeneity, temporal dynamics and context dependence (see Cole et al., 2004). Despite this, Cole et al. argue that advancing our understanding of ER is crucial and propose a model of ER that involves both automatic and controlled processes. Automatic processes are quick, involuntary reactions to emotional stimuli, while controlled processes involve deliberate cognitive strategies to modulate emotional responses. With regards to ER strategies, Cole et al., broadly categorise two main types: antecedent-focused strategies, which aim to modify emotional reactions before they fully emerge (e.g., cognitive reappraisal, situation selection), and response-focused strategies, which involve managing emotions after they have already been experienced (e.g., expressive suppression, distraction).

1.4.2. The relationship between ER, mental health and development

Research suggests that a lack of effective ER skills is a core feature underlying a range of mental health disorders (Aldao et al., 2010; Maliken & Katz, 2013; Rutherford, 2015). Furthermore, findings indicate that mothers with mental health difficulties struggle more with ER than those without (Wu et al., 2020). This has

important implications for both mother and baby outcomes. For example, it is suggested that a mothers ability to engage in ER strategies can impact the severity and duration of her mental health symptoms (Coyne & Thompson, 2011; Maliken & Katz, 2013).

Mothers with ER difficulties are more likely to struggle to cope with stress during pregnancy, which in turn, can result in increased levels of uterine cortisol and is associated with infant impaired cognitive development (Bergman et al., 2010) and poorer mother-infant bonding (Bieleninik et al., 2021). This provides support for the idea that biological factors may help explain the link between maternal ER and early development. Furthermore, it is suggested that maternal ER ability, rather than the experience of difficult emotions in itself, influences the quality of parent-infant interaction (Lotzin et al., 2016). This indicates that psychological distress in and of itself may not be as impactful to parent-infant outcomes as effective maternal ER.

The aforementioned literature suggests a potential direct association between maternal ER and infant development. ER may also be indirectly related to infant development by influencing bonding and parenting behaviours. For example, maternal ER difficulties may result in more negative emotions about parenting and increased helplessness (George & Solomon, 2008). Associations between ER and parenting have also been demonstrated, including difficulties with implementing discipline (Kim et al., 2009), harsher discipline measures (Zalewski et al., 2014), and reduced emotional availability (Kim et al., 2012). Furthermore, research demonstrates that poor maternal ER is related to reduced rates of breastfeeding (Li et al., 2023), which is closely linked with bonding and infant development in and of itself (Choi et al., 2018; Schwarze et al., 2015).

Furthermore, there appears to be an intergenerational impact of poor ER; given that the capacity for ER emerges in infancy and is developed through experiences within the parent–child relationship (Kiel et al., 2017) such as mother-infant synchrony (Abney et al., 2021). The ability to effectively regulate emotions in childhood is considered an essential aspect of adaptive development (Calkins & Leerkes, 2011) and an indispensable component of both cognitive and social-emotional development (Denham et al., 2012; Garner, 2010; Trentacosta & Izard, 2007). Indeed, children who are able to effectively regulate their emotions are found to have

a more positive outlook on life, higher self-esteem and better emotional wellbeing (Schutte et al., 2002). Furthermore, effective ER skills enable people to resist threats to their self-esteem, manage emotions during challenging situations and experience greater life satisfaction (Ciarrochi et al., 2000). Effective ER also positively influences engagement and educational achievement in early schooling (Garner, 2010; Trentacosta & Izard, 2007). Conversely, poor ER skills in early childhood are indicative of poorer emotional wellbeing (Djambazova-Popordanoska, 2016), later aggression and withdrawal behaviours (Calkins et al., 1998), as well as cognitive and social developmental delays (Morris et al., 2007; Thümmler et al., 2022). These findings highlight the relationship between ER and the development of cognitive, social and emotional wellbeing.

1.4.3. Conclusion

The literature presented in this section indicates that ER may be a helpful transdiagnostic construct to explore in relation to maternal mental health and infant development. Another important factor known to influence both maternal mental health and infant development in the perinatal period is CSD; the following section will explore this in more detail.

1.5. Caesarean Section Delivery

This section provides an overview of CSD rates in the UK, outlines sociodemographic differences in rates of CSD, and explores the relationships between CSD, perinatal mental health and infant development.

1.5.1. The rising rates of CSD

The prevalence of CSD in England is estimated at 31%, and rates of both elective and emergency CSD have increased by 13% and 14% respectively since 1975 (APS Group Scotland, 2021). One of the proposed explanations for this increase is the shift in maternal demographics including increased maternal age, higher body mass index and higher levels of obesity (APS Group Scotland, 2021). However, the difference in rate of CSD procedures is unlikely to be explained solely by increased obstetric risk factors; indeed, data from the APS group suggest that rates of CSD significantly increased following the 2011 update to the NICE guidelines suggesting

that clinical guidance is contributing to higher rates of CSD, potentially due to increasingly risk averse clinical guidance.

It is important to note that CSD can save lives, and is therefore a valuable birth option in high risk pregnancies. However, rates of CSD in the UK are well above the World Health Organization's (WHO) recommended 15% ceiling, suggesting that approximately half of procedures may be avoidable (Evans et al., 2022; Gibbons et al., 2010). Indeed, the WHO suggests that rates of CSD above 10% are unlikely to improve maternal or neonatal mortality rates (World Health Organization, 2015), thereby indicating a need for further clarity and consideration around the contexts in which CSD is medically indicated, in alignment with the WHO guidelines aimed at optimising maternal and neonatal outcomes.

1.5.2. The relationship between CSD, maternal health and early development

CSD poses an increase in risk of short and long-term adverse outcomes to both mother (Keag et al., 2018) and baby (Słabuszewska-Jóźwiak et al., 2020) compared to vaginal delivery (VD), including impaired infant development (Lilford et al.,1990). Furthermore, the relationship between CSD and adverse developmental outcomes is demonstrated to have enduring, long-term consequences, even after accounting for other risk factors such as socioeconomic disadvantage, lower rates of breastfeeding, adverse child and maternal health, and neurodevelopmental conditions (Polidano et al., 2017). The exact mechanisms through which CSD exerts influence on early childhood development are complex and multifaceted; this section outlines some of the direct and indirect paths demonstrated in the literature.

CSD impacts maternal mental health

CSD has been found to lead to increased rates of postnatal depression (Tonei, 2019) and post-traumatic stress disorder (PTSD) (Grisbrook et al., 2022), particularly in the context of unplanned/emergency procedures. In a systematic review of 66 papers, researchers identified that emergency CSD was related to a range of adverse psychological outcomes for mothers including post-traumatic stress, lower satisfaction, and lower self-esteem (Benton et al., 2019). Concurrently, women who had CSD were found to have higher post-traumatic stress, somatic, obsessive

compulsive, depressive, and anxiety symptoms compared to those who had a VD, even after controlling for other factors such as premorbid mental health, education and neonatal complications (Dekel et al., 2019).

Mothers with a history of mental health difficulties have been found to be at greater risk of requiring psychiatric treatment following emergency CSD compared to those with no history of mental health difficulties (Henderson & Quenby, 2021; Möller et al., 2017). Furthermore, similar trends of increased rates of postnatal depression and anxiety have also been found following maternal requests for elective CSD (Olieman et al., 2017).

The finding that CSD contributes to maternal mental health difficulties is significant because, as discussed in Section 1.3, maternal/perinatal mental health has a considerable impact on early development. Therefore, CSD may be a relevant factor influencing the relationship between maternal mental health and infant development.

CSD impacts maternal health and caregiving behaviours

As well as influencing maternal mental health, CSD has a considerable impact on maternal health. Compared with spontaneous VD, CSD is associated with an increased risk of adverse maternal health outcomes including pelvic injury/wounds, obstetric complications, venous disorders, and major puerperal infection, which require maternal postpartum admission to hospital (Liu et al., 2005). Furthermore, maternal health complications following CSD increase likelihood of separation from infants after birth (Boyd, 2017; Moore et al., 2016) which reduces opportunity for breastfeeding and bonding. Indeed, mothers who deliver by CSD have been found to have lower rates and shorter periods of breastfeeding (Kramer et al., 2008; Moore et al., 2016; Zanardo et al., 2010). There is also an increased likelihood of breastfeeding difficulties following CSD (İsik et al., 2016; Jikijela et al., 2018). This is significant as exclusive breastfeeding has been associated with improved infant developmental outcomes (Choi et al., 2018; McCrory & Murray, 2013), therefore, reduced rates of breastfeeding in mothers who deliver via CSD may help explain the link between birth mode and infant development.

Furthermore, the maternal recovery period following CSD is considerably longer than VD (Hale & Harer, 2005), which may reduce early opportunities for skin-to-skin contact, which is important for bonding (Widström et al., 2019; Stevens et al., 2014). Qualitative research with mothers who experience unplanned CSD indicates an adverse impact on bonding and attachment, the development of a maternal role identity and perceived caregiving ability (van Reenen & van Rensburg, 2013). This is significant as healthy bonding has been found to positively impact early childhood development (Le Bas et al., 2022).

The aforementioned research indicates that maternal health (both physical and psychological), bonding and caregiving behaviour can be negatively impacted following CSD, which can in turn influence child development, indicating various indirect pathways between CSD and poorer child developmental outcomes.

CSD impacts childhood health

As well as impacting maternal physical health, CSD has been found to have a significant short and long-term impact on the health of offspring. For example, rates of asthma, diabetes, allergies and obesity are thought to be higher amongst children born via CSD (Cardwell et al., 2008; Cho & Norman, 2013; Li et al., 2013; Sandall et al., 2018; Thavagnanam et al., 2008). A recent systematic review and meta-analysis concurred, demonstrating a higher risk of developing respiratory tract infections, obesity and asthma than children born via VD (Słabuszewska-Jóźwiak et al., 2020). However, this review did not find evidence to support an elevated risk of developing diabetes or neurological disorders in children born via CSD.

Many of the adverse childhood health conditions following CSD are associated with adverse developmental outcomes. For example, a meta-analysis of children with asthma found impaired cognitive functioning, with prominent effects on measures of academic achievement and executive functioning, though the impact on processing speed, attention, visuospatial skills, language, learning, and memory was also highlighted (Irani et al., 2017). Furthermore, this study found that the adverse effects of asthma were greater in those from low socioeconomic backgrounds, and from minoritised racial/ethnic backgrounds. This indicates that there is an interaction

between aspects of sociodemographic characteristics that relate to deprivation/marginalisation and the relative impact of asthma on children.

Similarly, obesity has been identified as a risk factor for developmental delays. One study found that both motor and cognitive functioning were poorer in those identified as overweight or obese and these deficits were identified as early as 9 months of age (Cataldo et al., 2016). Another study found that obesity contributed to delays in language, social skills, and activities of daily living at age 2-4 years (Cawley & Spiess, 2008), but only in boys; these findings were consistent in children who did not attend day care, indicating that the association between obesity and development was not due to discrimination or bullying by peers or teachers.

A review of outcomes in early-onset diabetes found that young children with diabetes performed worse on tests of memory and global cognitive ability in early childhood (Schwartz et al., 2014). Similar trends have been identified longer-term, whereby adolescents with type II diabetes demonstrate poorer performance on tests of memory, processing speed and academic achievement as well as experiencing poorer emotional and behavioural wellbeing (Brady et al., 2017).

Collectively, these findings indicate that babies born via CSD have higher rates of health conditions in early childhood, which in turn, impacts their cognitive and social-emotional development.

<u>CSD contributes to dysbiosis (disturbed gut microbiota)</u>

CSD induces dysbiosis, an imbalance of the infant intestinal microbiome which is associated with adverse outcomes and disease (Hoang et al., 2021). Indeed, CSD is thought to be the earliest and strongest influence on neonatal dysbiosis of any identified factor (Nagpal & Yamashiro, 2017). Gut microbiota influence a range of bodily functions including resistance to pathogens, metabolism, immune function and behaviour (Cabreiro & Gems, 2013; Erkosar et al., 2013), which may help explain the relationship between CSD and childhood health described in the previous section.

Furthermore, emerging research indicates that gut microbiota can influence early cognitive and emotional development including affect memory, motivation, mood and stress reactivity (Cryan & Dinan, 2012; Galland, 2014) and there is evidence of long-term adverse impact (Salminen et al., 2004; Sarkar et al., 2021). Furthermore, higher rates of neurodevelopmental conditions such as autism spectrum disorder (ASD) and attention deficit hyperactivity disorder (ADHD) have been identified amongst those born by CSD (Curran et al., 2015).

The above findings indicate that dysbiosis may help explain the relationship between CSD and infant developmental outcomes. However, a causal relationship can not be determined, as there are a wide range of potentially confounding factors such as obesity, length of time in hospital post-birth, breastfeeding, and antibiotic use which can also influence the neonatal microbiome as well as infant developmental outcomes (Nagpal & Yamashiro, 2017).

CSD may cause iron depletion

CSD can lead to lower levels of iron and anaemia in neonates (McCarthy et al., 2022; McCarthy & Kiely, 2019). Research indicates that iron deficiency in the first week of life is associated with higher levels of distress, lower levels of alertness and greater difficulty soothing, suggesting altered neonatal temperament (Wachs et al., 2005). Another study found that infants with low iron had poorer recognition memory at two weeks old, and delayed motor development and impaired auditory recognition memory at 12 months (Siddappa et al., 2004). Furthermore, left untreated, poorer iron deficiency can contribute to emotional and global development at 9 months (Armony-Sivan et al., 2016; Santos et al., 2018). There is also evidence to suggest developmental delays caused by iron deficiency persist at age 5 (McCarthy et al., 2022; Tamura et al., 2002). These findings suggest that iron depletion may explain some of the association between CSD and poorer developmental outcomes.

CSD impacts infant sleep

Birth mode has been found to predict infant sleep quality, whereby those born by CSD are more likely to have sleep problems (Korotchikova et al., 2016; Sadeh et al., 1996). A recent study found that infants delivered by emergency CSD obtain on

average 1 hour less sleep than infants born by VD at 3 months (Matenchuk et al., 2019). This reduction in infant sleep was not observed with elective CSD, suggesting that levels of stress during birth may have a mediating impact on birth mode and sleep.

Disrupted sleep in early infancy has been associated with poorer cognitive, linguistic, and motor skills (Shellhaas et al., 2017; Tham et al., 2017) as well as memory, executive function and physical growth (Tham et al., 2017). However, the impact of sleep may change over time. For example, one study found that by 10 months, sleep quality was associated with lower cognitive development but not motor development (Scher, 2005).

Sleep quality in infancy predicts sleep quality in middle-late childhood (Tikotzky & Shaashua, 2012). Poor quality sleep is consistently associated with poorer child developmental outcomes across a range of domains (Blackwell et al., 2020; Dewald et al., 2010; El-Sheikh et al., 2022).

Importantly, there is evidence to suggest that mothers of infants with poor sleep have more symptoms of depression and more difficulties with their co-parent (Bayer et al., 2007; Lam et al., 2003). This demonstrates the intricate interconnections among CSD, sleep, maternal mental health, and infant developmental outcomes.

Taken together, this literature indicates that disturbed sleep following CSD may contribute to poorer developmental outcomes.

1.5.3. Conclusion

This section has explored research relating to the impact of CSD on maternal and infant outcomes with a specific focus on the direct and indirect impact on early development. The following section connects the topics of early development, maternal mental health, ER and CSD through the lens of reproductive injustice and social inequality.

1.6. Reproductive Injustice and Social Inequalities

The previous sections in this chapter have examined the influence of individual level factors on infant development. This section focuses on systemic factors that influence development.

This section begins by outlining the reproductive justice framework (RJF) and Black et al's., (2017) model of the multigenerational life course of development, health and wellbeing. It will be highlighted that underpinning both these models is an emphasis on the contribution of social inequalities in creating conditions that foster disparities in health and development. Then, it will be argued that deprivation and marginalisation are two key elements of social injustice relevant to perinatal mental health and infant development. The section concludes by substantiating this argument on the basis of research relating to the impact of deprivation and marginalisation on health and developmental outcomes.

1.6.1. The reproductive justice framework

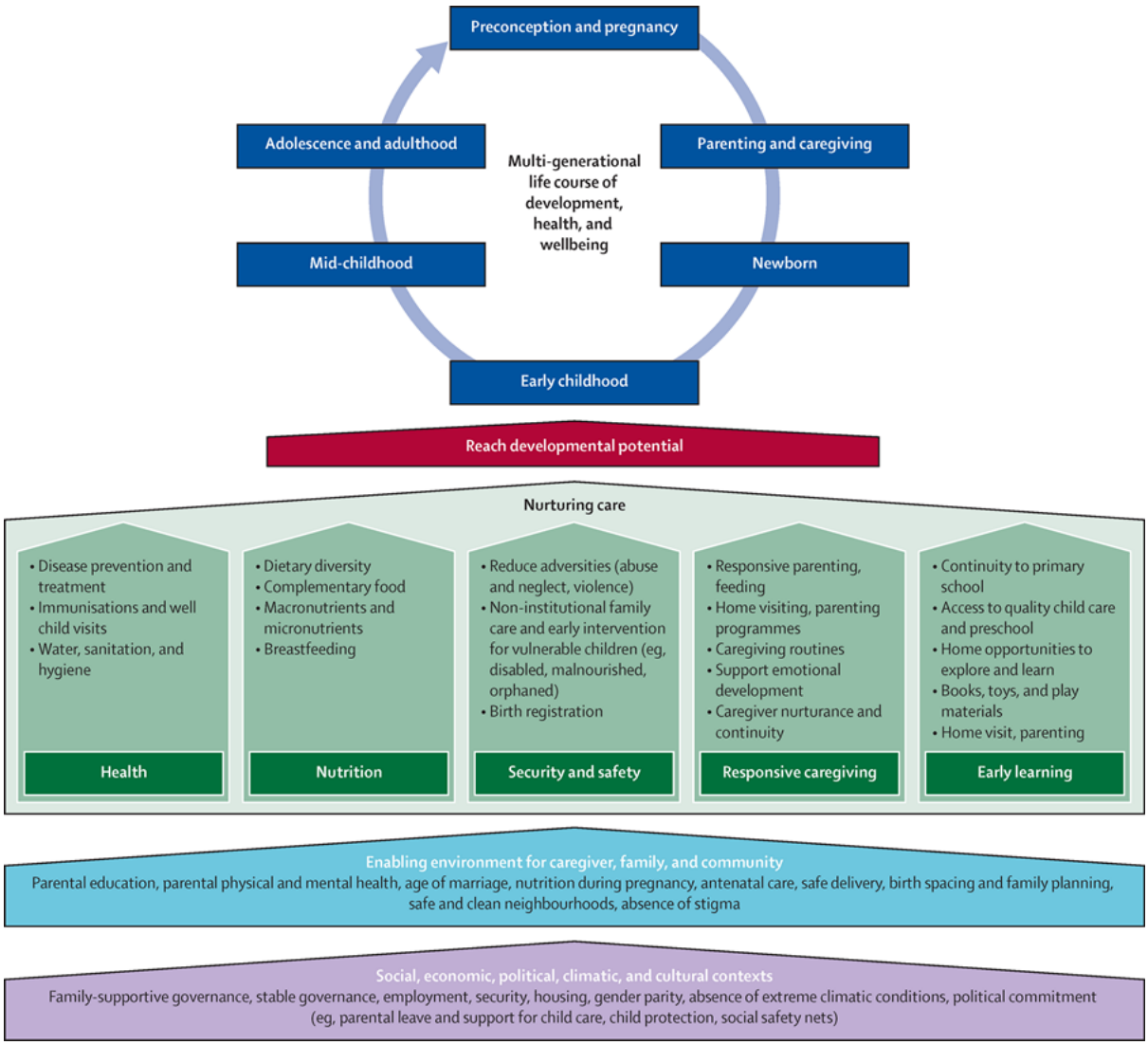
The reproductive justice framework (RJF) is a multidisciplinary theory formulated by women of African descent and is grounded in principles of feminism, human rights and intersectionality (Morison, 2021). The RJF recognises reproductive issues as socio-political in nature (Bakhru, 2019). In doing so, the RJF shifts accountability from individuals to systems by acknowledging that the context of people's lives determines their health and wellbeing (Scott et al., 2019).

The RJF recognises that individuals often have limited control over many of the upstream social determinants of health including policy, services and cultural/societal values; highlighting that individual, structural and social determinants of health cannot be understood as separate entities (Crear-Perry et al., 2021). Proponents of the RJF argue that individual factors are only ever as impactful as the resources available within a community (Ross & Solinger, 2017). The RJF is a relatively novel model and as such, research incorporating this framework is limited. However, there is significant overlap with wider research on social inequality, such as the multigenerational life course of development, health and wellbeing model (Black et

al., 2017). Figure A, taken from Black et al.,[2] illustrates a range of systemic factors that influence health and development across the lifespan and across generations.

Figure A

The multigenerational life course of development, health and wellbeing; taken from Black et al., (2017).



The multigenerational model describes three levels of influence on health and development:

Contexts and environments: This refers to the broad social, economic, and environmental contexts in which families live and encompasses general factors like

[2] Permission to include this figure was granted by Elsevier on May 10, 2024; licence number 5785471454872, for reuse in a thesis/dissertation (see Appendix A for full licence agreement).

socioeconomic status, employment, access to healthcare, neighbourhood characteristics, and exposure to environmental hazards as well as parental specific factors such as parental physical and mental health, antenatal care and safe delivery.

Nurturing care: This refers to the quality of care and support provided to individuals across the lifespan, particularly during critical periods such as infancy. Nurturing care includes access to healthcare, nutrition, and opportunities for learning and development.

Multigenerational impact: This emphasises the relevance of the aforementioned experiences for future generations, acknowledging that factors such as socioeconomic status, health and wealth are often passed down generations in families, thus perpetuating social and health inequalities.

Both the RJF and the multigenerational model draw attention towards the need for acknowledging and understanding the impact of social inequalities on health and development. Taken together, these models highlight the importance of a sociopolitical climate that enables families from all backgrounds to access effective services, adequate nutrition, security and safety in order to promote positive, multigenerational outcomes. Emerging research supports this idea, demonstrating that environmental and social factors can have a profound impact on the rate and quality of early development (Chelini et al., 2022; Tierney & Nelson, 2009). Indeed, the influence of social inequality is becoming increasingly apparent; with evidence demonstrating the significant impact of factors beyond the mother-infant dyadic unit, including experiences that occur even before a child is born, such as deprivation and marginalisation (Walker et al., 2011); these factors will now be examined in further detail.

1.6.2. Deprivation and marginalisation

The following sections consider deprivation and marginalisation as overarching factors that limit access to reproductive justice and social equality, which in turn impacts maternal mental health, birth mode and developmental outcomes.

The definition of ‘deprivation’ and ‘marginalisation’ can vary across the literature. For the purposes of this review, deprivation will be considered as broadly comprising a number of factors including low levels of education, employment and income (Volodina et al., 2021), which results in limited access to economic, cultural and social capital (Şengonul, 2022).

For the purposes of this review, marginalisation refers to the social processes by which individuals or groups are excluded from participation in social, economic, and political activities (Baah et al., 2019; Hall et al., 1994). Marginalisation can relate to various sociodemographic factors, including minoritised race, ethnicity, gender, sexual orientation, socioeconomic status, disability and health/mental health status. Marginalised individuals or groups often face barriers to accessing resources, opportunities, and rights that are available to the majority of society, and this is often rooted in historical and structural inequalities (Baah et al., 2019).

Despite the Equality Act (2010) mandating that all public institutions actively promote equal access and opportunities, minimise discrimination and disadvantage, and commit to understanding the needs of marginalised groups, those experiencing deprivation and marginalisation in the UK experience a range of social inequalities. For example, deprivation has been found to lead to poorer developmental (Mensah et al., 2005) and educational (McKinney et al., 2012) outcomes, poorer physical (Norman & Boyle, 2014) and mental health (Foster et al., 2018), as well as poorer healthcare (Cookson et al., 2016). Marginalisation has been associated with disparities in psychological wellbeing (Bansal et al., 2022; Lereya et al., 2024), mental health care provision (Cooper et al., 2013; Hui et al., 2020), as well perpetuating cycles of disadvantage (Afuape et al., 2022; Colen et al., 2019; Smith et al., 2009).

The following section will explore the impact of social inequalities on maternal outcomes during the perinatal period, highlighting the differential health, mental health, and birth mode outcomes based on deprivation and marginalisation.

1.6.3. The impact of deprivation and marginalisation on maternal outcomes

Emerging research demonstrates differential health outcomes for mothers during the perinatal period, with poorest outcomes often found in those who experience the intersection of disparities caused by deprivation and marginalisation. The literature shows persistent relationships between various social determinants of health and poorer maternal health related outcomes. For example, lower occupational class, lower income and marginalised ethnicity are associated with higher risk of severe maternal morbidity (Aoyama et al., 2019; Kayem et al., 2011; Ray et al., 2018; Urquia et al., 2017). Studies have also shown that life threatening events relating to pregnancy are higher in women from deprived backgrounds (Snelgrove et al., 2021). Despite the increased risk of adverse health in pregnancy, factors associated with both deprivation (such as household income), and marginalisation (such as mother's country of birth and recent immigration) are associated with inadequate perinatal care utilisation (Gonthier et al., 2017).

With regards to mental health, deprivation has been found to increase the risk of developing mental health difficulties during the perinatal period (Ban et al., 2012). Furthermore, population level research demonstrates that mothers who identify as coming from minoritised ethnic groups have significantly lower rates of mental health services utilisation and higher rates of involuntary inpatient admission compared to women from 'White British' backgrounds (Jankovic et al., 2020), thus indicating inequality of access to mental health support based on marginalised ethnicity.

Another significant social inequality faced by mothers from deprived and marginalised backgrounds is differences in healthcare. Recent studies have suggested that rates of CSD are higher in those from ethnically minoritised (Hanson et al., 2022) and deprived backgrounds (Kim et al., 2019), suggesting that social inequality may be a contributing factor to high rates of CSD. Similarly, recent research has demonstrated a significant relationship between the experience of perinatal mental health difficulties during pregnancy and CSD, whereby mothers with clinical levels of psychological distress have been found to be at least twice as likely to have a CSD than healthy mothers (Moameri et al., 2019). Strikingly, this study found that the presence of clinical levels of symptoms of anxiety and depression

during pregnancy led to 81% and 96% higher rates of CSD respectively. This indicates that the presence of mental health difficulties may contribute to higher rates of CSD. However, this study was conducted in Iran, and there may be cultural, service and individual level differences that are not necessarily generalisable to the UK context. Indeed, a similar study conducted in the US found a similar trend for increased rates of CSD in parents with mental health difficulties, though the rates of CSD were only 3.5% higher in this sample (Zochowski et al., 2021). Importantly, neither of these studies differentiate between elective and emergency CSD, meaning it is difficult to determine the specific circumstances under which mental health issues might influence the choice or necessity of CSD.

The significance of differentiating between emergency and elective CSD has been demonstrated in the literature. A systematic review found that some of the most common reasons for requesting CSD related to a range of anxieties including fear of labour pain, foetal injury/death, childbirth, gynecologic examination, loss of control and lack of support from medical professionals (Jenabi et al., 2020). Additionally, this review found a relationship between maternal request for CSD and demographic factors such as increased maternal age, professional occupation, obesity, and higher household income. The increased rate of elective CSD since 1975 (APS Group Scotland, 2021) can therefore be seen as an important consideration in the context of social inequality, perinatal mental health and infant outcomes. Indeed, these findings suggest the need for improved identification and support for mothers experiencing birth anxiety or previous birth trauma in order to reduce the rates of unnecessary procedures.

Conversely, emergency CSD appears to be higher in those from marginalised or deprived backgrounds. Recent research has demonstrated that among 18,946 deliveries in the US, mothers from Black, Asian and Hispanic backgrounds and single mothers, had a significantly increased likelihood of unplanned CSD even after adjusting for maternal age, BMI and socioeconomic background (Williams et al., 2022). The finding that rates of unplanned CSD vary by ethnicity has been replicated in a number of studies conducted in the US (Valdes, 2021; Zhang et al., 2023) . The UK follows a similar trend, whereby mode of delivery differs significantly based on

sociodemographic characteristics (Essex et al., 2013). For example, non-UK born women, and those from minoritised ethnic backgrounds exhibited an increased risk of emergency CSD.

Collectively, the findings in this section indicate significant health, mental health and healthcare disparities for mothers based on social inequality. The following section will explore the impact of deprivation and marginalisation on infant development.

1.6.4. The impact of deprivation and marginalisation on early development

Deprivation has been found to have a significant impact on developmental outcomes. In 2007, researchers estimated that over 200 million children below the age of 5 were not attaining their developmental potential, primarily because of deprivation (Grantham-McGregor et al., 2007; Walker et al., 2007). Indeed, the biological and psychosocial risks linked with poverty are thought to contribute to both poorer early development, as well as later educational achievement (Engle et al., 2007) thus potentially perpetuating intergenerational cycles of poverty.

A systematic review and meta-analysis comparing the highest versus lowest deprivation areas in the UK, found that the odds of adverse birth outcomes including low birth weight, premature birth and stillbirth were significantly higher in families from high deprivation areas (Weightman et al., 2012). Further studies suggest that even in otherwise low-risk pregnancies, more adverse outcomes are seen in those from high deprivation areas (Taylor-Robinson et al., 2011). Similarly, negative outcomes among low-risk pregnancies have been demonstrated to differ based on marginalised race; for example infants of black mothers experience the highest risk for neonatal morbidity and mortality (Parchem et al., 2020).

Deprivation is found to have long-term consequences on brain development and cognitive ability (e.g. Shonkoff et al., 2012). Indeed, a review identified that 43% of children below the age of 5 are at risk of not attaining their developmental potential as a result of poverty (Black et al., 2017). Economic deprivation is also associated with deficits in language and cognition at 3 years, which increases at 5 years of age (Dickerson & Popli, 2016; Fernald et al., 2011; Rubio-Codina et al., 2016; Schady et

al., 2015). Some studies demonstrate that these deficits are evident in children as early as 3 months of age (Fernald et al., 2012).

By age 7, children who experience persistent deprivation during their early years have been found to exhibit reduced cognitive development than children who have never encountered poverty, even when adjusting for various background characteristics and parental involvement (Dickerson & Popli, 2016). Conversely, a longitudinal study found that the majority of the effect of poverty (86%) was mediated by parental education, the quality of stimulation at home up to the age of 5, birth size and physical growth up to 24 months (Hamadani et al., 2014).

Importantly, research demonstrates the significant influence of social inequality on development, particularly in the first 24 months (Zeanah et al., 2003). Indeed, the first 2 years post birth are thought to be the most sensitive times for the development of foundations in cognitive ability, executive functioning, and academic attainment (Hamadani et al., 2014; Manji et al., 2015; Stein et al., 2008), after which, the association weakens (Hamadani et al., 2014; Sudfeld et al., 2015), thereby highlighting the importance of examining development at the earliest possible stage.

1.6.5. Conclusion

This section introduced the RJF and multigenerational model (Black et al., 2017) in order to highlight the relevance of understanding health and development in the perinatal period through the lens of social inequality. Research demonstrating the wide range of adverse outcomes for mothers and babies experiencing deprivation and marginalisation has been outlined. Furthermore, the significance of life experiences within the first two years of development was highlighted. Despite this, research relating to development in the first stages of life remains limited. Similarly, there have been no attempts to systematically synthesise evidence regarding the relationships between maternal ER or CSD with developmental outcomes. Therefore, in the following sections, two scoping reviews will be conducted in order to explore the breadth of current evidence in these areas.

1.7. Scoping Review 1 - Emotion Regulation & Early Development

1.7.1. Methods

Research question

Based on the literature presented in Chapter 1.4, the following research question was proposed to guide the search: what is the relationship between maternal ER and developmental outcomes in early childhood?

Identifying relevant studies

Various key search terms were used to ensure broad coverage of the literature pertaining to ER and developmental outcomes in early childhood.

In order to identify relevant literature, the following electronic databases were searched: Academic Search Ultimate, APA PsycArticles and APA PsyInfo via EBSCO. The author also conducted hand-searching of reference lists and additional searches via Google Scholar to ensure identification of any other relevant sources. The scoping review was completed in November 2023 and was repeated in February 2024 to check for new papers.

Search terms

(("development" OR “developmental outcomes” OR "NEURODEVELOPMENT") AND (“CHILD OR INFANT OR NEONATE OR NEWBORN OR TODDLER OR PRESCHOOL”) AND ("EMOTION* REGULATION" OR “AFFECT REGULATION” OR “EMOTION* DYSREGULATION”))

Eligibility criteria

Inclusion criteria:

- Peer reviewed quantitative studies, published in the last 10 years to ensure the inclusion of up to date, high quality research
- Studies that include a clear measure of both:
    - a) maternal emotion regulation AND
    - b) one or more aspects of cognitive, motor, language, social-emotional or behavioural development in children aged <24 months

- Studies written/published in any country

Exclusion criteria:

- Case studies
- Studies which include children under 2, but where the age range of participants makes it hard to draw conclusions specific to those under 2
- Articles not available in English
- Articles that could not be accessed

1.7.2. Results

A total of 8 papers were identified (See Appendix B for flow chart) and quality assessed. All of the identified papers explored the relationship between maternal ER and aspects of social-emotional development specifically (see Appendix C for summary of included studies). There were no papers relating to cognitive or wider global developmental outcomes that met the inclusion criteria for the scoping review, highlighting an important gap in the literature.

Impact of maternal ER on broad social-emotional development

One paper (Behrendt et al., 2019) utilised structural equation modelling to explore a broad range of social-emotional developmental outcomes in infants born to a community sample of first time mothers. The findings indicated that maternal ER difficulties were directly associated with maternal depressive symptoms, but not infant outcomes. However, there was a significant indirect effect of ER on infant outcomes, whereby greater difficulties with ER related to poorer bonding, which in turn predicted poorer social-emotional development. Importantly, this study investigated mothers with subclinical levels of depression, and as such, the findings may not generalise to mothers with moderate-to-severe mental health difficulties.

Impact of maternal ER on infant temperament

One paper (Kiel et al., 2017) investigated the impact of maternal ER on infant temperament (specifically in relation to anger and fear). In this study, the sample consisted of infants born to two samples of mother; those with and those without a diagnosis of borderline personality disorder (BPD). Mother-infant dyads were

observed during two scenarios, respectively designed to induce anger and fear in the infant. The findings suggest that maternal ER difficulties did not lead to greater infant anger, but that the misattribution of or bias towards perceiving anger in mothers with ER difficulties may lead to more maladaptive, non-supportive responses to infant distress. BPD is characterised by high levels of emotion dysregulation, a finding reiterated in this study. However, the study identified that maternal ER difficulties, above and beyond BPD diagnosis, predicted punitive and minimising responses to infant distress, which the authors argue, could contribute to poorer emotional development in children over time. This study found no differences in infant anger between groups, but parent-reported infant anger was greater in mothers with higher levels of BPD symptoms. This indicates that mothers with high levels of ER difficulties may find the subjective experience of infant anger more prominent and difficult than those without, which may in turn impact caregiving and infant social-emotional development.

Kiel et al., found no relationship between infant fear and punitive/minimising emotion socialisation in either groups. The authors hypothesised that this is because mothers with BPD have heightened sensitivity towards rejection, which they may associate more with interpersonal anger than fear. This demonstrates some of the potential nuance and complexity in the relationships between maternal mental health difficulties, ER and infant developmental outcomes.

Impact of maternal ER on infant ER

Three papers focused specifically on infant ER outcomes which were measured via a mixture of observation and physiological markers of ER (parasympathetic nervous system functioning) in stress inducing situations (Gao et al., 2022, 2023; Riva Crugnola et al., 2019). These papers consistently identified that poorer maternal ER predicted poorer infant ER.

One study (Gao et al., 2022) included measures of both prenatal and postnatal maternal ER. In this study, mothers' and infants' respiratory sinus arrhythmia (RSA) was used as a measure of ER during the still face experiment. The researchers found that the RSA levels of infants had a weaker tendency to return to homeostasis

and were less affected by their mothers' RSA, when the mothers had poorer ER, indicating less effective coregulation in these mother-infant dyads. This underscores the importance of maternal ER in influencing infants' ability to regulate their own emotions. This contributes to our understanding of the intergenerational transmission of ER skills, suggesting that mothers' postnatal ER behaviours may serve as a model for infants, influencing their emerging emotional development.

Furthermore, the findings demonstrated that postnatal, but not prenatal, ER predicted infant ER in a stressful situation. This highlights the potential temporal aspect of maternal ER's influence on infant emotional regulation. Specifically, it suggests that while prenatal maternal ER may not directly predict infant ER, postnatal maternal ER does.

Impact of maternal ER on mother-infant synchrony

Mother-infant synchrony (gaze, affect and behavioural) was the social-emotional developmental outcome of interest in three of the included studies (Doba et al., 2022; Lotzin et al., 2015, 2016), the latter two consisting of the same sample of parent-infant dyads. The studies consistently found that poor maternal ER predicted maladaptive patterns of synchrony.

Doba et al., examined mother–infant gaze, vocal and motor synchrony in a modified version of the Strange Situation, a task which involves an initial condition of spontaneous interaction, a period of separation, and a reunion condition in which the mother returns and re-engages in spontaneous interaction with her infant. The researchers found that motor synchrony was greater during the reunion condition than in the initial condition, such that mothers touched their infants more which in turn helped reduce infant distress, such as crying, self-soothing behaviours, and gaze aversion. This indicates that the mothers touch allowed for adaptive coregulation of emotions, and may be a critical factor for emotional development in infancy.

Further, this study emphasised the role of maternal ER difficulties in the establishment of maladaptive synchrony. The authors found that maternal anxiety

mediated the relationships between ER difficulties and mother–infant synchrony whereby mothers who were less able to regulate their emotions experienced greater anxiety and exhibited heightened levels of synchrony in both conditions, characterised by more intrusive and hypervigilant behaviour. This suggests that maternal ER plays a role in the development of maternal anxiety and heightened mother–infant synchrony, even in theoretically non-stressful situations.

Conversely, Lotzin (Lotzin et al., 2015, 2016) found that maternal ER mediated the link between maternal mental health difficulties and heightened mother-infant synchrony, indicating that ER may directly account for the variance in outcomes in infants whose mothers experience mental health difficulties. This discrepancy in findings may be due to the difference in populations investigated, whereby Lotzin et al., investigated a high risk sample of mothers with mood disorders, whilst Doba et al., participants were drawn from a non-clinical community sample. The implications of these findings are significant for understanding the relationships between maternal ER, perinatal mental health difficulties, and infant development.

1.7.3. Limitations

Each study was assessed for methodological limitations, as outlined in Appendix C. With regards to general trends across the data, the range of infant developmental domains investigated is limited, with a heavy focus on infant ER. There were few studies relating to wider infant social-emotional development, and no studies relating to the impact of maternal ER on infant cognitive outcomes, thus highlighting an important gap in the literature.

Another common limitation of the included research is the high levels of overall homogeneity in the samples investigated. Research relating to mother-infant dyads from a range of socioeconomic, educational, ethnic and mental health backgrounds is scarce. This restricts the external validity of the findings.

1.7.4. Conclusion

Overall, the findings of this scoping review indicate that there may be a link between maternal ER and infant social-emotional development. However, due to the scarcity of research, directionality of the relationships between ER, mental health difficulties

and infant developmental outcomes remains unclear. Given the relationship between maternal mental health and infant development, further research on clinical samples of mother-infant dyads is crucial. Furthermore, there is no research pertaining to the influence of maternal ER on developmental outcomes beyond a very limited selection of social-emotional domains, highlighting an important literature gap.

1.8. Scoping Review 2 - Caesarean Section Delivery & Early Development

1.8.1. Methods

Research question

Based on the literature presented in Section 1.5, the following research question was proposed to guide the search: What is the relationship between caesarean section delivery (CSD) and developmental outcomes in early childhood?

Identifying relevant studies

Various key search terms were used to ensure broad coverage of the literature pertaining to ER and developmental outcomes in early childhood.

In order to identify relevant literature, the following electronic databases were searched: Academic Search Ultimate, APA PsycArticles and APA PsyInfo via EBSCO. The author also conducted hand-searching of reference lists and additional searches via Google Scholar to ensure identification of any other relevant sources. The scoping review was completed in November 2023 and was repeated in February 2024 to check for new papers.

Search terms

(("infant development" OR "CHILD DEVELOPMENT" OR developmental AND outcomes OR "DEVELOPMENT" OR "NEURODEVELOPMENT") AND ("MODE OF DELIVERY" OR "MODE OF BIRTH" OR "BIRTH MODE" OR “caesarean” OR “c section”))

Eligibility criteria

Inclusion criteria:

- Peer reviewed quantitative studies, published in the last 10 years to ensure the inclusion of up to date, high quality research which:
    - Relates to children born via CSD
    - Includes a clear measure of one or more aspects of cognitive, motor, language, social-emotional or behavioural development in children aged <24 months

- Written/published in any country

Exclusion criteria:

- Case studies
- Studies which include children under 24 months, but where the age range of participants makes it hard to draw conclusions specific to those under 24 months
- Studies investigating complications including preterm or low birth weight children, as these are known to impact child development
- Articles not available in English
- Articles that could not be accessed

1.8.2. Results

A total of 4 eligible papers were identified (See Appendix D for flow chart) and quality assessed. The papers covered a wide range of developmental outcomes including motor, language and social-emotional skills, with mixed results around the influence of CSD (see Appendix E for summary of included studies). Only one study included those born by emergency CSD as well as those born by elective CSD (Khalaf et al., 2015), whereas the other studies did not include those born by emergency CSD.

Two studies used the Ages and Stages Questionnaire (ASQ-II) to investigate the impact of mode of birth on a broad range of developmental outcomes (Khalaf et al., 2015; Zaigham et al., 2020). Khalaf et al., found that at 9 months, both emergency and elective CSD were associated with poorer gross motor skills. Elective CSD was additionally related to poorer personal and social skills in infants. This suggests that both emergency and elective CSD can lead to poorer developmental outcomes in infants. Additionally, the authors noted that parity, maternal BMI and ethnic origin appeared to have a significant confounding effect on many of the associations. This indicates the interwoven nature of sociodemographic factors, CSD and infant developmental outcomes, underscoring the importance of considering maternal characteristics and demographic factors when examining the relationship between mode of delivery and infant outcomes.

Similarly, Zaigham et al., found that infants born by elective CSD have poorer developmental outcomes compared to VD infants at 4 months of age, across all domains of the ASQ-II. However, after adjusting for age at testing, by 12 months, infants born via CSD only had lower gross motor skills. This suggests that the impact of neurodevelopmental outcomes may flatten out over time. The findings underscore the dynamic nature of infant development and the potential for catch-up growth or convergence in developmental trajectories over time. Infants born via CSD may initially exhibit differences in developmental outcomes compared to VD infants, but these differences may attenuate or disappear as infants grow and develop. Understanding the trajectory of developmental outcomes following different modes of delivery is essential for providing appropriate advice, support and intervention.

One study conducted in Portugal found that 24 month old's born by elective CSD had poorer self-care skills compared to VD infants, and performed below expected levels for their age range (Rodrigues & Silva, 2018). Additionally, CSD infants were identified as having poorer motor skills than those born by VD, though they were still within the expected parameters for their age. Both groups in this study were below the expected age parameters for manipulative, visual, and speech and language skills, though those born by CSD scored lower. This paper did not find any differences in cognitive, hearing and language, and social-interaction skills between the groups. This suggests that while there may be differences in specific domains of development associated with mode of delivery, other aspects of development may not be affected.

Conversely, one study (Zavez et al., 2021) conducted on a population-based cohort in Quebec found that children born via CSD had a slightly higher risk of scoring poorly on the ASQ at 20 months compared to those born vaginally. However, this association was not statistically significant after adjusting for potential confounding factors such as maternal age, education, parity, gestational age, and infant sex. Additionally, the study did not find any significant differences in specific neurodevelopmental domains, including communication, fine motor skills, gross motor skills, problem-solving, and personal-social skills, between children born via CSD and those born vaginally. This underscores the importance of considering the

variability in findings across different studies and the need for further research to clarify the relationship between mode of delivery and developmental outcomes. Importantly, a number of limitations were identified with this study (see Appendix E), which raise questions over the reliability and validity of the findings.

1.8.3. Limitations

Each study was assessed for methodological limitations, as outlined in Appendix E. With regards to general trends across the data, one key limitation identified was the overall homogeneity in the samples included in the review, which limit the generalisability of the findings to Western, educated, wealthy families. Furthermore, there was only one paper that explicitly reported on the impact of sociodemographic variables on the findings (Khalaf et al., 2015). Further research relating to children from families from a range of socioeconomic, educational, ethnic and mental health backgrounds is required in order to understand the influence of wider factors on outcomes of CSD, particularly given the variance seen in sociodemographic factors of mothers who have elective CSD compared to those who undergo unplanned CSD (Williams et al., 2022). Indeed, only one study included emergency CSD as a variable of interest (Khalaf et al., 2015). Given that most of the data apply only to elective CSD, it is difficult to draw conclusions around those who experienced unplanned and emergency CSD.

1.8.4. Conclusion

Overall, these findings present a mixed picture on whether CSD impacts developmental outcomes in early childhood. There is some indication that CSD may lead to poorer developmental outcomes, particularly in the short-term. However, given the paucity of high quality research in this area, it is difficult to draw meaningful conclusions; further research is recommended to address this gap in the literature.

1.9. Rationale for Present Research

It is well established that maternal mental health difficulties increase the risk of adverse developmental outcomes for children (see Section 1.3). However, findings consistently indicate that maternal mental health alone cannot directly account for the variance seen in infant development. ER is emerging as a possible transdiagnostic mechanism that impacts both maternal mental health and parent-infant interaction which may help account for some of the variance in infant outcomes. Similarly, there is an abundance of evidence indicating differential outcomes for mothers and infants based on mode of delivery, whereby unassisted[3] VD consistently demonstrates the best outcomes across a range of domains (Bodner et al., 2011; Evans et al., 2022; Shamsa et al., 2013) compared to assisted VD or CSD. Importantly, individual experiences and outcomes cannot be thought of as existing within a vacuum; maternal mental health, birth, and development are intricately connected with one another. Furthermore, adverse experiences in these domains are linked by underlying risk factors associated with social inequalities such as deprivation and marginalisation.

The findings from the two scoping reviews presented in this chapter indicate that both ER and CSD may play a role in early developmental outcomes, though the nature of these relationships remain somewhat unclear due to the paucity of high quality research.

This chapter has identified four major gaps in the literature relating to the scarcity of research on i) developmental outcomes prior to 24 months, ii) the role of social inequalities, iii) samples of parents with clinical levels of perinatal mental health difficulties and iv) research that adopts a critical psychology approach to mental health. By attending to these gaps, the present research aims to provide a more holistic understanding of the relationships between moderate-to-severe perinatal mental health difficulties, birth and infant development.

[3] Without the need for interventions such as surgery, forceps or vacuum extraction.

1.10. Research Questions & Hypotheses

1) What is the relationship between maternal mental health and infant development in parents accessing perinatal mental health services?

2) Do emotion regulation and birth mode help explain the relationship between maternal mental health difficulties and infant development in parents accessing perinatal mental health services?

3) What is the relationship between social inequalities, maternal mental health and infant development in parents accessing perinatal mental health services?

Based on the literature presented in Chapter one, the following tentative hypotheses are proposed:

Hypothesis 1: Severity of perinatal mental health difficulties in a clinical sample of mothers is associated with poorer infant developmental outcomes across a range of global, cognitive and social-emotional domains.

Hypothesis 2: In a clinical sample of mothers, maternal ER and birth mode account for some of the variance in the relationship between perinatal mental health and infant development, whereby difficulties in ER and CSD contribute to greater developmental delays.

Hypothesis 3: In a clinical sample of mothers, markers of social inequality including deprivation (disability, education and unemployment) and marginalisation (ethnicity, gender identity and sexuality) are associated with poorer maternal mental health and infant developmental outcomes.

2. METHODS

2.1. Chapter Overview

This chapter begins by introducing the COSI study, from which the data for this study was generated. Next, the participants, procedure and ethical considerations of the research will be outlined. Details of the analytic procedure will then be discussed. Thereafter, epistemological and ontological considerations of the research will be examined. The chapter concludes with a reflective section examining the researcher's relationship to the research topics.

2.2. The COSI Trial

This study utilises secondary data from the COSI study (Rosan et al., 2023); an ongoing randomised controlled trial testing the Circle of Security-Parenting (COS-P) intervention. The aim of the COSI study is to examine whether COS-P can improve maternal mental health and mother-infant bonding in those accessing perinatal mental health services (PMHS) in the UK.

2.2.1. Co-production

The COSI trial was co-produced alongside a panel of experts by experience (EbE) comprised of mothers who have accessed PMHS and/or COS-P groups at one of the trial sites.

The panel advised on research protocols, recruitment, engagement, and retention strategies; and co-designed documents for participant use including information sheets and consent forms. Furthermore, throughout the COSI trial, the panel were consulted for their input.

Though there was no direct co-production involved in the present study, the influence of the EbE panel's contributions to the COSI trial trickles down into this study. For example, their preferences, insights and recommendations informed the choice of measures, which in turn, contributes to the research design and analysis of the present study.

2.3. Participants

Participants consisted of 352 mothers/birthing parents accessing PMHS across England and their infants (aged <12 months). All participants were drawn from the COSI study (Rosan et al., 2023) and were recruited between Jan 2022-Oct 2023 from community PMHS in the following NHS Trusts:

1. Cheshire and Wirral Partnership NHS Trust
2. Merseycare NHS Foundation Trust
3. Cumbria, Northumberland, Tyne & Wear NHS Trust
4. South West Yorkshire Partnership NHS Trust
5. Tees, Esk and Wear Valleys NHS Foundation Trust
6. Northampton Healthcare NHS Foundation Trust
7. Sussex Partnership NHS Foundation Trust
8. Devon Partnership NHS Trust
9. Southern Health NHS Foundation Trust

Inclusion Criteria

Mothers who (at the time of recruitment):

- Were accessing a community PMHS from one of the recruiting sites.
- Had a child aged 0-12 months with no severe illness or developmental disorder.
- Were experiencing moderate to severe mental health difficulties (as assessed by an average score of at least 1.1 on the CORE-OM).
- Were experiencing bonding difficulties (as assessed by a total score of at least 12 on the PBQ).
- Were aged at least 18.
- Were willing and able to give informed consent.

Exclusion Criteria

Mothers who (at the time of recruitment):

- Had previously received the COS-P intervention.

- Were experiencing active psychosis.

2.4. Measures

Multiple sources of quantitative, qualitative and observational data were collected as part of the COSI trial. Participants of the COSI trial were invited to one pre-intervention and three post-intervention study visits to complete these measures. For the purpose of this study, only data from the pre-intervention visit is used[4]. These measures were recorded at a single time point between 0-12 months postpartum.

The pre-intervention measures relevant to this study are listed and described below:

- Clinical Outcomes in Routine Evaluation – Outcome Measure (CORE-OM)

The CORE-OM is a 34-item measure of mental health which measures four key areas; well-being, symptoms, functioning and risk. The CORE-OM has strong internal consistency (0.75-0.95) and convergent validity with other measures of mental health difficulties, and has been reported as acceptable in both clinical and non-clinical populations (Evans et al., 2002).

Sample items include statements such as ‘I have felt terribly alone and isolated’ and ‘I felt I have had someone to turn to when needed’ which is rated on a Likert scale from 0-4.

- Difficulties in Emotion Regulation Scale (DERS) (Gratz & Roemer, 2004)

A self-report measure of perceived ER ability, based around four broad facets (a) awareness and understanding of emotions; (b) acceptance of emotions; (c) the ability to control impulses and behave in accordance with goals in the presence of negative affect; and (d) access to helpful ER strategies. The DERS demonstrates good construct validity, good internal consistency, and good discriminative ability (Burton et al., 2022), including in clinical samples (Hallion et al., 2018).

[4] At the time of this study's execution, the collection of post-intervention data was still ongoing. Therefore, only baseline data was available.

Sample items include statements such as ‘When I’m upset I lose control of my behaviours’ and ‘when I’m upset my emotions feel overwhelming’ which are rated on a Likert scale from 1-5.

- Postpartum Bonding Questionnaire (PBQ) (Brockington et al., 2006)[5]

A 25-item self-report measure designed to provide an early indication of disorders within mother-infant relationships. It consists of four factors; general emotional factor, anger towards and rejection of baby; infant-focus anxiety; and risk of abuse. The PBQ’s 4-factor structure is found to have high sensitivity for anger and rejection, and a clinical cut off score of 13 has been suggested (Brockington et al., 2006). The PBQ has been widely translated and validated in a wide range of countries including Japan (Suetsugu et al., 2015), Italy (Busonera et al., 2017), Spain (Garcia-Esteve et al., 2016) and China (Siu et al., 2010). Sample items of the PBQ include ‘I enjoy playing with my baby’ and ‘I am afraid of my baby’ which are rated on a Likert scale from 0-5.

- Ages and Stages Questionnaire-3 (ASQ-3) (Squires et al., 2009)

The ASQ-3 is a tool for assessing and screening global infant development in communication, motor and cognitive areas. The ASQ-3 has shown to be a reliable and valid instrument for determining the need for further developmental evaluation; it is found to have excellent test-retest reliability (Rubio-Codina et al., 2016; Squires et al., 2009) and excellent interrater reliability (Marks & LaRosa, 2012).

Sample items include ‘If you hold both hands just to balance your baby, does he support his own weight while standing?’ and ‘When your baby is on her back, does she try to get a toy she has dropped if she can see it?’. The total score will be calculated and used in the analysis.

- Ages and Stages Questionnaire Social-emotional (ASQ-SE) (Squires et al., 2009)

[5] NB: The PBQ was only used to assess eligibility for the COSI trial as part of the participant recruitment process. The PBQ was not used as a measure in the present study.

The ASQ-SE focuses specifically on social and emotional behaviours including autonomy, compliance, adaptive functioning, self-regulation, affect, interaction and social communication. This measure has been found to demonstrate good validity, test-retest reliability and internal consistency (Squires et al., 2015).

Sample items include ‘does your baby stiffen and arch her back when picked up’ and ‘does your baby laugh or smile at you and other family members’.

2.5. Procedure

During the recruitment period, information about the trial was publicised among clinicians working in the PMHS recruitment sites. PMHS staff approached birthing parents about the trial during standard screening meetings (e.g. intake assessments, review meetings) and introduced the trial. Parents who met the eligibility criteria were given a participant information sheet and recruitment leaflet and asked to provide verbal consent to be contacted by a member of the COSI research team to discuss this information further.

Scores on the CORE-10 or CORE-OM and the PBQ were assessed within 6 weeks prior to the beginning of a recruitment block and were also accepted as screening scores for the trial. Further eligibility was assessed by a member of the study team who contacted the parents to discuss the trial in detail. Following this call, written informed consent for interested and eligible parents was obtained. The family doctor of each participant was notified of their participation.

Baseline trial assessments took place prior to the first intervention session and were offered either face-to-face or virtually. Participants were given the choice to self-complete the measures online, or to complete them together with a member of the research team. Study outcome measures were entered directly into a secure online system by participants (online, using a unique access code) or research staff with role-based and password-protected access. Participants received a £10 voucher for completing the measures at baseline.

2.6. Ethical Considerations

This study utilised secondary data from the COSI study (Rosan et al., 2023). Ethical approval for the COSI study was obtained on 26/11/2021 with the Surrey REC (Health Research Authority, 3rd Floor, Barlow House, 4 Minshull Street, Manchester, M1 3DZ, UK; + 44 (0)207 104 8144; surrey.rec@hra.nhs.uk), REC ref: 21/LO/0723.

Additional ethical approval was obtained for the specific purpose of this study from the University of East London (UEL), School of Psychology Research Ethics Committee (Appendix F, G and H). Amendments were subsequently requested and approved (see Appendix I and J). All ethical considerations were informed by the British Psychological Society (BPS) code of ethics and conduct (British Psychological Society, 2018).

Trial Registration

The COSI trial was registered on 18th February 2022, registration: ISRCTN18308962. Further registration was not required for the purposes of this study.

Funding Statement

The present research did not receive any direct funding. However, the COSI trial is funded by the National Institute for Health Research (NIHR) Health Technology Assessment (HTA) Programme (NIHR131339) and is supported by the National Institute for Health and Care Research ARC North Thames. The COSI study is also supported by the NIHR Clinical Research Network (CPMS 50,730).

The views expressed in the present research are those of the author(s) and not necessarily those of the NIHR or the Department of Health and Social Care or any other organisations involved.

2.7. Analytic Plan

Power analysis

To determine the sample size required to test the hypotheses, power analysis for the statistical analyses requiring the greatest power (linear multiple regression) were conducted using G*Power version 3.1.9.7 (Faul et al., 2009). The minimum sample

size to achieve 80% power for detecting a medium effect, at a significance criterion of α = .05, was 164. This sample size was exceeded by the current sample, inferring sufficient power to detect at least medium effects.

Data management

All analyses were conducted using SPSS. Data normality was assessed through skewness/kurtosis values, box plots, and histograms, in line with guidance from Clement & Bradley-Garcia (2022). All data was included in the analysis, and missing data is accounted for using multiple imputation with 5 imputations. The pooled data is reported in the results section.

Sample characteristics

In the results chapter, sociodemographic and clinical characteristics of the full sample of mothers are summarised using n (%) for categorical data and mean (SD) for continuous data (see section 3.4).

Correlations between variables

Pearson's product-moment correlations were run to determine the relationships between each of the variables. Although assisted vaginal birth was not a key focus of this research, findings from these participants were included in correlational analyses in order to explore whether any meaningful differences exist.

Research question 1: What is the relationship between maternal mental health and infant development in parents accessing perinatal mental health services?

In order to address this question, Pearson's correlations between severity of psychological distress (CORE-OM total score), comorbidity of mental health diagnoses (self-report), global developmental outcomes (ASQ-3) and social-emotional developmental outcomes (ASQ-SE) were executed.

Research question 2: Do emotion regulation and birth mode help explain the relationship between maternal mental health difficulties and infant development in parents accessing perinatal mental health services?

In order to address this question, two moderated mediation models were executed

using model 5 on the PROCESS macro for SPSS (see Figure B and Figure C). Non-parametric bootstrapping with 10,000 samples was used to test the indirect effects. The indirect effect was deemed significant if zero was not included in the 95% confidence intervals (CIs).

Figure B

Model 1 - Moderated mediation model with global infant developmental outcomes (ASQ-3)

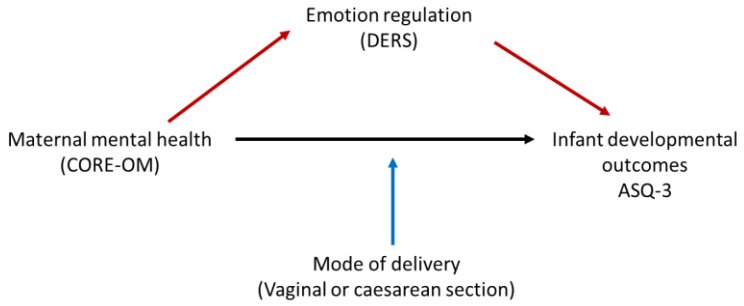
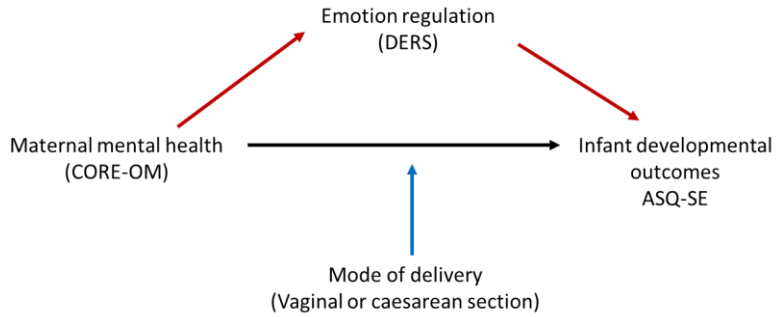


Figure C

Model 2 - Moderated mediation model with social-emotional developmental outcomes (ASQ-SE)



In each of the models, age of infant and SES were included as covariates. In order to measure SES, a composite variable was created consisting of household income and maternal level of education, as recommended by the APA (APA, 2015), health inequality research (e.g. Lindberg et al., 2022) and similar studies (Torres, 2013).

<u>Research question 3: What is the relationship between social inequalities, maternal mental health and infant development in parents accessing perinatal mental health services?</u>

In order to address this question two composite variables were created; deprivation and marginalisation.

The deprivation composite consists of participants' disability, employment and income status, in line with three out of the four dimensions of deprivation in the UK Census (Office for National Statistics (ONS), 2022b)[6]. Participants were scored on each of these variables, up to a maximum of 4 points, with higher scores indicating greater deprivation.

The marginalisation composite consists of minoritised ethnicity, sexuality and gender identity and has a total maximum value of 3, with higher scores indicating greater marginalisation.

The research question was then investigated using Pearson's correlation analyses between the composite variables and infant global (ASQ-3) and social-emotional (ASQ-SE) outcomes.

2.8. Epistemology

This study is predicated on the epistemology of pragmatism. As a research paradigm, pragmatism holds that researchers should make use of the philosophical and/or methodological approaches that work best for the research questions under investigation (Tashakkori et al., 1998). Pragmatism recognises that there are many ways of defining concepts, undertaking research, and interpreting the world, thus holding space for the possibility of multiple realities (Creswell & Clark, 2017). The position taken throughout this research is that any knowledge gained is inherently situated within a historical, social, cultural and political context. As such, the relevant constructs and their measurement are scrutinised, and assumed to be fallible. This is important in the context of the present research as concepts such as ‘mental health’, ‘emotion regulation’, ‘bonding’ and expected stages of development can be seen as time and culture bound, and therefore may not represent an inherent ‘truth’ or ‘reality’, but rather one way of making sense of human behaviour.

2.9. Reflexivity

[6] The fourth dimension of deprivation in the UK Census is housing, deprivation in this dimension is defined as accommodation that “is either overcrowded, in a shared dwelling, or has no central heating”. Given that this data was not collected as part of the COSI study, it was not possible to add this dimension to the composite variable.

Reflexivity allows researchers to critically explore their position, biases and presumptions in relation to their chosen area of research (Berger, 2015). Although mostly used in qualitative research, the skill of reflexivity can be highly relevant in quantitative research given that personal background, values and experiences invariably shape the research process such as the chosen methodology, selection of sources and interpretation of findings (Huntington-Klein, 2021; Jamieson et al., 2023).

To establish transparency and allow the reader to consider the researcher's influence on the research, relevant aspects of the researcher's identity, positionality and experience are presented below alongside reflections on how these influenced the development of the research.

Birth mode

The researcher is a mother of one who experienced birth via an emergency CSD in 2022. During pregnancy, the researcher experienced substantial pressure to have a ‘natural’ (i.e. vaginal) birth, on the advice of medical and societal influences, particularly the abundance of hypnobirthing advocates. This contributed to stigma towards caesarean births, lack of clarity around and preparedness for CSD, as well as anxiety and guilt regarding i) ‘failing to achieve’ a ‘natural’ birth and ii) potential harm towards her infant as a result of the procedure. The lack of available information regarding the short and long-term consequences of CSD was a significant source of anxiety and frustration during the early postpartum stages, particularly as the researcher's infant exhibited feeding, sleep and weight gain difficulties which could potentially have been attributed to CSD.

Discussions with peers revealed that the majority of parents known to the researcher who had CSDs, whether emergency or elective, shared similar feelings of disappointment, guilt, anxiety, and confusion.

Importantly, the life-saving value of the procedure is not intended to be undermined in this research. Rather, the intention is to draw attention towards the high rates of CSD and the lack of research regarding the potential consequences of this birth

mode. The researcher aims to address some of the gaps in the literature in order to contribute towards informed decision-making for families, clinicians and policymakers.

Mental health, reproductive justice and social inequality

Transdiagnostic, non-pathologising approaches to mental health are privileged in this research. This decision is rooted in a combination of the researchers training, personal values, lived experience and clinical experience. Furthermore, identification as a Middle Eastern woman belonging to various marginalised groups influenced the significance placed on social inequality and reproductive justice in relation to this research. Importantly, this perspective entails respect and awareness of the intersections of systemic inequalities which impact mental health, particularly for mothers from marginalised and deprived communities.

3. RESULTS

3.1. Chapter Overview

In this chapter, the results of the analyses are presented. First, the data is tested to assess whether assumptions for analysis have been met. Then, demographic information is outlined to contextualise the sample. Next, correlations between the variables of interest are presented. Finally, each research question and hypothesis is addressed in turn.

3.2. Assumption Testing

The proposed analyses involve regression and moderated mediation models. Therefore, it is necessary to ensure that the following assumptions are met; independence of observations, linearity of relationships, homoscedasticity, multicollinearity and normal distribution of data (Clement & Bradley-Garcia, 2022). In order to verify these assumptions, the procedure outlined by Clement & Bradley-Garcia, (2022) was conducted on SPSS.

The distribution of data using Kolmogorov-Smirnov and Shapiro-Wilk tests demonstrated all variables to be normally distributed, apart from the DERS total score which was found to be significant on the Kolmogorov-Smirnov test (0.04, p = <0.05). However, given that the skew was between -2 and 2 and Kurtosis between -7 and 7, the data in this variable was not transformed. All other data was found to meet the necessary assumptions required to proceed.

3.3. Missing Data

Some participants did not complete all aspects of the questionnaires, resulting in missing data in 9.4% of cases on the CORE-OM total score, 3.1% of cases on DERS total score, 10.2% on the ASQ-SE, 6.3% on the ASQ-3 and 2.3% on the marginalisation and deprivation composite scores. Birth mode data was available for all participants. Missing values were imputed using multiple imputation with 5 imputations, and where possible, pooled data is reported.

3.4. Descriptive Statistics

3.4.1. Participant demographics

Maternal characteristics

A total of 352 mothers completed the baseline measures. The average age of the mothers in the study was 30.83 (SD = 5.48) and the average of infants was 21 weeks (SD = 12.61).

The majority of the mothers identified as female (94%), white (93%), and were either married or in a relationship (88%). See Table 5 and Table 6 for a breakdown of the characteristics of mothers and babies in the sample respectively.

Table 5

Sociodemographic Characteristics of the Sample

Demographic Variable	Specify	Mean (SD) / n	%
Maternal Age	n/a	30.83 (5.48)	
Gender Identity	Woman (including trans woman)	332	94.10
	Non-binary	5	1.40
	Other	1	0.30
	Prefer not to say/ data missing	15	4.20
Sexuality	Heterosexual	296	84.10
	Bisexual	43	12.20
	Lesbian	2	0.60
	Prefer not to say/ data missing	11	3.2
Ethnicity	Asian or Asian British	3	0.80

Demographic Variable	Specify	Mean (SD) / n	%
	Black or Black British	1	0.30
	Mixed	9	2.50
	Other Ethnic Group	2	0.60
	White (British, Irish, Other White Background)	329	93.20
	Prefer not to say/ data missing	9	2.50
Disability	Yes	65	18.40
	No	273	77.30
	Prefer not to say/ data missing	15	4.30
Marital Status	Civil Partnership	2	0.60
	In a relationship	154	44.20
	Married	152	43.10
	Single	33	9.30
	Prefer not to say/ data missing	10	2.80
Highest completed level of education	Higher education (e.g. University degree)	197	55.80
	Tertiary/further education	111	31.40
	Secondary education	26	7.40
	Primary education or less	4	1.10

Demographic Variable	Specify	Mean (SD) / n	%
	Other general education	4	1.10
	Prefer not to say/data missing	11	3.10
Employment Status	Employed	247	70.00
	Not in employment	98	27.80
	Prefer not to say/data missing	8	2.30

Infant and birth characteristics

The average age of infants was 21.39 weeks, and there was an even split of male and female infants in the sample. The majority of infants were born at term (86%) and just over half (56%) had first born child status. A total of 147 infants (42%) were born by CSD and a further 59 (17%) required forceps or ventouse intervention during VD.

Table 6

Birth and Infant Variables

Birth/Infant Variable	Specify	Mean (SD) / n	%
Planned Pregnancy	Yes	224	63.50
	No	122	34.60
	Prefer not to say/ data missing	7	1.90
Birth Mode	Unassisted vaginal birth	140	39.70
	Caesarean birth	147	41.70

Birth/Infant Variable	Specify	Mean (SD) / n	%
	Assisted vaginal birth	59	16.70
	Other	6	1.70
	Prefer not to say/ data missing	1	0.30
Sex of Child	Male	177	50.10
	Female	174	49.30
	Prefer not to say/ data missing	2	0.60
Gestational Age	37 weeks or more (full-term)	305	86.40
	Less than 37 weeks (pre-term	46	13.00
	Prefer not to say/ data missing	2	0.60
First Child Status	Yes	196	55.50
	No	153	43.30
	Prefer not to say/ data missing	4	1.20
Infant age at baseline (weeks)		21.39 (12.61)	

Deprivation and marginalisation

With regards to deprivation, in the sample, 27.8% were not in employment, 9.6% were educated at secondary education or below and 18.4% considered themselves to have a disability.

The maximum possible score for the composite deprivation variable was 4, with higher scores indicating greater deprivation. The sample scores ranged from 0-4, with a mean of 0.60 (SD = 0.82).

With regards to characteristics of marginalisation, only 4.2% of the sample described themselves as coming from a background other than 'White', 9.3% were single parents, 12.8% identified as not being heterosexual, and 1.7% identified their sex as 'non binary' or 'other'. Combined, these characteristics formed a 'marginalisation' composite variable. The maximum possible score for the marginalisation composite variable was 4, with higher scores indicating greater risk of marginalisation. The sample scores ranged from 0-2, with a mean of 0.29 (SD = 0.51).

3.4.2. Maternal mental health difficulties and ER

The CORE-OM was used as a transdiagnostic measure of maternal mental health difficulties. The possible maximum raw score on this measure is 136, with higher scores indicating greater psychological distress. In this sample, the raw scores ranged from 11- 121, with a mean raw score of 65.27 (SD = 20.38). The CORE-OM is scored by calculating the average response to each item (from 0 – 4). The participant average response on items was 1.92 (SD= 0.60), which is similar to the average response found in the CORE-OM's clinical validation sample 1.86 (SD = 0.75) (Evans et al., 2002).

The DERS was used to measure ER in the sample. The maximum possible score is 180, with higher scores indicating greater difficulties with ER. In this sample, the scores ranged between 47-168, with a mean total score of 115.89 (SD = 26.02). This is at the higher end of the clinical mean found in other papers (e.g. Burton et al., 2022; Hallion et al., 2018) where the mean total score was found to be between 89-116 in clinical samples.

Additional mental health variables

Table 7 contains a breakdown of the mental health characteristics of mothers in the sample. Depression and anxiety were the most common mental health diagnoses reported by the mothers in the sample (85.3%, and 85% respectively. Most of the

mothers (89.5%) had a history of mental health difficulties prior to the birth of their child, with a mean age of onset of 16.63 (SD = 6.30).

Comorbidity (the presence of other mental health conditions in addition to the primary reason for referral to PMHS) in the sample was examined as an additional marker of mental health difficulties. The majority (85.3%) of participants reported experiencing comorbidity, and more than half of these (43.8%) reported experiencing at least three mental health conditions.

Table 7

Mental Health Variables in the Sample

Mental Health Variable	Specify	Mean (SD) / n	%
Main difficulty relating to PMHS referral	Depression	301	85.30
	Anxiety	300	85.00
	Obsessive Compulsive Disorder	43	12.20
	Personality difficulties	53	15.00
	Trauma	138	39.10
	Psychosis	11	3.10
	Bipolar disorder	15	4.20
	Prefer not to say/ data missing	1	0.30
Mental Health Comorbidities	1 diagnosis only	47	13.40
	2	146	41.50
	3+	154	43.80
Experience of mental health difficulties prior to perinatal period	Yes	316	89.50
	No	32	9.10
	Prefer not to say/ data missing	5	1.40

Mental Health Variable	Specify	Mean (SD) / n	%
Age of onset of mental health difficulties		16.63 (6.30)	

3.4.3. Infant development

Global development (ASQ-3)

The maximum score on the ASQ-3 is 300, with higher scores indicating greater developmental ability. The sample scores range from 10-300, with a mean of 208.47 (SD= 55.58). There are no cut off scores for developmental concern based on total score, however, table 8 shows the scores for each subtype of the ASQ-3 by age alongside the clinical cut off range.

The average scores suggest that generally speaking, infants in the sample do not have impaired development, with the exception of at 2 months, where communication, gross motor and problem-solving skills are within the clinical cut off range. The results also indicate that at 12 months, there may be impaired or delayed problem-solving and personal-social skills, however, given the small sample (n= 7) within this age range, these results could be anomalous.

Table 8

Scores on the ASQ-3 by subcategory

Subtype	Age *(n)*	Average score	Clinical range	Cut off category
Communication	2 months *(104)*	32.50	22.77-35.00	**At cut off**
	4 months *(95)*	43.52	34.60-44.00	**At cut off**
	6 months *(62)*	41.21	29.65-39.00	Above cut off
	8 months *(39)*	45.90	33.06-42.00	Above cut off
	10 months *(22)*	41.36	22.87-35.20	Above cut off

Subtype	Age *(n)*	Average score	Clinical range	Cut off category
	12 months (*7)*	35.00	15.64-30.00	Above cut off
Gross Motor	2 months *(104)*	42.99	41.84-47.50	**At cut off**
	4 months *(95)*	49.11	38.41-46.00	Above cut off
	6 months *(62)*	36.33	22.25-33.50	Above cut off
	8 months *(39)*	41.97	30.61-41.00	Above cut off
	10 months *(22)*	43.41	30.07-41.50	Above cut off
	12 months (*7)*	41.67	21.49-35.50	Above cut off
Fine Motor	2 months *(104)*	40.38	30.16-40.00	Above cut off
	4 months *(95)*	41.90	29.62-40.50	Above cut off
	6 months *(62)*	37.08	25.14-36.50	Above cut off
	8 months *(39)*	47.83	40.15-47.50	Above cut off
	10 months *(22)*	50.91	37.97-46.00	Above cut off
	12 months (*7)*	44.29	34.50-42.00	Above cut off
Problem Solving	2 months *(104)*	35.34	24.62-36	**At cut off**
	4 months *(95)*	47.53	34.98-44.50	Above cut off
	6 months *(62)*	40.75	27.72-39.00	Above cut off
	8 months *(39)*	51.58	36.17-45.00	Above cut off
	10 months *(22)*	46.36	32.51-42.00	Above cut off
	12 months (*7)*	34.29	27.32-37.00	**At cut off**

Subtype	Age *(n)*	Average score	Clinical range	Cut off category
Personal-Social	2 months *(104)*	41.25	33.71-42	**At cut off**
	4 months *(95)*	44.63	33.16-42.00	Above cut off
	6 months *(62)*	39.18	25.34-36.50	Above cut off
	8 months *(39)*	51.05	35.84-44.00	Above cut off
	10 months *(22)*	44.32	27.25-37.75	Above cut off
	12 months (*7)*	32.14	21.73-33.75	**At cut off**
Total ASQ-3 score	2 months *(104)*	190.53	NA	NA
	4 months *(95)*	226.21	NA	NA
	6 months *(62)*	190.24	NA	NA
	8 months *(39)*	234.62	NA	NA
	10 months *(22)*	226.36	NA	NA
	12 months (*7)*	181.43	NA	NA

Social-emotional development

The maximum score on the ASQ-SE is 330, with higher scores indicating poorer social-emotional development. The scores in the sample ranged from 5-140, with a mean of 37.94 (SD = 23.13). The cut off score for developmental concern ranges between 45-48 depending on the age of the child (Squires et al., 2002). The ASQ-SE does not contain any subcategories of social-emotional development.

3.5. Correlations Between Variables

Table 9 presents the results of Pearson's correlations between each variable of interest.

Table 9

Pearson's Correlations

Variable	Deprivation	CORE Total	DERS Total	ASQ-3 Total	ASQ-SE Total
Deprivation					
CORE Total	.314**				
DERS Total	.232**	.670**			
ASQ-3 Total	.111*	-.038	-.078		
ASQ-SE Total	.044	.205**	.177**	-.238**	

Note. * Correlation is significant at the 0.05 level (2-tailed) **. Correlation is significant at the 0.01 level (2-tailed).

A further Pearson product-moment correlation was run to determine the relationship between the variables and subcategories of the ASQ-3 (communication, gross motor, fine motor, problem solving and personal-social). The findings demonstrated significant correlations (p = 0.01) between each subcategory. Furthermore, the CORE-OM was correlated (p = 0.05) with the personal-social subscore on the ASQ-3. No other significant relationships were found.

3.6. Research Question 1: What is the relationship between perinatal mental health difficulties and infant development in parents accessing perinatal mental health services?

Hypothesis 1: *Severity of perinatal mental health difficulties in a clinical sample of mothers is associated with poorer infant developmental outcomes across a range of global, cognitive and social-emotional domains.*

The results indicate a significant association between the CORE-OM, and the ASQ-SE but not the ASQ-3 total score; however, further analysis revealed that the CORE-OM was significantly correlated to the personal-social domain of the ASQ-3 (r =.115, p = <0.5). These findings provide partial support for hypothesis one.

Furthermore, the findings also indicate that comorbidity of mental health conditions is significantly correlated with the CORE-OM score. However, there were no significant correlations between comorbidity and infant development.

3.7. Research Question 2: Do emotion regulation and birth mode help explain the relationship between perinatal mental health and infant developmental delays in parents accessing perinatal mental health services?

Hypothesis 2: *In a clinical sample of mothers, maternal ER and birth mode account for some of the variance in the relationship between perinatal mental health and infant development, whereby difficulties in ER and CSD contribute to greater developmental delays.*

Moderated mediation model testing

The results of the moderated mediation models indicate that neither model was statistically significant (See Table 10).

Table 10

Results from the moderated-mediation models

Measure	F	R2	CORE total → DERS	DERS → ASQ Total	CORE → ASQ Total	Birth Mode → ASQ Total	Interactions (CORE x Birth Mode)
			b/SE	b/SE	b/SE	b/SE	b/SE
ASQ-3	5.98	.13	.83/.06**	-.27/.18	.57/.55	-7.24/6.82	-.34/.33
ASQ-SE	3.26	.08	.86/.06**	.10/.08	.09/.24	.30/2.94	.05/.14

Note. **. Correlation is significant at the 0.01 level.

Although the moderated mediation models were found to not be statistically significant, further analysis was conducted to examine the relationships between the variables.

Further exploratory analyses

Given the literature presented in Section 1.5, it was hypothesised that birth mode would have an impact on infant development. Table 11 shows the mean scores on measures of mental health, ER and infant development.

Table 11

Mean Scores on Measures of Maternal Mental Health, ER and Infant Development by Birth Mode

Birth mode *(n)*	CORE-OM	DERS	ASQ-3	ASQ-SE
Vaginal Delivery *(146)*	67.29	118.22	213.05	38.44
Caesarean Section *(147)*	65.41	115.41	204.70	38.09
Assisted Vaginal Delivery *(59)*	61.40	114.25	209.84	39.98

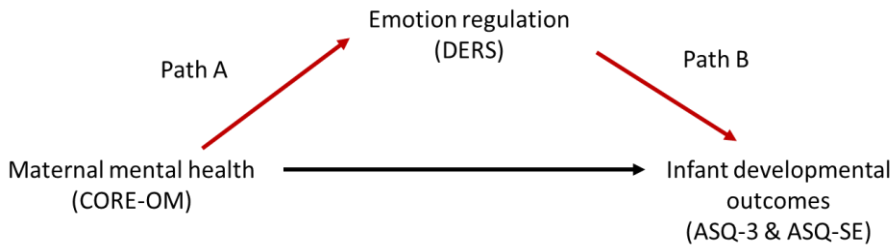
A one-way MANCOVA was conducted to assess whether the total mean CORE-OM, DERS, ASQ-3 and ASQ-SE scores differ significantly by birth mode, with infant age and SES as covariates. The results demonstrated no significant differences between groups in these domains, with the exception of those delivering via VD demonstrating significantly poorer scores on the CORE-OM compared to those who experienced assisted VD ($F(2,316) = 3.20$, $p = .042$).

Alternative model testing

Given the findings of the aforementioned analyses, whereby significant associations were found between the CORE-OM, DERS, ASQ-3 and ASQ-SE, an alternative model was proposed (see Figure D).

Figure D

Alternative mediation model



Thus, two mediation analyses were conducted to test the new model with CORE-OM score as the IV, DERS score as a mediator, and ASQ-3 and ASQ-SE scores as the respective DVs.

The results of the first mediation model showed that both path a (i.e., severity of mental health on ER) (B = 0.85, p <.001) and path b (i.e., ER on ASQ-3) (B = -.20, p <.001) were significant. The indirect effect of maternal mental health on ASQ-3 score was also found to be statistically significant (effect = -.17, CI 95% = -.28 to -.07).

The results of the second mediation model showed that path a (i.e., severity of mental health on ER) (B = 0.85, p <.001) and path b (i.e., ER on ASQ-SE) (B = .07, p = .01) were significant. The indirect effect of maternal mental health on ASQ-SE was also found to be statistically significant (effect = .06, CI 95% = .01 to .10).

3.8. Research Question 3: To what extent are social inequalities associated with infant development in parents accessing perinatal mental health services?

Hypothesis 3: *In a clinical sample of mothers, markers of social inequality including deprivation (disability, education and unemployment) and marginalisation (ethnicity, gender identity and sexuality) are associated with poorer maternal mental health and infant developmental outcomes.*

Table 9 shows that the deprivation composite score was significantly correlated with the ASQ, whereby higher deprivation scores were associated with poorer scores on the ASQ. However, there were no significant correlations between deprivation and any of the subdomains of the ASQ-3, or the ASQ-SE score.

Deprivation was also found to be associated with greater comorbidity as well as higher scores on the CORE-OM and DERS, indicating poorer mental health and emotional regulation in mothers with greater levels of deprivation.

Given the lack of heterogeneity in the sample, it was not possible to investigate sociodemographic characteristics individually, so the composite marginalisation variable was used. Bivariate analyses revealed significant correlations between marginalisation and deprivation (r = .238, p= <0.01) as well as marginalisation and CORE-OM (r = .187, p = <0.01).

4. DISCUSSION

4.1. Chapter Overview

This chapter begins with a brief summary of the study aims. This will be followed by an exploration of the findings pertaining to each research question in relation to pre-existing literature, where available. Implications for clinical practice, policy and research will then be discussed. Next, the limitations of the research will be outlined and critically evaluated. The chapter ends with a final conclusion.

4.2. Summary of Aims

Through the lens of reproductive justice and social equality, the broad aim of this study was to explore whether transdiagnostic factors can help to explain the relationship between maternal mental health and infant development in those experiencing moderate-to-severe perinatal mental health difficulties. Based on the literature presented in Chapter 1, four factors were proposed as potentially relevant: ER, birth mode, deprivation and marginalisation.

The research aimed to address gaps in the literature relating to i) developmental outcomes prior to 24 months, ii) the role of social inequalities, iii) samples of parents with clinical levels of mental health difficulties and iv) research that adopts a critical psychology approach to perinatal mental health.

4.3. Exploration of Findings

In this section, the results pertaining to each research question are presented alongside possible explanations for findings and links to wider literature.

4.3.1. What is the relationship between maternal mental health and infant development in parents accessing perinatal mental health services?

Descriptive statistics

Prior to in-depth analysis, descriptive statistics were investigated to explore trends in the data. This revealed that infants in the sample scored, on average, above the clinical cutoff for developmental concern in relation to global and social-emotional development, with the exception of the youngest babies (i.e. between 0 and 3

months old), where communication, gross motor and problem-solving skills were found to be below the clinical cut off for developmental delay. The results also indicated that in infants aged 12 months, there were delays in problem-solving and personal-social skills. However, given the small sample size (n= 7) within this age range, these results could be anomalous. These findings indicate that the presence of perinatal mental health difficulties in and of itself may not directly lead to global developmental impairment, though could potentially contribute to delays in some domains of development. There is, however, a clear need for further research into the impact of perinatal mental health difficulties on infant development, particularly in babies under 3 months and those over 12 months to explore the trends seen in the data.

Overall, the findings indicate that in a clinical sample of mothers experiencing perinatal mental health difficulties, there does not appear to be a global trend for atypical infant development. This finding aligns with a recent systematic review, which indicates that the relationship between perinatal mental health difficulties and infant development is still inconclusive (Burger et al., 2020). This highlights the importance of further research exploring direct and indirect pathways underpinning the relationship between perinatal mental health and infant development.

Psychological distress and infant development

The results of correlational analyses conducted in this study indicated that, in mothers accessing PMHS, there are significant relationships between severity of psychological distress and the social-emotional development of infants aged <12 months. This finding is congruent with the growing body of literature regarding maternal mental health and infant social-emotional development (e.g. Behrendt et al., 2019; McIntosh et al., 2021; Porter et al., 2019; Rogers et al., 2020). Furthermore, this study adds to the knowledge base by demonstrating these findings in two understudied populations: i) a clinical sample of mothers (those accessing PMHS) and ii) infants below the age of 12 months. This finding carries important clinical and theoretical implications which will be explored later in this chapter.

Importantly, this study did not generate findings in support of the impact of severity of maternal psychological distress on wider global development in infants. This finding is incongruent with the wider literature (see Section 1.3.1); for example, the large-scale meta-analysis by Rogers et al., (2020) which found significantly poorer childhood development in mothers experiencing depression and anxiety. However, a possible explanation for this finding could be that global developmental delays/difficulties are not yet evident in infants, and the majority of research supporting this link has been conducted in early childhood and beyond. There would be a benefit to repeating the analysis on this sample at a later stage, or a similar sample. This would allow us to track the trajectory of development, which would have important theoretical and clinical implications, such as identifying critical periods for intervention and refining our understanding of the developmental pathways influenced by maternal psychological distress.

Another possible explanation for this finding is that all the mothers in the sample were accessing treatment under PMHS. Given that the families were known to services, it is possible that they may have had additional support from health visitors or other services, which in turn may have served as a protective factor, buffering against potential adverse outcomes. However, it is unclear why this would only affect social-emotional development and not global development; further research is required to help understand the impact of PMHS interventions on infant developmental outcomes, and whether interventions can be tailored to promote both maternal health and infant development.

Comorbidity of mental health diagnoses

Further exploratory analyses were conducted to investigate comorbidity (the presence of more than one mental health diagnosis) as a potentially influential factor in relation to maternal mental health and infant development. In the sample, 85.3% of mothers reported experiencing more than one mental health disorder. The perinatal comorbidity rate found in this study is considerably higher than those in other studies (Cena et al., 2021; Verreault et al., 2014), though these studies were not conducted on clinically relevant samples. Therefore, it may be that rates of comorbidity increase along with severity of mental health difficulties, as indicated in

non-perinatal populations (Kessler et al., 2005). Indeed, the findings of this study support this theory as within this sample, comorbidity was significantly correlated with severity of psychological distress.

Comorbidity was also significantly correlated with greater difficulties in ER. This provides support for the significance and utility of ER as a transdiagnostic indicator of psychological distress across a range of mental health symptomatology.

This study found no significant correlations between comorbidity of perinatal mental health diagnoses and infant development, indicating that the status of having more than one mental health diagnosis was not associated with developmental delays in this sample. This finding suggests that mental health diagnoses may be less relevant to infant outcomes than transdiagnostic factors such as severity of psychological distress or ER and emphasises the lack of information that can be inferred from diagnosis alone. In turn, this provides support for moving away from traditional diagnostic approaches (in line with the limitations discussed in Section 1.3.3) to aid understanding of the link between perinatal mental health and infant development.

4.3.2. Do emotion regulation and birth mode help explain the relationship between maternal mental health difficulties and infant development in parents accessing perinatal mental health services?

Maternal ER

Correlational analyses demonstrated that maternal ER was significantly associated with infant social-emotional development. This result is congruent with the findings of scoping review 1 (see Section 1.7), which concluded that may be a link between maternal ER and infant social-emotional development (particularly infant ER).

Conversely, maternal ER was not found to be significantly associated with global developmental outcomes; however, there was evidence that maternal ER mediates the relationship between perinatal mental health difficulties and both infant global and social-emotional developmental outcomes. As such, the findings of this study suggest that maternal ER may serve as a mechanism through which perinatal

mental health difficulties exert their effects on infant development. This is perhaps unsurprising, given that one major way infants learn about emotions is via parent-infant interactions such as facial expressions, gaze, vocalisations, and gestures. Where parents experience ER difficulties, these interactions and communications may be reduced or otherwise negatively impacted (Parfitt et al., 2013). Furthermore, infants depend on caregivers to help soothe and manage their emotions, which can be seen as an early form of co-regulation and eventually fosters the development of independent ER (Cole et al., 2004). When a parent is able to consistently tune into and modulate their infants communications, they create a mutual and interactive system of co-regulation, from which infant ER eventually emerges, as well as wider aspects of social-emotional development, including internal working models of relationships (Zimmermann, 1999) and mental health (Sroufe et al., 2005). However, poor maternal ER disrupts the caregiving environment, leading to less responsive and emotionally supportive interactions with a child (Martin et al., 2020; Morelen et al., 2016); which may subsequently contribute to the poorer developmental outcomes demonstrated in this study.

Overall, the results indicate that although perinatal mental health difficulties may manifest in various ways, their impact on infant development can be mediated by maternal ER. This adds to the limited body of literature regarding maternal ER and infant development in mothers experiencing perinatal mental health difficulties. Importantly, though the significance of maternal ER in relation to perinatal mental health and infant development is demonstrated, this research is not intending to convey that ER should be prioritised over other transdiagnostic factors. Rather, this research supports the need for adopting a broader transdiagnostic approach to research, assessment and intervention of perinatal mental health difficulties, which includes but is not limited to consideration of factors such as ER.

Birth mode

Contrary to hypothesis 2, the results of the analyses revealed that there was no moderation effect of birth mode on infant development and no difference in developmental outcomes based on birth mode in this sample. This finding is surprising based on the wider literature around the impact of CSD (see Section 1.5).

However, given the findings of scoping review 2 (see Section 1.8), which found no conclusive evidence for the link between CSD and developmental outcomes in early childhood, it is not entirely unexpected.

Importantly, this study adds to the literature by demonstrating that for those with moderate-to-severe perinatal mental health difficulties, birth mode is not directly associated with poorer development in early infancy, nor indirectly associated via perinatal mental health and ER. One possible explanation for this finding is that the influence of factors associated with CSD (e.g. maternal physical health, dysbiosis, iron depletion, sleep deprivation…etc) that were not investigated in this study have a greater impact on infant development than birth mode in and of itself (see Section 1.5.1. for further exploration of these mechanisms). However, further research is required to provide support for this theory.

This study also did not find any significant differences in specific developmental domains, including communication, fine motor skills, gross motor skills, problem-solving, and personal-social skills, between children born via CSD and those born vaginally, which corroborates the findings of research in community based mother-infants dyads (Zavez et al., 2021). Given this, it might be helpful for mothers to be aware that, based on this data, there is no evidence that early infant development is impacted by CSD. This could benefit parents more broadly by adding information about the relative costs and benefits of CSD when engaging in birth planning, and therefore promote informed consent. Furthermore, this could be particularly helpful for those experiencing birth anxiety, birth trauma or guilt associated with CSD because it may offer reassurance, clarity and/or relief.

Surprisingly, this study found no differences in severity of psychological distress or maternal ER by birth mode, apart from the finding that those who delivered via VD exhibited greater psychological distress compared to those who experienced assisted VD. This is in contrast to the literature cited in section 1.5.2 that CSD leads to increased rates of postnatal depression (Tonei, 2019), post-traumatic stress disorder (PTSD) (Grisbrook et al., 2022) and lower self-esteem (Benton et al., 2019).

This finding is unexpected given that assisted births are associated with higher rates of physical problems, birth trauma and complications (Rowlands & Redshaw, 2012). It is possible that this finding is anomalous, though further research is needed to assess this. More broadly, the finding that psychological distress and maternal ER are not significantly different in those who experienced VD and CSD in mothers with perinatal mental health difficulties implies that delivery method may not play a critical role in influencing mental health in those with existing difficulties. This may be different to the impact of birth mode in community samples, whereby unplanned CSD in particular is seen to increase the risk of mental health difficulties (Dekel et al., 2019).

4.3.3. What is the relationship between social inequalities, maternal mental health and infant development in parents accessing perinatal mental health services?

Deprivation, marginalisation and perinatal mental health

The findings indicate that deprivation is associated with greater comorbidity of mental health difficulties, greater psychological distress, and greater difficulties with ER in mothers accessing perinatal mental health services. These findings highlight the significant link between deprivation and perinatal mental health, which is congruent with the literature presented in Section 1.6, such as the literature demonstrating increased risk of developing mental health difficulties during the perinatal period in those experiencing deprivation (Ban et al., 2012). Importantly, the present research adds an additional layer of nuance to this finding, highlighting that mental health symptomology, comorbidity and ER during the perinatal period are all associated with deprivation.

An explanation for this finding is that experiences of unemployment, disability and low levels of education, can lead to financial strain, inadequate housing, limited access to healthcare, and social isolation, which can serve as chronic stressors and in turn, increase severity of psychological and physical health difficulties (Hruschak & Cochran, 2017; Marin et al., 2011). Furthermore, deprivation often intersects with other risk factors for mental health difficulties, such as adverse childhood

experiences or trauma (Corfield et al., 2016; Morris et al., 2019; Walsh et al., 2019), thus further increasing the likelihood of severe mental health difficulties.

In this study, deprivation was positively correlated with marginalisation (i.e. minoritised ethnicity, gender identity and sexuality), meaning those with the highest levels of deprivation were more likely to come from a marginalised background. This is an important finding as mothers who identify with marginalised identity characteristics are likely to encounter the intersection of disparities in both obstetric care and mental health care (Huggins et al., 2020); as well as wider experiences of discrimination which has been found to increase psychological distress in the perinatal period (Doherty et al., 2023). Indeed, the findings of this study demonstrate that marginalisation in the sample is associated with higher levels of psychological distress among mothers experiencing moderate-to-severe mental health difficulties during the perinatal period. Given the positive correlations between deprivation, marginalisation and psychological distress, it seems reasonable to hypothesise that the cumulative burden of stressors associated with social inequality may lead to greater psychological distress in early parenthood, though further research is required to confirm this hypothesis.

Moreover, the results of the study indicate that amongst mothers accessing PMHS, those experiencing deprivation have poorer ER than those in a better socio-economic position. However, given that there was no comparison across time, it is difficult to determine directionality of this effect. For example, it might be that prior to pregnancy, ER was impaired in those with lower socioeconomic status; it could also be the case that the burden of deprivation during pregnancy/early parenthood overwhelmed existing maternal capacity for ER. Better understanding of these dynamics might provide valuable insights into how best to support parents experiencing socioeconomic deprivation during the perinatal period.

Overall, the findings of this study highlights the relationships between deprivation, marginalisation and psychological distress. The precise mechanisms underlying these links remain unclear, and further research in this area would be beneficial (see section 4.6 for recommendations).

Deprivation and infant development

The results of the study indicate that deprivation is associated with poorer infant global developmental outcomes, which is consistent with the findings discussed in section 1.6. Importantly, this finding adds to the literature by demonstrating this finding amongst mothers experiencing moderate-to-severe mental health difficulties during the perinatal period.

One explanation for the link between deprivation and infant development is that factors such as deprivation can impact a caregivers ability to provide early learning opportunities. Infant development can be stimulated through activities with caregivers, such as reading, storytelling, singing, and playing (Barros et al., 2010). These activities have been found to promote learning and predict early developmental progress, particularly among infants of mothers with low levels of schooling (Barros et al., 2010). Indeed, research conducted during the Covid-19 pandemic illustrated that home learning activities were related to fewer social-emotional difficulties among school aged children (Larsen et al., 2020; Tso et al., 2020). However, disparities have been identified in the number of home-based activities offered by parents based on deprivation (Black et al., 2017). Indeed, parental socioeconomic status (SES) is seen as a crucial predictor of caregiving practices (Treviño et al., 2021). Some researchers have argued that this is because families have a finite amount of resources to 'invest' in their children; low income families have lower 'funds' to invest in services, activities, materials, and experiences that promote learning, hence the adverse impact on child development (Altschul, 2012; Volodina et al., 2021). Experiences of deprivation are also thought to impact families' internal sense of power by adjusting the expectations and value placed on educational achievement (Brown & Putwain, 2022); parents who have experienced social inequalities may feel disillusioned about their child's academic potential due to the impact of fewer educational opportunities, limited economic resources and hardships, which in turn, decreases the value they perceive in investing their limited resources in promoting their child's academic development (Ren et al., 2021).

Stress may also be a relevant factor explaining the link between deprivation and child development. The family stress model posits that stress mediates the relationship between deprivation and developmental outcomes (Barnett, 2008; Masarik & Conger, 2017). Low SES is associated with higher levels of family stress, which can adversely impact parental affect, behaviour and caregiving, which in turn impacts child development (Zhang et al., 2021). Indeed, these explanations demonstrate that deprivation reduces accessibility of resources, caregiver expectations, emotional availability and stress. However, it is important to note that caregiver physical availability can also be impacted by deprivation, whereby parents from low income families may be required to work longer hours, or multiple jobs, which in turn reduces opportunities for bonding, learning and engagement.

Contrary to our hypothesis, there was no evidence that deprivation was significantly associated with infant social-emotional outcomes. This suggests that deprivation may have a more pronounced impact on certain developmental domains compared to others. For instance, global development, which encompasses various areas such as cognitive, motor, and language skills, may be more directly influenced by factors associated with deprivation, such as access to resources and environmental stimulation. On the other hand, social-emotional outcomes may be influenced by a broader range of factors including perinatal mental health, parenting practices, and social support, which may mitigate the effects of deprivation to some extent. The relevance of these findings includes highlighting that while deprivation may pose significant challenges to infant development, there may be protective factors which can buffer against some of the negative effects on developmental outcomes. Research indicates that these protective factors might include extrinsic factors such as public health initiatives (Bellis et al., 2012) and early intervention strategies (McDonald et al., 2016) which could be addressed by policymakers (see Section 4.5), as well as intrinsic factors such as greater social support, higher optimism, and better parental relationships (McDonald et al., 2016) some of which could be addressed by services including PMHS (see Section 4.4).

Marginalisation and infant development

Based on the findings of this study, there was no evidence that maternal marginalisation is associated with infant developmental outcomes. It is possible that this association was not found due to the relatively low levels of marginalisation in the sample, however, this hypothesis would benefit from further testing. It would also be helpful to compare the impact of marginalisation on mothers who are receiving treatment under PMHS with those who are not, as it is possible that PMHS involvement and interventions serve as a protective factor.

Another explanation for this finding might be that the infants had not yet been exposed to enough environmental disadvantage for the full effects of marginalisation to be exhibited in this age group. On the other hand, the mothers, who have potentially experienced the lifelong effect of these social inequalities, were consistently found to experience poorer outcomes in terms of mental health and ER. Indeed, research has suggested that with cumulative exposure to developmental risks, disparities widen and child developmental trajectories become more firmly established (Walker et al., 2011). This effect appears to be evident in infants by 12 months (Hurt & Betancourt, 2017); it would be worthwhile therefore, to repeat these measures at a later stage in the infants development.

Overall, the findings relating to research question 3 underscore the importance of considering the multifaceted nature of infant development and the differential impacts of deprivation and marginalisation across developmental domains. The findings highlight that social inequality is an important factor to consider in relation to maternal mental health and infant outcomes.

4.4. Novel Contributions of the Study

As discussed in section 1.3.2, prior to this study, the relationship between maternal mental health and infant development was reasonably well-established. The current literature highlights the negative impact of maternal mental health on a range of developmental outcomes, and various factors had been proposed that potentially influence this relationship. However, while there is evidence suggesting connections between maternal mental health, ER, birth mode, deprivation, marginalisation and infant development, prior to this research, no study had examined these factors

together. This study integrated a range of biopsychosocial variables into a single analytical framework, and the findings shed light on how these variables interact with one another.

The findings of this study contributes to the field of perinatal mental health by addressing several significant gaps in the existing literature relating to the relationship between maternal mental health and infant development; including the scarcity of research on i) developmental outcomes prior to 24 months, ii) the role of social inequalities, iii) samples of parents with clinical levels of perinatal mental health difficulties and iv) research that adopts a critical psychology approach to mental health. Indeed, the results demonstrate that the impact of maternal mental health difficulties, ER and social inequality (particularly deprivation) can have an impact on development, which can be seen in infants below the age of 12 months. Furthermore, in examining the underlying mechanisms that drive these associations, the study highlights ER as an important mediating variable in the relationship between maternal mental health and infant development. Implications of these findings will be discussed in sections 4.6 - 4.8.

4.5. Relevance of Findings in Relation to Theoretical Frameworks

As discussed in section 1.6, the present research was informed by the reproductive justice framework and Black et al.'s (2016) multigenerational model of health and development.

The RJF emphasises the right of all individuals to a) have children, b) not have children, and c) parent their children in safe and supportive environments. This study specifically addresses points a and c; noting the importance of addressing differences in outcomes for families based on sociodemographic factors. Indeed, the findings of this study highlight the socio-political nature of mental health in relation to reproductive issues, focusing on the impact of social inequality.

This study's findings align with the RJF by highlighting the significant role of maternal psychological distress and ER difficulties in infant developmental outcomes. This association supports the RJF's assertion that the conditions under which women

become parents and raise children are deeply influenced by broader social determinants of health. This also highlights the need for improved services to support families (see section 4.5 and 4.6 for recommendations). Furthermore, the study's identification of deprivation as a critical factor impacting both maternal mental health and infant development provides empirical support for the assertion that efforts to promote reproductive justice must address socio-economic disparities, and effective support depends upon systems change rather than individuals.

Black et al.'s (2016) multigenerational model of health and development posits that the health and development of one generation are intricately linked to the health and development of previous and subsequent generations. The study's findings contribute to this model by demonstrating how maternal mental health and ER difficulties impact infant developmental outcomes. This suggests that interventions aimed at improving maternal mental health could potentially benefit both current and future generations.

Furthermore, the findings of this study support the use of transdiagnostic approaches to perinatal mental health. This aligns with both the RJF and the multigenerational model, which advocate for comprehensive, intersectional approaches to health and development.

To summarise, the study's findings reinforce the importance of the RJF and the multigenerational model in understanding and addressing perinatal mental health and infant development. By highlighting the significant impact of social inequality on infant outcomes, the research highlights the need for holistic, inclusive, and equity-focused approaches in perinatal healthcare.

4.6. Implications for Clinical Practice

There are a number of implications for clinical practice that can be drawn from this research including consideration of transdiagnostic approaches to perinatal mental health, a need for improving accessibility of PMHS to diverse populations and informing birth planning.

Transdiagnostic approaches to perinatal mental health care

The findings of this study indicate that taking a transdiagnostic approach to perinatal mental health may contribute to improved identification of vulnerable families, which may support better outcomes. A transdiagnostic approach to perinatal mental health care involves a paradigm shift away from traditional diagnostic categories towards a more comprehensive understanding of mental health that acknowledges the complexity and heterogeneity of mental health difficulties during the perinatal period, as well as the impact of social inequality.

Within PMHS, a transdiagnostic approach could include moving away from rigid referral/eligibility criteria centred upon psychiatric diagnoses towards more flexible and person-centred approaches, which could include self-referral options. Similarly, clinicians should avoid relying solely on interventions tailored to specific disorders unless clinically indicated. Interventions that encourage peer support such as COS-P may be a fruitful avenue to explore (Maxwell et al., 2021). Furthermore, systemic, couples, and family therapy intervention options may be beneficial (Cluxton-Keller & Bruce, 2018; Giallo et al., 2022; Hales-Ho & Timm, 2023; Şengonul, 2022).

This study demonstrates that comorbidity of mental health difficulties is common in a PMHS sample, at 85.3%. Traditional diagnostic approaches may therefore fail to address the multiplicity of perinatal mental health difficulties, leading to limitations in treatment outcomes and potential intergenerational transmission of adverse outcomes. Given the finding that ER partly explains the effect of psychological distress on development, it is proposed that assessment of ER in mothers would be beneficial, as well as incorporating ER skills training within interventions, though research examining the efficacy of this will also be needed.

Importantly, a transdiagnostic approach to perinatal mental health also entails addressing social inequalities. Given that mothers experiencing deprivation are more vulnerable to mental health difficulties, addressing underlying social issues is likely to improve mental health and developmental outcomes by alleviating some of the stressors contributing to psychological distress. This entails helping families experiencing deprivation to access better living conditions, e.g. through supporting

housing applications, benefits appeals, advocacy and signposting to wider support services. Addressing social inequalities also entails addressing issues associated with marginalisation, which will be explored in more detail in the following section.

In summary, a transdiagnostic approach to perinatal mental health care could offer a comprehensive and flexible framework for understanding and addressing the needs of vulnerable individuals and families during the perinatal period. By focusing on underlying mechanisms and social factors, rather than specific diagnostic labels, this approach could improve treatment outcomes, enhance service delivery and contribute towards reducing social inequality.

Improving accessibility of PMHS

This study, alongside wider literature, demonstrates that there is a lack of representation in UK PMHS of mothers from deprived and marginalised backgrounds. Given the unprecedented expansion of specialist perinatal mental health services as part of the Five Year Forward View for Mental Health in England (NHS England, 2014) and the NHS Long Term Plan (NHS England, 2019), ensuring services are equitable is crucial. The collection and tracking of reliable large-scale data about the use of PMHS by women from ethnically minoritised backgrounds could help inform current policies, and provide information around how to improve accessibility and cultural sensitivity of PMHS. Indeed, recent reports demonstrate that in England, the proportion of women from ethnic minorities who gave birth in 2022 was higher than those from the ethnic majority population (NHS Digital, 2023; Office for National Statistics (ONS), 2022a). However, existing literature consistently highlights shortcomings in achieving equitable access to PMHS. For example, evidence indicates that mental health difficulties during the perinatal period were twice as likely to be missed in ethnically minoritised women (Croudace et al., 2016). Indeed, a national survey indicated that during the perinatal period, non-White mothers were less likely to be asked about their mental health, offered treatment or to receive support (Redshaw & Henderson, 2016). A potential explanation for this might be that some ethnically minoritised women are not aware of the support available and are therefore less likely to request it, however, it is also important to acknowledge organisational issues including unconscious bias, culturally insensitive

and fragmented services and unhelpful interactions with healthcare staff (Watson et al., 2019).

Given the links between deprivation, marginalisation, perinatal mental health and infant development found in this study, there is a clear need for action. Researchers have suggested that access to PMHS could be improved by addressing various barriers including; awareness of perinatal mental health amongst the general population, professionals' expertise in understanding and working with diversity, and organisational flexibility, e.g. availability of interpreting services, appropriate information material for all groups, considerate appointment cancellation/did not attend policies and increased number of sessions for those from marginalised backgrounds (Priebe et al., 2011; Singh et al., 2013). Furthermore, mandating recording of ethnicity in health records and ensuring interventions explicitly aim to reduce ethnic health inequalities may be beneficial tracking progress and identifying gaps in service provision, ultimately leading to more equitable and effective mental health support (Esan et al., 2022).

It would also be beneficial for PMHS to collaborate with community organisations, faith-based groups, and grassroots initiatives to reach underserved populations, build trust within minoritised communities and promote co-production of services. Similarly, collaboration and partnership with other sectors, including housing, education, employment, and social services, can contribute to a comprehensive approach that helps address the needs of deprived and marginalised populations. An example of this is Home-Start in Manchester, a charity which supports families facing difficulties during the perinatal period in their own homes (*Home-Start Manchester*, n.d.). Consisting of staff across parent-infant mental health, immigration services, midwifery, social care and local charities, Home-Start offers services including direct family work for those with complex needs, peer support groups, and specialised support for asylum seekers. Engaging with communities that are disproportionately affected by deprivation and marginalisation in this way could be essential for increasing accessibility of services, awareness of available support and reducing stigma around perinatal mental health. Formal research evaluating the outcomes of

the Home-Start project would be beneficial in order to demonstrate whether it would be beneficial to introduce similar services across the UK.

Improving accessibility of PMHS by introducing holistic and collaborative interventions can contribute to broader efforts to promote social justice. By implementing and reviewing the suggested strategies, staff working in PMHS can take proactive steps to ensure that all mothers, regardless of background, have access to high-quality perinatal mental health care.

Informed decision making for birth-planning

Contrary to our hypothesis, this study found no effects of mode of birth on infant development in a PMHS sample. Factors such as severity of psychological distress, ER and social inequality were found to have a more significant impact on infant development. This challenges the notion that CSD inherently leads to worse developmental outcomes for infants compared to VD. This research also suggests that maternal ER and social inequalities may be more strongly correlated to maternal psychological distress than birth mode during the perinatal period. These findings are significant as wider research indicates that mothers often experience feelings of guilt, inadequacy, or failure if they are unable to deliver their baby vaginally (Kahalon et al., 2022; Richard et al., 2014); which is likely in turn to increase maternal psychological distress. Where this is evident, healthcare providers could help by providing balanced information about the pros and cons of various birth modes; it could be noted, for example, that based on the findings of this study there is no evidence that early infant development is impacted by CSD. This will contribute to allowing mothers to make informed choices about their birthing preferences.

4.7. Implications for Policy

The findings of this study suggest that social inequalities such as marginalisation and deprivation have a significant impact on both perinatal mental health, ER and global infant development. This has numerous implications for clinicians, NHS senior leadership and policymakers, who play a crucial role in shaping healthcare policies, allocating resources, and promoting initiatives aimed at reducing inequality.

This study provides evidence that could be used in service design, commissioning and parliamentary meetings, similar to the policy level work conducted by organisations such as FIVEXMORE and MBRRACE-UK. However, effectively tackling the disparities noted in this study and in the wider literature necessitates the commitment of those in positions of power to acknowledge the issues and actively implement strategies to address the inequalities. Leadership engagement is essential for fostering systemic, widespread change. The following sections will describe specific recommendations for policymakers, including developing interventions aimed at reducing social inequality, integration of mental health in routine care, and investment in services and research.

Addressing social inequality

The most effective, time and cost-efficient approach to addressing social inequality is prevention (NHS Highland, 2023). Action or lack of action can have lifetime consequences for adult functioning, the wider wellbeing of society, and future generations (Walker et al., 2011).

Policymakers should prioritise efforts to address structural inequalities through targeted funding, policies and interventions aimed at reducing socioeconomic disparities, improving access to healthcare and social services, and promoting social inclusion and support networks for vulnerable populations. This involves implementing policies related to affordable housing (Leventhal & Newman, 2010; Newman & Holupka, 2016), high quality education (Roberts et al., 1999; Rowe et al., 2016), and healthcare access (Holliday et al., 2014), which are critical determinants of maternal and infant wellbeing, as well as infant development.

In addition to addressing social inequalities in the general population, it is important to explore initiatives specifically targeted at promoting social equality for families of young children. Examples of relevant policies could include parental leave policies, which allow more generous and flexible leave so that both parents are able to take time off work to care for their newborns. This could include extending both paid maternity and paternity leave and supporting flexible working arrangements for parents returning from maternity/paternity leave. Extending childcare subsidies is

another policy initiative that could be beneficial. Providing access to high-quality, affordable child care would ensure that children are cared for in stimulating and supportive environments which can promote their development and allow parents to work or pursue education/training opportunities. Although the introduction of 30 hours of free childcare during term-time is a positive development, more could be done, particularly for vulnerable families. For example, this policy fails to address the needs of parents who are unemployed or working less than the required number of hours, meaning those from deprived backgrounds are likely to be disproportionately disadvantaged.

Integration of mental health in routine care

Policymakers could consider providing support and funding for better integration of mental health care in routine perinatal care settings, including prenatal and postnatal visits.

Integrated support could include holistic assessments of psychological well being (beyond a basic symptom checklist) within pre and postnatal visits, as well as more regular check ins about mental health during appointments in order to support timely identification of vulnerable families and reduce the risk of overlooking parents who may be in need of mental health support. Policymakers could also consider funding for more community based perinatal mental health workers, training for existing health and social care workers in perinatal mental health and the addition of more perinatal mental health services for families, such as the recent introduction of specialist NHS psychological services for those who experience birth trauma and/or baby loss.

The integration of mental health in routine perinatal care may promote reduced stigma surrounding mental health difficulties, as indicated in non-perinatal populations (Rowan et al., 2021). Furthermore, integrating mental health care into routine perinatal care may make these services more accessible to minority ethnic women who may otherwise face barriers to accessing or seeking mental health support due to factors such as language barriers, cultural stigmas, or lack of

awareness about available services, as recommended in the general patient population (Holden et al., 2014).

Invest in research and data collection

Policymakers should prioritise funding for research and data collection efforts that further explore the relationship between perinatal mental health, infant development, and social inequalities. This includes longitudinal studies, intervention trials, and population-level surveys that examine the effectiveness of various interventions and identify areas for targeted action. By investing in research, policymakers can make informed decisions and allocate resources more effectively to promote maternal and infant well-being. Recommendations of helpful avenues for research will be made in the next section.

4.8. Directions for Future Research

Future research in the field of maternal mental health and infant development could explore various avenues to build upon the findings of this study and address remaining gaps in the literature. Recommendations based on the findings of this study include a need for longitudinal research, further research on issues affecting diverse populations, innovative intervention research, qualitative research, exploring the role of fathers and other caregivers, further research around birth mode and exploring global perspectives. The following sections will elaborate on these recommendations.

Longitudinal research

The addition of longitudinal studies that follow mothers and infants over time could provide valuable insights into the long-term effects of maternal mental health difficulties, ER and social inequality on infant development. Tracking outcomes beyond the first year of life could help identify developmental trajectories and better understand the persistence of effects into childhood and beyond. This would allow researchers to assess how developmental patterns unfold and whether delays persist, worsen or resolve as children grow older. Longitudinal studies examining how ER and other transdiagnostic factors influence maternal mental health and

infant outcomes could provide valuable insights into effective identification and intervention strategies.

Research on issues affecting deprived and marginalised perinatal populations

It is recommended that in order to improve outcomes for deprived and marginalised groups, more research into interventions targeting ethnic health inequalities and incorporating socioeconomic contexts is required. Indeed, a recent report by the NHS Race and Health Observatory identified a significant lack of evidence-based interventions specifically aimed at reducing ethnic health inequalities in maternal and neonatal outcomes (Esan et al., 2022). The report also found a scarcity of interventions targeting structural and institutional racism within healthcare settings and limited research focusing on specific ethnic groups such as Black African, Black Caribbean, Roma, Gypsy, and mixed ethnic groups, as well as migrants and asylum seekers. Therefore, future research should aim to ensure adequate diversity and representativeness of participants to capture the experiences of those disadvantaged by social inequalities. Methods for addressing this can include employing more inclusive recruitment strategies, diversifying study settings, and incorporating multiple measures of social inequalities to better understand their impact on maternal and infant health outcomes. Indeed, future research should aim to adopt an intersectional approach to examine how multiple dimensions of social identity (e.g., race, ethnicity, socioeconomic status, immigration status) intersect to shape perinatal mental health and infant development. This approach will help to identify challenges and disparities that may not be evident when examining these factors in isolation.

Innovative interventions: development and evaluation research

Developing and evaluating innovative interventions aimed at improving maternal mental health and infant developmental outcomes is a critical area for future research. This could include testing the effectiveness of transdiagnostic interventions (e.g. ER skills training) and interventions that address social determinants of health and development (e.g. deprivation and marginalisation). Rigorous evaluation studies using randomised controlled trials and implementation science approaches can provide evidence for the scalability and effectiveness of such interventions.

Qualitative research

Qualitative research investigating the lived experiences of mothers with perinatal mental health difficulties, particularly those facing social inequalities, has the potential to offer valuable insights and add richness to the existing literature. Through methods such as interviews, focus groups, and ethnographic observations, researchers can gain a more nuanced understanding of the challenges, coping strategies, and resilience factors that shape mother and baby experiences during the perinatal period.

Qualitative research may also provide a contextual understanding of how social inequalities intersect with perinatal mental health and well-being. Furthermore, qualitative research has the potential to empower mothers with mental health difficulties and those facing social inequalities by providing a platform for their voices to be heard. By sharing their stories and experiences, mothers can contribute to advocacy efforts aimed at raising awareness, reducing stigma, and promoting policy changes to improve maternal mental health and wellbeing. This may foster a sense of empowerment and agency among mothers, as well as promote solidarity and community-building among those with shared experiences.

Qualitative research with ethnically minoritised mothers would add to our understanding of the role of marginalisation on perinatal mental health. By engaging with diverse populations and listening to their stories, researchers can identify cultural norms, beliefs, and practices that shape perinatal experiences as well as uncovering the types of support that are most valued, and potential barriers to accessing support services. For example, a recent qualitative study with mothers from ethnically minoritised backgrounds identified specific barriers to accessing and engaging with PMHS including anxiety about taking medication during the perinatal period, previous experiences of discrimination in healthcare, fear of concerns about stigma (Pilav et al., 2022). The mothers in this study also indicated treatment preferences that embrace holistic approaches, and highlighted the value of family, friends and peer support.

Furthermore, community-based participatory research (CBPR) approaches can help ensure that research priorities, methods, and outcomes are relevant and meaningful to the populations being studied. CBPR can facilitate the co-creation of interventions, enhance cultural relevance, and promote community ownership and sustainability of research efforts (Israel et al., 2019). An example of CBPR in the context of UK perinatal mental health is the patient and public involvement and engagement in maternity and perinatal mental health (PPIE) project in South London (Turienzo et al., 2021). Researchers partnered with local mothers, healthcare providers, and community organisations to discuss issues affecting deprived and marginalised families and suggestions for improving perinatal service provision. Key themes included difficulties with health and social care services in relation to accessibility, engagement, and quality of care; racism, discrimination, and trust; as well as the broader impact of social inequalities. This demonstrates an example of how a CBPR approach could contribute to research aimed at developing culturally relevant, community-driven, and effective services through engaging stakeholders within the research process.

Exploring the role of fathers and other caregivers

Infants typically interact with multiple caregivers within their family and social environment, including fathers, grandparents, other relatives, and childcare providers. Though this study focused specifically on maternal mental health, it is recommended that future research examine the role of other important caregivers in an infant's life, particularly in infants whose mothers struggle with perinatal mental health difficulties. Indeed, this could be an important topic to explore as research has shown that fathers' involvement can positively contribute to children's developmental outcomes (Cano et al., 2019; Maselko et al., 2019; Sarkadi et al., 2008). Conversely, just as maternal mental health can impact infant development, the mental health of fathers can also negatively impact infant development. Research has demonstrated that paternal depression, for example, has adverse effects on child development and mental health (Dachew et al., 2023; Gutierrez-Galve et al., 2015; Sweeney & MacBeth, 2016). Understanding the roles of other caregivers provides insight into the impact of broader support systems available to infants and their families. In some cases, other caregivers may step in to provide care, emotional support, and stability

when the mother is experiencing mental health challenges. Therefore, examining the contributions of other caregivers would help to gain a more holistic assessment of the resources available within a family. For example, it may be the case that other caregivers can provide a protective buffer against the negative impacts of perinatal mental health difficulties by offering additional nurturing, stability, and responsive care to the infant; understanding how these potential buffering effects operate could inform family based interventions.

Further explorations around birth mode

Although this study did not find a relationship between CSD and infant developmental outcomes, further research is recommended in order to allow healthcare providers to support families to make informed decisions regarding their birth preferences. Given the unexpected findings, further research could offer insights into why no relationship was found between CSD and infant development in this sample. In particular, research that separates emergency and elective CSD is recommended to explore whether differences would be seen on the basis of birth context. Furthermore, exploring whether similar results would be found in non-clinical samples of mothers would be beneficial in exploring the generalisability of this study's findings.

This study did not investigate the specific mechanisms through which CSD impacts infant development. However, given the literature presented in section 1.5, which demonstrates the significant role that CSD may play in relation to both perinatal mental health and child development, there appears to be a need for further exploration of this, as well as the short and long-term consequences of CSD.

Exploring global perspectives

This study focused specifically on mothers in the UK, and therefore generalisability to other parts of the world may be limited. Indeed, the cultural, socioeconomic, healthcare system, and policy differences between countries may significantly influence maternal and infant health outcomes, meaning the experiences of families in the UK may differ from those in other countries. Furthermore, it is important that researchers do not overlook the global disparities in maternal and infant health

outcomes (Moller et al., 2019). Many countries, particularly in low and middle-income regions, face significant challenges related to maternal mortality, access to prenatal care, nutrition, and infectious disease prevention (Gon et al., 2018; Small et al., 2017; Yaya & Ghose, 2019). Research that overlooks these disparities may fail to address critical global health issues relating to reproductive justice and social inequality.

4.9. Critical Evaluation

Whilst this study contributes important findings in relation to perinatal mental health and infant development, it is important to acknowledge the potential methodological limitations of the work and the implications of these limitations on the research. In this section, the study will be critically evaluated in relation to methodological limitations and ethical considerations.

4.9.1. Methodological limitations

The main methodological limitations of this study include homogeneity in the sample, cross-sectional study design, absence of longitudinal data and limitations of the chosen measures. This section will address each of these limitations in turn.

Sample homogeneity

The majority of participants in the sample identified as white, educated to at least college level, and in a relationship. There are sociodemographic differences in these domains between those in the sample, and those in the general population according to the 2021 UK census (Office for National Statistics (ONS), 2022b), suggesting that the results cannot necessarily be generalised to mothers from a diverse range of sociodemographic backgrounds. However, within the context of PMHS, the participant sample is congruent with previous research in relation to patient ethnicity (Jankovic et al., 2020). This is an important finding as it demonstrates a lack of inclusivity and accessibility of PMHS to women from ethnically minoritised backgrounds. Indeed, evidence from a large nationally representative sample of mothers indicates that ethnically minoritised and migrant women are less likely to be offered mental health support (Moore et al., 2019). The literature suggests that in addition to the existing barriers to accessing mental health care during the perinatal period, mothers from non-White backgrounds experience further barriers such as language barriers, cultural stigma surrounding mental health, lack of culturally competent care, systemic racism within healthcare systems, and wider social disparities in SES and access to healthcare resources (Lawrence et al., 2019; Watson et al., 2019). By addressing these barriers, PMHS can become more accessible and effective for mothers from non-White backgrounds, which may ultimately improve wider health and developmental outcomes (see Section 4.6 for further elaboration).

The mean age of mothers in the sample was 30.83, which is congruent with the national average age for those giving birth in 2022 (Office for National Statistics (ONS), 2023). Research suggests that mothers at the younger and older end of the spectrum may have unique experiences in the perinatal period (Zasloff et al., 2007). For example, mothers who are younger, typically in their teenage years or early

twenties, may have less social support, limited access to resources, and lower levels of education, which can impact their overall well-being and ability to cope with the demands of pregnancy and motherhood (Mangeli et al., 2017). Additionally, younger mothers may still be in the process of establishing their own identities and may face stigma or judgement from society (Mangeli et al., 2017; Mental Health Foundation, 2013). Indeed, research on younger mothers indicates increased risk for mental health problems including antenatal and postpartum depression (Hodgkinson et al., 2014), and some studies have found that their children can be at a higher risk for premature birth and poorer educational achievement (Lipman et al., 2011; Malabarey et al., 2012). Similarly, older mothers, typically in their late thirties or forties, may encounter distinct experiences during the perinatal period. They may have difficulties related to fertility, pregnancy complications, and health risks associated with advanced maternal age (Glick et al., 2021). Older mothers might also have established careers or families, which can influence their priorities and decision-making during pregnancy and early motherhood (Bayrampour et al., 2012). Indeed, research on advanced maternal age suggests that those aged 40-44 have higher rates of depression than those aged 30-35 (Muraca & Joseph, 2014), and that increasing maternal age has been found to predict poorer infant development on the ASQ (Alvik, 2014). Therefore, we cannot assume that these results are generalisable to mothers of all ages; indeed, based on this research, one might hypothesise that the findings would be more pronounced in mothers at each end of the age spectrum. Improving our understanding of the distinct experiences of younger and older mothers during the perinatal period in relation to maternal mental health and infant development is essential. Research exploring the factors underlying these age-related differences can inform policies and practices aimed at improving maternal and infant outcomes.

Another factor limiting the generalisability of this research is the limited variance amongst the sample relating to social inequalities. This means the research findings cannot provide comprehensive insights into the impact of deprivation and marginalisation on mother and infant outcomes. It is likely that the study does not accurately reflect the extent of the experiences and challenges faced by individuals from marginalised or disadvantaged backgrounds. As a result, it is not possible to

generalise these findings to populations with greater experience of social inequalities.

Cross-sectional study design

The findings provide a snapshot of the PMHS population at a specific point in time, and provide some useful insights into the relationships between maternal mental health, ER, birth mode, and infant development. However, cross-sectional study designs do not provide information around causality or temporality (Mann, 2003). Furthermore, all mothers in the sample were at varying stages of their PMHS intervention, which adds complexity in interpreting the findings. Some may have just started receiving support, while others may be nearing completion or have already completed it. This variation in intervention timing may have influenced the mental health status and developmental outcomes measured in the study. For instance, those who have just begun the intervention may not yet experience its full benefits, while those who have completed it might show different outcomes. There was no data available regarding what type of intervention the mothers in the study were receiving, and therefore it is unclear to what extent the type of intervention impacted the findings. As a result of these confounding factors, it is challenging to draw definitive conclusions from the study, highlighting the need for more research to better understand these relationships.

Absence of longitudinal data

This study investigated infants aged 0-12 months and provides insights in relation to this early stage of development. However, it is unclear whether these findings are generalisable at later stages of development. The absence of follow-up assessment prevents a comprehensive understanding of how developmental outcomes evolve over time. Longitudinal research with similar samples to track developmental progress throughout early childhood is highly recommended. Without such longitudinal data, the temporal stability and predictive validity of the observed outcomes remain uncertain.

Measures

The chosen measures in a study can impact research findings by influencing the validity, reliability, sensitivity, bias and generalisability of findings. The measures were selected by the COSI team and represent some of the highest quality tools existing in the literature. However, the measures used in the study are not without limitations. Furthermore, some of the measures may have directly influenced the findings of this study. For example, the ASQ-3 has been found to demonstrate greater sensitivity in children with severe developmental delays; this indicates that emerging or mild-moderate difficulties may have been missed in the sample, particularly given the young age of the infants (Gollenberg et al., 2010; Lindsay et al., 2008). Similarly, emerging research on the ASQ-SE suggests that the measure may lack sensitivity to adequately detect social-developmental delays prior to 18 months of age (Krijnen et al., 2021). These findings suggest that there may have been a lack of sensitivity to identify developmental difficulties and delays in the sample, perhaps due to some of the proposed associations being particularly nuanced, which could potentially lead to an undermining of the influence of factors such as perinatal mental health, ER and birth mode.

Another factor to consider is that the measures included in this research were all self-report. The reliance on self-report measures in research can introduce several potential limitations that may impact the overall validity of the results. For example, self-report measures are susceptible to social desirability bias, whereby participants may provide responses that they believe are socially acceptable or desirable, rather than reflecting their true experiences. Indeed, social desirability bias is seen as an important consideration in research relating to parenting (Morsbach & Prinz, 2006), which may be due to stigma and fear of judgement. However, the findings of one study indicate that within the context of parenting, self-report is not statistically different from observational measures (Zahidi et al., 2019). It is important to acknowledge that within the context of this study, it is possible that participants altered their reporting of symptoms of distress, difficulties with ER, and infant development based on how they thought the data might be used by PMHS (i.e. over-reporting in order to access further support, or under-reporting difficulties in order to present as ‘healthy’ and reduce risk/safeguarding concerns). This may in turn distort the true relationships between the variables.

Composite variables: deprivation and marginalisation

This study used secondary data from the COSI trial (Rosan et al., 2023), which did not include specific measures of deprivation and marginalisation. Therefore, two composite variables were created respectively, using variables in the data from the COSI trial.

Deprivation consisted of disability, employment and income status, in line with three out of the four dimensions of deprivation in the UK Census (Office for National Statistics (ONS), 2022b); the fourth dimension of deprivation in the UK Census is housing. Given that this data was not collected in the COSI study, it was not possible to add this dimension to the composite variable. In turn, this may mean that the composite measure of deprivation underestimates important differences in deprivation amongst the sample.

In this study, marginalisation consisted of minoritised ethnicity, sexuality and gender identity. Importantly, although these variables can be markers of marginalisation, not everyone who falls within these categories may feel marginalised. Therefore, it is important to consider the subjective experience of being marginalised, which can be achieved through measures such as the social exclusion index (van Bergen et al., 2017).

Further research with more defined and broad measures of deprivation and marginalisation is recommended in order to provide meaningful insights into the experience of vulnerable communities.

4.9.2. Ethical considerations

In addition to acknowledging the theoretical limitations of research, there is a moral, social and academic responsibility to critically evaluate research on the grounds of ethical considerations (Ketefian, 2015).

Co-production

Co-production is integral to ethical practice as it ensures that research is conducted with, rather than on, participants. Each key aspect of the COSI trial was co-produced

with an eBe panel, in a commitment to incorporating experiential knowledge to ensure the relevance, effectiveness, and acceptability of the research. This meant for example, that the chosen measures were selected on the basis of finding tools that strike a balance between high reliability and validity, acceptability to mothers, and ease of use for clinicians to incorporate into routine practice.

Due to practical limitations, the present study did not receive direct input from the eBe panel. However, co-production may have promoted a more participant-centred approach to the research. For example, it would have been helpful to consult on the use of language in this study, such as the term ‘mother’ as opposed to ‘birthing parent’. Though the former was used, it is acknowledged that some may find the latter term more inclusive. The decision to use ‘mothers’ was not intended to exclude those who do not identify as female, but rather to acknowledge that motherhood encompasses not just the process of giving birth, but also the broader physiological, physical, cultural, emotional, practical, and social dimensions associated with conception, pregnancy, giving birth and caregiving which are influenced by gender normative ideologies. This links to the RJF, which shines light on the fact that reproductive issues are highly socio-political in nature and therefore cannot be fully understood without acknowledgement of contextual factors.

Emphasis on mothers

Whilst maternal mental health is clearly an important topic of research, the bias towards focusing on mothers is an important ethical consideration. Historically, research and discourse around mothers was highly blame-saturated, and although not the intention of this research, the findings could be interpreted by some in this way. Furthermore, neglecting the contributions of other caregivers or family members perpetuates the notion that mothers bear sole responsibility for child-rearing and overlooks the diverse roles that other caregivers, such as fathers, grandparents, or same-sex partners, play in infant care and development.

The disproportionate focus on mothers and maternal factors on infant outcomes in this research, wider literature, health services and wider society can be seen as discriminatory. This emphasis may inadvertently devalue the contributions of other

caregivers and perpetuate gender inequalities. Moreover, this emphasis tends to perpetuate heteronormative assumptions which excludes alternative family structures from consideration.

Socio-political context

It is also important to acknowledge the impact of the current socio-political culture on caregiving. For example, amidst the current cost of living crisis, many parents are returning to work sooner, meaning it is likely that infants are spending more time with alternative caregivers than in previous generations. Indeed, in 2023 nearly 3 in 5 mothers reported returning to work early from maternity leave for financial reasons (Maternity Action, 2023). Conversely, approximately 76% of mothers are reporting that it makes more sense for them to sacrifice their career as the cost of childcare exceeds their salary (Pregnant Then Screwed, 2023); this report also highlighted that 32% of parents had to rely on some form of debt to cover their childcare costs. Given this data, it is likely that there will be a widening of the poverty gap in the coming years. Further research is therefore needed to examine the differential impact these sociopolitical factors might have on families of varying socioeconomic backgrounds including exploration of the impact of parental leave policies, cost/availability of childcare, economic recessions and social mobility.

Protective factors

Although this study primarily focused on identifying risk factors for poorer mental health and development, future research could be done which addresses protective factors, such as investigations around the impact of social support, family relationships, and access to PMHS which may play a vital role in mitigating the impact of these risks. By integrating an understanding of both risk and protective factors, we can develop more effective interventions that not only address potential harms but also recognise and promote strengths.

Conclusion

Overall, the findings of this study indicate that a shift towards a more holistic, inclusive and reproductive justice based approach to studying and supporting family wellbeing in the perinatal period would be beneficial. This approach requires

recognition of the diversity of family configurations and understanding the unique strengths and challenges faced by non-traditional families, such as same-sex couples, single parents and multi-generational households, particularly as some of these characteristics may be risk factors for poorer outcomes. Moreover, this approach necessitates understanding the influence of sociopolitical factors on caregiving, parental mental health, and child development. By considering the broader sociopolitical context, researchers, policymakers, and practitioners can better understand and address the systemic barriers and inequalities that impact family wellbeing, thus promoting reproductive justice.

4.10. Conclusion

The present study aimed to address gaps in the literature relating to the nature of the relationship between maternal mental health difficulties and early development. The study adopted a critical psychology approach to examine the influence of transdiagnostic factors including maternal ER, birth mode, deprivation and marginalisation on perinatal mental health and infant development. Recognising the impact of broader systemic issues on these factors, the study is informed by models of reproductive justice and social equality.

Informed by the findings of a broad literature review and two focused scoping reviews (presented in Chapter 1), three research questions were proposed:

1) What is the relationship between maternal mental health and infant development in parents accessing perinatal mental health services?

2) Do emotion regulation and birth mode help explain the relationship between maternal mental health difficulties and infant development in parents accessing perinatal mental health services?

3) What is the relationship between social inequalities, maternal mental health and infant development in parents accessing perinatal mental health services?

In order to test the research questions, secondary data from the COSI study (Rosan et al., 2023) was analysed, consisting of data from 352 mother-infant dyads accessing PMHS in the UK. All participants completed a range of baseline self-report questionnaires relating to sociodemographic background, maternal mental health and infant development. This data was analysed using a series of regressions, moderation analyses and moderated mediation analyses.

Key findings of the study include:

- Maternal severity of psychological distress is associated with poorer infant social-emotional development in a perinatal population, thus adding to the body of literature regarding the nature of the link between maternal mental health difficulties and infant development.
- Maternal ER difficulties are independently associated with poorer infant social-emotional development and mediate the relationship between severity of psychological distress and both infant global and social-emotional developmental outcomes, thus indicating that maternal ER may be an important underlying mechanism in the relationship between maternal mental health difficulties and infant development in the perinatal period.
- Birth mode is not associated with significant differences in infant developmental outcomes.
- Deprivation is associated with poorer infant global developmental outcomes, as well as greater maternal psychological distress, difficulties with ER and marginalisation. In turn, marginalisation is associated with higher levels of psychological distress. This indicates that factors associated with social inequality are relevant and important in understanding the link between maternal mental health and infant development.

Further exploratory analyses identified that:

- There was no global trend for atypical infant development, suggesting that the experience of perinatal mental health difficulties in and of itself does not predict below average scores on measures of infant development.
- 85.3% of mothers experienced comorbid mental health conditions, and this was significantly correlated with severity of psychological distress, greater difficulties in ER and deprivation. This provides support for the use of transdiagnostic approaches to understanding and addressing perinatal mental health.

Importantly, although birth mode and marginalisation were not found to significantly contribute to the relationship between perinatal mental health difficulties and infant development, further research in these areas is recommended.

There are a number of implications for clinical practice that can be drawn from the findings of this research including consideration of a transdiagnostic approach to perinatal mental health, a need for improving accessibility of PMHS to diverse populations and informing birth planning. Furthermore, the findings of this study suggest that social inequalities have a significant impact on both perinatal mental health and infant development. This has important implications for policy, in relation to re-shaping healthcare services, allocation of resources, and promoting initiatives aimed at reducing inequality and reproductive injustice.

Whilst the findings of this study demonstrate a range of important clinical and theoretical implications in relation to infant development, there are a few limitations that need to be acknowledged, including sample homogeneity, cross-sectional study design, absence of longitudinal data, and limitations of the chosen measures. Therefore, any conclusions drawn from this study must be considered tentatively.

It is hoped that further research will expand upon the findings of this study, particularly by investigating potential nuances and differential effects, especially among families from highly deprived and marginalised backgrounds. Further recommendations for research include a need for more longitudinal research, further research on diverse populations, innovative intervention research, qualitative research, exploring the role of fathers and other caregivers, further research around birth mode and exploring global perspectives.

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6. APPENDICES

Appendix A

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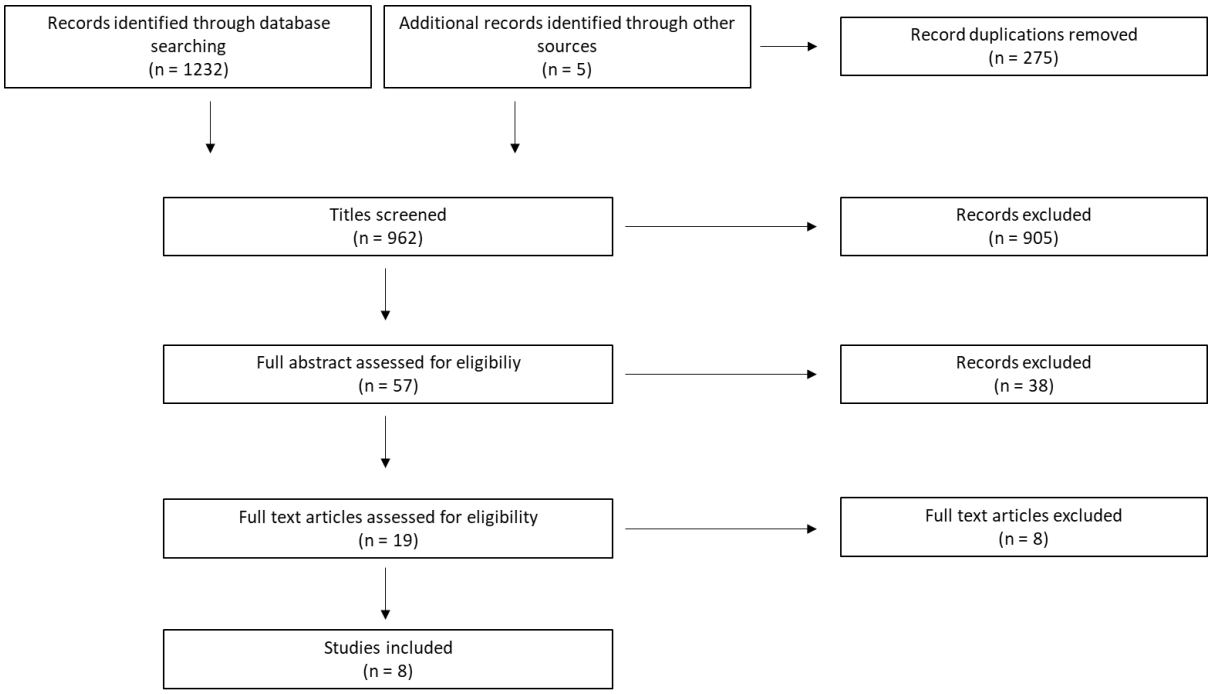
Appendix B

Flow Chart - Scoping Review 1



Appendix C

Summary Table - Scoping Review 1

Study	Population	Measures of maternal ER	Domains & measures of infant development	Relevant Findings	Limitations
Riva Crugnola et al., (2019)	· 63 adolescent and young adult mothers · 3 month-old infants	· Mother-infant interactions filmed and coded with a modified version of Infant and Caregiver Engagement Phases	· Infant ER: Observations of mother-infant interactions coded with a modified version of Infant and Caregiver Engagement Phases	· Maternal experiences of childhood maltreatment affect mutual mother-infant emotion regulation. · Cumulative childhood experiences of maltreatment increase negative emotions at both individual and dyadic level, less emotion coordination, and less capacity to repair.	· Subjectivity of interpreter coding · Non-standardised measure of ER used · No consideration of risk factors e.g. maternal depression, parental stress, and quality of the relationship with the partner
Gao et al., (2023)	· 106 mothers · 7 month-old infants	· Difficulties in Emotion Regulation Scale (DERS) · Respiratory sinus	· Infant ER/ parasympathetic nervous system functioning: Infant respiratory	· Infants of mothers with poor ER were slower in returning to their RSA homeostatic points (indicating poorer ER) · Mothers with poor ER were less effective in	· Infant distress led to missing data, therefore, results may not be generalizable to mother-infant dyads who exhibited

Study	Population	Measures of maternal ER	Domains & measures of infant development	Relevant Findings	Limitations
		arrhythmia (physiological measure of ER) during still face paradigm	sinus arrhythmia during still face paradigm	engaging in activities that brought their infants' physiology back to homeostasis	intensely aroused negative states · Ethical considerations relating to causing emotional distress in infants · RSA estimates can be confounded by factors such as respiration rate and vocalisations · Largely homogenous sample, limits generalisability
Gao et al., (2022)	· 104 mothers · 7 month-old infants	· Difficulties in Emotion Regulation Scale (DERS) during 3rd trimester and 7 months postpartum	· Infant ER/ parasympathetic nervous system functioning: Infant respiratory sinus arrhythmia during still face paradigm	· Maternal postnatal, but not prenatal, ER difficulties related to dampened reactivity and recovery in infant RSA pattern in response to social stress. · Infant baseline RSA and RSA levels during non-stressful interpersonal interactions were not	· Infant distress led to missing data, therefore, results may not be generalizable to mother-infant dyads who exhibited intensely aroused negative states · Ethical considerations relating to causing emotional distress in infants

Study	Population	Measures of maternal ER	Domains & measures of infant development	Relevant Findings	Limitations
				predicted by maternal prenatal ER.	· RSA estimates can be confounded by factors such as respiration rate and vocalisations · Largely homogenous sample, limits generalisability
Lotzin et al., (2015)	· 68 mothers diagnosed with a DSM-IV Axis I mood disorder · 4–9-month-old infants	· Difficulties in Emotion Regulation Scale (DERS)	· Gaze synchrony: observation of mother-infant interaction during Still-Face paradigm coded using Infant Regulatory Scoring System	· Poor maternal ER was related to heightened mother-infant gaze synchrony, indicating higher distress · Maternal ER, but not maternal depressive symptoms, significantly predicted heightened mother-infant gaze synchrony. · Maternal ER fully mediated the effect of maternal depressive symptoms on mother-infant gaze synchrony. · Maternal anxiety symptoms were	· Subjective nature of coding gaze synchrony · Patients recruited from a psychiatric mother-infant unit - might not be representative for mothers with less severe mental health difficulties. · Largely homogenous sample, limits generalisability

Study	Population	Measures of maternal ER	Domains & measures of infant development	Relevant Findings	Limitations
				unrelated to mother-infant gaze synchrony.	
Lotzin et al., (2016)	· 68 mothers diagnosed with a DSM-IV Axis I mood disorder · 4–9-month-old infants	· Difficulties in Emotion Regulation Scale (DERS)	· Affect synchrony: observation of mother-infant interaction during Still-Face paradigm coded with facial affect rating scales	· Poor ER in mothers with mood disorders was positively related to mother–infant facial affect synchrony, after controlling for maternal psychopathology, infant gender, and infant age. · Maternal ER fully mediated the effect of maternal psychopathology on mother–infant facial affect synchrony in a high-risk sample of mothers with mood disorders · Facial affect synchrony appears to be stable across the first year of life	· Subjective nature of coding affect synchrony · Patients recruited from a psychiatric mother-infant unit - might not be representative for mothers with less severe mental health difficulties · Largely homogenous sample, limits generalisability

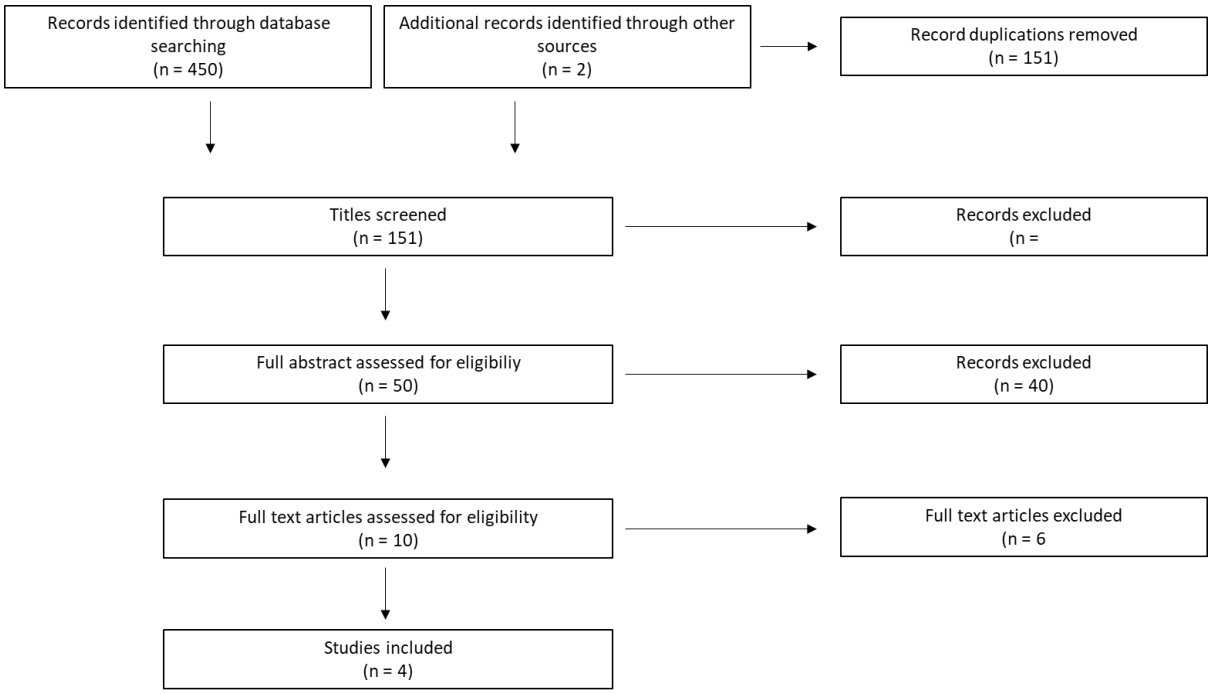
Study	Population	Measures of maternal ER	Domains & measures of infant development	Relevant Findings	Limitations
Doba et al., (2022)	· 72 mothers · 6 month-old infants	· Difficulties in Emotion Regulation Scale (DERS)	· Behavioural synchrony: observation of mother-infant interaction during strange situation	· Maternal anxiety mediates the relationships between mothers' ER difficulties and mother– infant synchrony · Mothers with poor ER, more likely to experience anxiety and exhibit heightened levels of gaze, verbal and motor synchrony	· High percentages of managerial occupations and university degrees in the sample limit the generalizability of results. · Cross-sectional design of this study precludes any causal interpretations.
Behrendt et al., (2019)	· 66 mothers · 6–8 month-old infants	· Difficulties in Emotion Regulation Scale (DERS) German version	· Social-emotional development at 12 months: German version of the Brief Infant-Toddler Social and Emotional Assessment	· Maternal ER had no direct effect on child outcomes · Maternal ER had a significant indirect effect on child competency delay via bonding, such that more difficulties in ER related to poorer bonding, which in turn predicted fewer competencies in infants	· By 6 to 8 months, preexisting child social-emotional competency delay/behavior problems could also have already affected mother–infant interaction and measured maternal factors. · Sample was fairly homogenous and skewed toward first-

Study	Population	Measures of maternal ER	Domains & measures of infant development	Relevant Findings	Limitations
					time, partnered mothers who had a household income and educational level above the average German population.
Kiel et al., (2017)	· 99 mothers with a diagnosis of borderline personality disorder (BPD) · 12-23 month old infants	· Difficulties in Emotion Regulation Scale (DERS)	· Temperament and emotional responding: Observation of infants during the Laboratory · Temperament Assessment Battery-Locomotor Version (a task designed to elicit fear and anger)	· BPD diagnosis predicted maternal ER difficulties. · Maternal ER difficulties predicted punitive/minimising emotion socialisation strategies above and beyond BPD diagnosis · The subjective experience of infant temperamental anger was most salient to mothers with high levels of BPD symptoms, in terms of leading to non-supportive responses to their infant emotions · No between-group differences in infant anger were found,	· Study examined emotion socialisation in relation to hypothetical scenarios, which may not reflect actual responses

Study	Population	Measures of maternal ER	Domains & measures of infant development	Relevant Findings	Limitations
				suggesting misattribution of or bias towards perceiving anger in infants relates to non supportive responses to infant emotions · Punitive/minimization emotion socialization did not relate to maternal or infant age, but it did relate to SES, number of siblings in the home, and infant gender	

Appendix D

Flow Chart- Scoping Review 2



Appendix E

Summary Table - Scoping Review 2

Study	Population	Domains & measures of infant development	Relevant Findings	Limitations
Zavez et al., (2021)	● 1328 20 month-old infants ● In the Republic of Seychelles ● (n = 236 born via CSD)	● **Cognition:** Bayley Scales of Infant Development II, Mental Development Index ● **Psychomotor function:** BSID-II Psychomotor Developmental Index ● **Social communication:** MacArthur Bates Communicative Development	● At 20 months, developmental outcomes were similar across the CSD and VD ● CSD was found to be associated only with better infant temperament. ● Socioeconomic status, maternal IQ, and child age at testing were associated with better developmental outcomes.	● The authors concede that the finding that CSD relates to better infant temperament may be erroneous due to the number of models used without adjusting for multiple comparisons ● · The developmental measures included were not designed for use with the Seychellois population and were designed for younger infants – compromising the internal and external validity of findings. ● · All comparisons were based on raw scores rather than standardized scores, and analyses restricted to within-cohort comparison.

Study	Population	Domains & measures of infant development	Relevant Findings	Limitations
		Inventories, Infant Behaviour Questionnaire-Revised		· The models did not control for confounding factors e.g. sociodemographic differences between mothers who gave birth via CSD compared to those who had a VD
Rodrigues & Silva (2018)	· 400 24-month-old infants · In Portugal · n = 15 born by CSD	· **Locomotor, manipulative, visual, hearing and language, speech and language, social-interactive, self-care, and cognitive skills:** Schedule of Growing Skills II – Portuguese version	· Infants born by elective CSD scored lower than VD infants in locomotor skills, but within the parameters expected for their age. · After adjustment for confounding variables, children born by CSD scored lower in manipulative, visual, and speech and language skills at aged 2 than VD infants, both of whom scored below expected age parameters · Infants born by CSD scored lower and were below the expected parameters for their age in self-care compared to VD infants.	· The study did not include infants born by emergency or unplanned CSD · Only 15 infants in the sample born by CSD, compromising generalisability of findings · Homogeneity of the samples was not determined.

Study	Population	Domains & measures of infant development	Relevant Findings	Limitations
			· Cognitive, hearing and language, and social-interactive skills were not significantly different between groups	
Zaigham et al., (2020)	· 418 infants · In Sweden · n = 66 born by CSD · Assessed at 4 & 12 months	· Ages and stages questionnaire (ASQ-II) – Swedish translation	· Infants born by CSD have poorer developmental outcomes compared to VD infants at 4 months of age, across all domains of ASQ-II · After adjusting for age at testing, infants born via CSD had significantly lower gross motor skills at 12 months of age.	· Only included infants born via elective CSD · The models did not control for confounding factors e.g. sociodemographic differences between mothers who gave birth via CSD compared to those who had a VD
Al Khalaf et al., (2015)	· 11,134 9-month-old infants · In Ireland	· Ages and stages questionnaire (ASQ-II)	· Elective CSD was associated with developmental delay in personal, social and gross motor skills · Emergency CS associated with developmental delay in gross motor skills	· Homogenous sample (94% Caucasian) · Findings may be influenced by unmeasured confounding factors · The data did not include indication for mode of delivery e.g. for emergency CSD, unclear whether this was due to maternal or infant complications

Study	Population	Domains & measures of infant development	Relevant Findings	Limitations
	· n = 1436 born by elective CSD · n= 1537 born by emergency CSD		· Parity, maternal BMI and ethnic origin appeared to have a significant confounding effect on many associations.	

Appendix F

UEL Ethics Application Form

UNIVERSITY OF EAST LONDON

School of Psychology

APPLICATION FOR RESEARCH ETHICS APPROVAL

FOR RESEARCH INVOLVING SECONDARY ANALYSIS OF EXISTING DATA

(Updated September 2022)

FOR BSc RESEARCH; MSc/MA RESEARCH; PROFESSIONAL DOCTORATE RESEARCH IN CLINICAL, COUNSELLING & EDUCATIONAL PSYCHOLOGY

Section 1 – Guidance on Completing the Application Form (please read carefully)	
1.1	Before completing this application, please familiarise yourself with: ● British Psychological Society's Ethics Guidelines for Internet-Mediated Research ● British Psychological Society's Code of Ethics and Conduct ● UEL's Code of Practice for Research Ethics ● UEL's Research Data Management Policy ● UEL's Data Backup Policy
1.2	**Email your supervisor the completed application and all attachments as ONE WORD DOCUMENT. Your supervisor will look over your application and provide feedback.**

1.3	When your application demonstrates a sound ethical protocol, your supervisor will submit it for review.
1.4	Your supervisor will let you know the outcome of your application. Research must NOT commence until your ethics application has been approved.

Section 2 – Your Details

2.1	Your name:	Solin Hamawandy
2.2	Your supervisor's name:	Dr Camilla Rosan
2.3	Name(s) of additional UEL supervisors:	Dr Trishna Patel
		3rd supervisor (if applicable)
2.4	Title of your programme:	DClin Psychology
2.5	UEL assignment submission date:	NA
		Re-sit date (if applicable)

Section 3 – Project Details

Please give as much detail as necessary for a reviewer to be able to fully understand the nature and purpose of your research.

3.1	Study title:	The Impact of Transdiagnostic Variables on Early Infant Development

	Please note - If your study requires registration, the title inserted here must be the same as that on PhD Manager.	**in Mothers with Mental Health and Post-partum Bonding Difficulties**
3.2	**Research question(s):**	**Are maternal emotion regulation and maternal sensitivity associated with infant developmental outcomes? Do maternal emotion regulation and maternal sensitivity mediate the impact of postnatal bonding difficulties on infant developmental outcomes? What impact do sociodemographic and clinical characteristics of pregnancy have on bonding and infant developmental outcomes?**
3.3	**What data are you analysing?**	**I will be analysing baseline data from the following measures: Postpartum bonding questionnaire, Sensitivity scale, difficulties in emotion regulation scale, Ages and Stages Questionnaire-3 & Socio-emotional, Clinical Outcomes in Routine Evaluation – Outcome Measure**
3.4	**Who owns the original data (i.e., copyright holder)?**	**The COSI team at the Anna Freud Centre**
3.5	**Who is the guardian of the data (if different to the original owner)?**	**The Imperial Clinical Trials Unit**

3.6	**Is the data in the public domain?** **Please note - For the purposes of this application, the 'public domain' means the data are freely available for anyone to access without restriction. Do bear in mind that even if data are available through publicly-available platforms (e.g., websites), the data are not necessarily in the public domain (e.g., in the case of a closed or private forum on a website).**	**YES** ☐	**NO** ☒
	If yes, go to section 5	**If you selected yes, please complete section 5**	
	If no, go to section 4	**If you selected no, please complete section 4**	

Section 4 – Data not in the Public Domain

It is vital that data are handled carefully, particularly details about participants. For information in this area, please see the UEL guidance on data protection, and also the UK government guide to data protection regulations. For analysis of data not in the public domain, please confirm the following:

4.1	**You have full and appropriate permission from the guardian of the data you intend to use**	**YES** ☒

	and/or the owner of the data (copyright holder):	
	Have you included evidence of this permission:	**YES** ☐
4.2	**You will comply with any regulations of use that the guardian and owner of the data stipulate:**	**YES** ☐**X**
4.3	**For datasets involving research participants, the guardian or owner of the dataset has confirmed that participant consent was gained as part of the initial data collection:**	**YES** ☒
4.4	**For datasets involving research participants, the guardian or owner of the dataset has confirmed that participants agreed that their data can be used in future research by other researchers:**	**YES** ☒
4.5	**For datasets involving research participants, the data you intend to use has been properly anonymised:**	**YES** ☐**X**
4.6	**So as not to infringe copyright, the data source and the guardian and owner (copyright holder) of the data will be**	**YES** ☐**X**

	acknowledged in your research:	
4.7	**You will not pass on the data to other people or groups:**	**YES** **☐X**
4.8	**Describe how you plan to obtain the data (e.g., who from, and in what way):**	**I will become an honorary member of the COSI team, in line with the agreement on the participant consent form for data to be shared within the COSI team. In order to access data, a data request form will be completed on my behalf by Camilla which I will then access on an Anna Freud PC**
4.9	**Outline how will you ensure data will be securely stored:**	**All data will be stored and accessed on a secure, encrypted Anna Freud PC.**
4.10	**Detail who will have access to the data:**	**The researchers of the COSI study will have access to the data. I will become an honorary team member.**
4.11	**How long will the data be retained for:**	**I will retain only analysed data (no raw data) for a period of up to two years for the purpose of publishing. After these two years, the data will be permanently deleted from my possession, but will remain with the COSI team for up to 10 years.**

Section 5 – Data in the Public Domain

Even if the data is in the public domain (e.g., comments on publicly-accessible internet forums), there are still some ethical considerations, including:

5.1	**How will data be collected (including details of any software used)?**	**Please detail how data will be collected**	
5.2	**Will data be collected in an unobtrusive manner (i.e., no contact made with the originator, copyright holder, guardian or owner of the data)?**	**YES** ☐	**NO** ☐
	If no, please give details of how you will make contact with the relevant person (i.e., the originator, copyright holder, guardian or owner of the data), and the specific details of the communication you intend to make (e.g., the text of the email or letter you intend to write).	**Please insert all relevant steps**	
5.3	**Will data be collected with the author's consent?**	**YES** ☐	**NO** ☐
	If not, please give an appropriate reason or justification:	**Please insert your reason/justification**	
5.4	**Are the personal details of individuals or groups identifiable in the data?**	**YES** ☐	**NO** ☐

	If yes, what steps will you take to ensure their anonymity?	**Please detail steps you will take**	
5.5	**Are individuals or groups liable to be adversely affected by the data being analysed and disseminated (e.g., damage to their reputation)?**	**YES** ☐	**NO** ☐
	If yes, what steps will you take to minimise these adverse effects:	**Please detail steps you will take**	
	If these adverse effects will not be minimised, please give an appropriate justification:	**Please provide a justification**	

Section 6 – Declarations

6.1	**Declaration by student. I confirm that I have discussed the ethics and feasibility of this research proposal with my supervisor:**	**YES** ☒
6.2	**Student's name:**	**Solin Hamawandy**

	(Typed name acts as a signature)	
6.3	**Student's number:**	**U2075205**
6.4	**Date:**	**09/08/2022**
Supervisor's declaration of support is given upon their electronic submission of the application		

Appendix G

Data Management Plan

UEL Data Management Plan

Completed plans must be sent to researchdata@uel.ac.uk for review

If you are bidding for funding from an external body, complete the Data Management Plan required by the funder (if specified).

Research data is defined as information or material captured or created during the course of research, and which underpins, tests, or validates the content of the final research output. The nature of it can vary greatly according to discipline. It is often empirical or statistical, but also includes material such as drafts, prototypes, and multimedia objects that underpin creative or 'non-traditional' outputs. Research data is often digital, but includes a wide range of paper-based and other physical objects.

Administrative Data	
PI/Researcher	Solin Hamawandy
PI/Researcher ID (e.g. ORCiD)	0000-0003-4013-6597
PI/Researcher email	U2075205@uel.ac.uk
Research Title	Maternal Mental Health, Emotion Regulation and Caesarean Section Delivery: Associations with Infant Development in a Sample Accessing Perinatal Mental Health Services
Project ID	NA
Research start date and duration	June 2020- September 2024

Research Description	Mental health difficulties are common during the perinatal period and are a predictor of impaired infant developmental outcomes. At present, existing psychological interventions focus largely on either minimising mental health symptoms or supporting the development of healthy postnatal bonding/attachment. However, the evidence-base for these kinds of interventions in improving both parent and infant outcomes is limited. There is a need for exploring the impact of transdiagnostic variables on outcomes for mothers and infants. This study proposes maternal emotion regulation and birth mode as important factors linking perinatal mental health, and infant developmental outcomes. Furthermore, the study aims to explore the impact of social inequalities on these outcomes. The proposed project will analyse data from the COSI study to investigate associations between transdiagnostic factors and infant development in a sample of women accessing perinatal mental health difficulties.
Funder	NIHR (funding the COSI study) but not directly linked to my research
Grant Reference Number (Post-award)	Award ID:17/49/38
Date of first version (of DMP)	23/08/2022
Date of last update (of DMP)	15/03/2024

Related Policies	The NHS Constitution England Data Management Policy UEL Data Backup Policy UEL Research Data Management policy UEL Statement on Research Integrity UEL Statement on Research Ethics The Data Protection Act NIHR Open Access publication policy - for publications submitted on or after 1 June 2022 NIHR position on the sharing of research data Concordat to Support Research Integrity UKRIO Code of Practice for Research
Does this research follow on from previous research? If so, provide details	**No**
Data Collection	

What data will you collect or create?	The following sub-set of data from the COSI study (in progress) will be used: · Maternal characteristics (e.g., mental health status, ER, age, ethnicity, education, income, disability, sexuality). · Pregnancy details (e.g., delivery type, previous pregnancies). · Infant characteristics (e.g., gender, age, scores on developmental questionnaires). Clinical Outcomes in Routine Evaluation – Outcome Measure (CORE-OM) The Difficulties in Emotion Regulation Scale (DERS) Postpartum Bonding Questionnaire (PBQ) Ages and Stages Questionnaire-3 & Socio-emotional (ASQ-3 & SE-2) Data will be transferred as one Excel (.csv) file containing data from approximately 369 participants. No data are personal and/or special category as I am working with fully anonymised datasets. I will be creating additional data from my analysis in the form moderation models and correlations.

How will the data be collected or created?	The study is a multi-centre, individually randomised controlled trial. All data will be collected by members of the COSI team using a mixture of interviews, observations and questionnaires. I will not be involved in data collection. Data will be collected on an Electronic Data Capture (EDC) system developed using the REDcap system, incorporating the trial database and randomisation system. This will be a web-based EDC comprising a full GCP-compliant audit trail, stored on a secure server at Imperial College London. Questionnaire data will be collected via tablets provided by the study and will automatically be uploaded to REDcap. Access will be restricted to trained staff with unique password-protected accounts. Identifiable data will not be recorded in the eCRF and participants will be identified by a unique trial ID only. I will only have access to the data described below, following a request for data form submitted on my behalf by my thesis supervisor. The trial sites within the study will be community PMHS in the following NHS Trusts: 1. Cheshire and Wirral Partnership NHS Trust 2. North West Boroughs Healthcare NHS Foundation Trust 3. Merseycare NHS Foundation Trust 4. Northumberland, Tyne & Wear NHS Trust 5. South West Yorkshire Partnership NHS Trust 6. Tees, Esk and Wear Valleys NHS Foundation Trust 7. Northampton Healthcare NHS Foundation Trust 8. Sussex Partnership NHS Foundation Trust

	9. Devon Partnership NHS Trust All data will be analysed using SPSS on an encrypted, password protected Anna Freud computer.

Documentation and Metadata	
What documentation and metadata will accompany the data?	I will only have access to data in anonymised form. The data sets that I will receive will not include additional documentation or contextual information beyond that described above (see 'what data will you collect'). I will not need to create any additional documentation or metadata required for the purposes of this study. Analysed data will be saved as 'data analysis V(n)'
Ethics and Intellectual Property	
Identify any ethical issues and how these will be managed	Consent – No patient identifiable information will be made available to the researcher, nor included in the write up of the report.
Identify any copyright and Intellectual Property Rights issues and how these will be managed	I have permission from the Anna Freud Centre to use and publish the data for the project outlined in this DMP. The data is not under any licensing restrictions and there are no issues regarding intellectual property. The investigators and study site staff will comply with the requirements of the Data Protection Act 2018 concerning the collection, storage, processing and disclosure of personal information and will uphold the Act's core principles. I have agreed with the research team that I will be the first author on publications, and members of COSI team will be co-authors. If I do not publish within 2 years, I will hand over the rights and ownership of the research to the COSI team.
Storage and Backup	

How will the data be stored and backed up during the research?	All data will be stored and backed up on secure computers owned by the Anna Freud Centre. I will only have access to the data described in section 'What data will be collected or created'. Personal information (e.g. contact details) will be collected when participants provide informed consent to participate in the full study. This information will be held by the AFNCCF on a secure, encrypted drive, and only be accessible by the Trial Manager and all research team members involved in data collection. Questionnaire data will be collected on an Electronic Data Capture (EDC) system developed using the REDcap system. This will be a web-based EDC comprising a full GCP-compliant audit trail, stored on a secure server at Imperial College London. This data is inaccessible without a request for data form. After the two years, the data I keep will be permanently deleted. After the ten years, the data kept of REDcap will be permanently deleted.
How will you manage access and security?	An encrypted and secure laptop will be provided by the Anna Freud centre which will be used for all research purposes. Access to study data is restricted to trained staff with unique password-protected accounts. The laptop will only ever be used at both the Anna Freud Centre or at the researchers private home. The device will be digitally locked at all times unless in active use. I will only have access to the data when working from my staff account on an Anna Freud computer.
Data Sharing	

How will you share the data?	I will only share analysed data in the write up of any publication including the thesis (e.g. means, SDs, regression models and correlations). The thesis will be publicly accessible via UEL's institutional repository and might be submitted for publication. Secondary data can only be accessed via the Anna Freud Centre and will not be publicly accessible
Are any restrictions on data sharing required?	No personal data will be shared. Should there be any requests for data sharing, this would need to go through the formal procedure outlined in the NIHR position on the sharing of research data. This will be the responsibility of the wider COSI team to manage, and I will not be involved in this process beyond passing on any potential requests for data.
Selection and Preservation	
Which data are of long-term value and should be retained, shared, and/or preserved?	I will keep the analysed data on a personal OneDrive account for a period of 2 years in order to allow time for publication. This data includes results from all statistical analyses completed as part of the research. There will be no follow up research based on this research project.
What is the long-term preservation plan for the data?	As I do not own the data, I will not be responsible for retaining any raw data following completion of the research. After 2 years, the analysed data will be transferred to the COSI team who will own and store the data for a further 8 years before permanently destroying it. If future researchers are interested in the raw data or analysed data, they would need to request this from the COSI team following the protocol outlined in the NIHR position on the sharing of research data.
Responsibilities and Resources	

Who will be responsible for data management?	The researcher and thesis supervisor will be responsible for data management
What resources will you require to deliver your plan?	A laptop from the Anna Freud Centre, which will be provided following confirmation of my honorary contract with them. Access to SPSS and R, both of which are available to UEL students.
Review	
	Please send your plan to researchdata@uel.ac.uk We will review within 5 working days and request further information or amendments as required before signing
Date: 23/08/2022	Reviewer name: Leo Watkinson Assistant Librarian (Open Access)

Appendix H
UEL Ethical Approval

School of Psychology Ethics Committee

NOTICE OF ETHICS REVIEW DECISION LETTER

For research involving human participants

BSc/MSc/MA/Professional Doctorates in Clinical, Counselling and Educational Psychology

Reviewer: Please complete sections in blue | **Student:** Please complete/read sections in orange

Details	
Reviewer:	**David Harper**
Supervisor:	**Trishna Patel**
Student:	**Solin Hamawandy**
Course:	**Prof Doc Clinical Psychology**
Title of proposed study:	**The Impact of Transdiagnostic Variables on Early Infant Development in Mothers with Mental Health and Post-partum Bonding Difficulties**

Checklist
(Optional)

	YES	NO	N/A
Concerns regarding study aims (e.g., ethically/morally questionable, unsuitable topic area for level of study, etc.)	☐	☐	☐
Detailed account of participants, including inclusion and exclusion criteria	☐	☐	☐
Concerns regarding participants/target sample	☐	☐	☐
Detailed account of recruitment strategy	☐	☐	☐
Concerns regarding recruitment strategy	☐	☐	☐
All relevant study materials attached (e.g., freely available questionnaires, interview schedules, tests, etc.)	☐	☐	☐
Study materials (e.g., questionnaires, tests, etc.) are appropriate for target sample	☐	☐	☐
Clear and detailed outline of data collection	☐	☐	☐
Data collection appropriate for target sample	☐	☐	☐
If deception being used, rationale provided, and appropriate steps followed to communicate study aims at a later point	☐	☐	☐
If data collection is not anonymous, appropriate steps taken at later stages to ensure participant anonymity (e.g., data	☐	☐	☐

analysis, dissemination, etc.) – anonymisation, pseudonymisation			
Concerns regarding data storage (e.g., location, type of data, etc.)	☐	☐	☐
Concerns regarding data sharing (e.g., who will have access and how)	☐	☐	☐
Concerns regarding data retention (e.g., unspecified length of time, unclear why data will be retained/who will have access/where stored)	☐	☐	☐
If required, General Risk Assessment form attached	☐	☐	☐
Any physical/psychological risks/burdens to participants have been sufficiently considered and appropriate attempts will be made to minimise	☐	☐	☐
Any physical/psychological risks to the researcher have been sufficiently considered and appropriate attempts will be made to minimise	☐	☐	☐
If required, Country-Specific Risk Assessment form attached	☐	☐	☐
If required, a DBS or equivalent certificate number/information provided	☐	☐	☐
If required, permissions from recruiting organisations attached (e.g., school, charity organisation, etc.)	☐	☐	☐

All relevant information included in the participant information sheet (PIS)	☐	☐	☐
Information in the PIS is study specific	☐	☐	☐
Language used in the PIS is appropriate for the target audience	☐	☐	☐
All issues specific to the study are covered in the consent form	☐	☐	☐
Language used in the consent form is appropriate for the target audience	☐	☐	☐
All necessary information included in the participant debrief sheet	☐	☐	☐
Language used in the debrief sheet is appropriate for the target audience	☐	☐	☐
Study advertisement included	☐	☐	☐
Content of study advertisement is appropriate (e.g., researcher's personal contact details are not shared, appropriate language/visual material used, etc.)	☐	☐	☐

Decision options	
APPROVED	**Ethics approval for the above-named research study has been granted from the date of**

	approval (see end of this notice), to the date it is submitted for assessment.
APPROVED - BUT MINOR AMENDMENTS ARE REQUIRED BEFORE THE RESEARCH COMMENCES	**In this circumstance, the student must confirm with their supervisor that all minor amendments have been made before the research commences. Students are to do this by filling in the confirmation box at the end of this form once all amendments have been attended to and emailing a copy of this decision notice to the supervisor. The supervisor will then forward the student's confirmation to the School for its records.** **Minor amendments guidance: typically involve clarifying/amending information presented to participants (e.g., in the PIS, instructions), further detailing of how data will be securely handled/stored, and/or ensuring consistency in information presented across materials.**
NOT APPROVED - MAJOR AMENDMENTS AND RE-SUBMISSION REQUIRED	**In this circumstance, a revised ethics application must be submitted and approved before any research takes place. The revised application will be reviewed by the same reviewer. If in doubt, students should ask their supervisor for support in revising their ethics application.** **Major amendments guidance: typically insufficient information has been provided, insufficient consideration given to several key aspects, there are serious concerns regarding any aspect of the project, and/or serious concerns in the candidate's ability to ethically, safely and sensitively execute the study.**

Decision on the above-named proposed research study

Please indicate the decision:	**APPROVED**

Minor amendments

Please clearly detail the amendments the student is required to make

Major amendments

Please clearly detail the amendments the student is required to make

Assessment of risk to researcher

	YES	**NO**

Has an adequate risk assessment been offered in the application form?	☒	☐
	If no, please request resubmission with an <u>adequate risk assessment.</u>	
If the proposed research could expose the <u>researcher</u> to any kind of emotional, physical or health and safety hazard, please rate the degree of risk:		
HIGH	**Please do not approve a high-risk application. Travel to countries/provinces/areas deemed to be high risk should not be permitted and an application not be approved on this basis. If unsure, please refer to the Chair of Ethics.**	☐
MEDIUM	**Approve but include appropriate recommendations in the below box.**	☐
LOW	**Approve and if necessary, include any recommendations in the below box.**	☒

Reviewer recommendations in relation to risk (if any):	**This is a low risk study as it involves secondary data analysis**

Reviewer's signature

Reviewer: (Typed name to act as signature)	**David Harper**
Date:	**17/11/2022**

This reviewer has assessed the ethics application for the named research study on behalf of the School of Psychology Ethics Committee

RESEARCHER PLEASE NOTE

For the researcher and participants involved in the above-named study to be covered by UEL's Insurance, prior ethics approval from the School of Psychology (acting on behalf of the UEL Ethics Committee), and confirmation from students where minor amendments were required, must be obtained before any research takes place.

For a copy of UEL's Personal Accident & Travel Insurance Policy, please see the Ethics Folder in the Psychology Noticeboard.

Confirmation of minor amendments

(Student to complete)

I have noted and made all the required minor amendments, as stated above, before starting my research and collecting data

Student name: **(Typed name to act as signature)**	*solin*
Student number:	**U2075205**
Date:	**7/11/2022**
Please submit a copy of this decision letter to your supervisor with this box completed if minor amendments to your ethics application are required	

Appendix I

UEL Ethics Amendment Form

School of Psychology Ethics Committee

REQUEST FOR AMENDMENT TO AN ETHICS APPLICATION

For BSc, MSc/MA and taught Professional Doctorate students

Please complete this form if you are requesting approval for proposed amendment(s) to an ethics application that has been approved by the School of Psychology

Note that approval must be given for significant change to research procedure that impact on ethical protocol. If you are not sure as to whether your proposed amendment warrants approval, consult your supervisor or contact Dr Trishna Patel (Chair of School Ethics Committee).

How to complete and submit the request	
	Complete the request form electronically.
	Type your name in the 'student's signature' section (page 2).
	When submitting this request form, ensure that all necessary documents are attached (see below).
	Using your UEL email address, email the completed request form along with associated documents to Dr Trishna Patel: t.patel@uel.ac.uk
	Your request form will be returned to you via your UEL email address with the reviewer's decision box completed. Keep a copy of the approval to submit with your dissertation.
	Recruitment and data collection are <u>not</u> to commence until your proposed amendment has been approved.

Required documents	
A copy of your previously approved ethics application with proposed amendment(s) added with track changes.	**YES** ☒
Copies of updated documents that may relate to your proposed amendment(s). For example, an updated recruitment notice, updated participant information sheet, updated consent form, etc.	**YES** ☒
A copy of the approval of your initial ethics application.	**YES** ☒

Details	
Name of applicant:	**Solin Hamawandy**
Programme of study:	**Doctorate in Clinical Psychology**
Title of research:	**The impact of Transdiagnostic factors including Emotion Regulation, Pregnancy and Birth Context on Maternal and Infant outcomes**
Name of supervisor:	**Trishna Patel & Dr Kim Alyousefi-van Dijk**

Proposed amendment(s)

Briefly outline the nature of your proposed amendment(s) and associated rationale(s) in the boxes below	
Proposed amendment	**Rationale**
Title Change to "Maternal Mental Health, Emotion Regulation and Caesarean Section Delivery: Associations with Infant Development in a Sample Accessing Perinatal Mental Health Services"	**Project topic changed since last ethics application**
Research questions have been changed	**To avoid overlapping with existing research within the COSI team and to refine the project**
Proposed amendment	**Rationale for proposed amendment**
Proposed amendment	**Rationale for proposed amendment**

Confirmation		
Is your supervisor aware of your proposed amendment(s) and have they agreed to these changes?	**YES** ☒	**NO** ☐

Student's signature	
Student: **(Typed name to act as signature)**	**Solin Hamawandy**
Date:	**09/01/2024**

Reviewer's decision		
Amendment(s) approved:	**YES** ☒	**NO** ☐
Comments:		
Reviewer: **(Typed name to act as signature)**	**Trishna Patel**	
Date:	**09/01/2024**	

Appendix J

UEL Request for Title Change Form

School of Psychology Ethics Committee

REQUEST FOR TITLE CHANGE TO AN ETHICS APPLICATION

For BSc, MSc/MA and taught Professional Doctorate students

Please complete this form if you are requesting approval for a proposed title change to an ethics application that has been approved by the School of Psychology

By applying for a change of title request, you confirm that in doing so, the process by which you have collected your data/conducted your research has not changed or deviated from your original ethics approval. If either of these have changed, then you are required to complete an 'Ethics Application Amendment Form'.

How to complete and submit the request	
1	Complete the request form electronically.
2	Type your name in the 'student's signature' section (page 2).
3	Using your UEL email address, email the completed request form along with associated documents to Dr Jérémy Lemoine (School Ethics Committee Member): j.lemoine@uel.ac.uk
4	Your request form will be returned to you via your UEL email address with the reviewer's decision box completed. Keep a copy of the approval to submit with your dissertation.

Required documents	
A copy of the approval of your initial ethics application.	YES ☒

Details	
Name of applicant:	Solin Hamawandy
Programme of study:	Doctorate in Clinical Psychology
Title of research:	Maternal Mental Health, Emotion Regulation and Caesarean Section Delivery: Associations with Infant Development in a Sample Accessing Perinatal Mental Health Services
Name of supervisor:	Dr Kim Alyousefi-vandijk

Proposed title change	
Briefly outline the nature of your proposed title change in the boxes below	
Old title:	The impact of Transdiagnostic factors including Emotion Regulation, Pregnancy and Birth Context on Maternal and Infant outcomes

New title:	**Maternal Mental Health, Emotion Regulation and Caesarean Section Delivery: Associations with Infant Development in a Sample Accessing Perinatal Mental Health Services**
Rationale:	**Research questions changed in order to refine ideas and avoid overlap with other research being conducted within the same team**

Confirmation		
Is your supervisor aware of your proposed change of title and in agreement with it?	**YES** ☒	**NO** ☐
Does your change of title impact the process of how you collected your data/conducted your research?	**YES** ☐	**NO** ☒

Student's signature	
Student: (Typed name to act as signature)	**Solin Hamawandy**
Date:	**09/01/2024**

Reviewer's decision		
Title change approved:	**YES** ☒	**NO** ☐
Comments:	**The new title reflects better the approved amendments made to the research.**	
Reviewer: **(Typed name to act as signature)**	**Dr Jérémy Lemoine**	
Date:	**12/01/2024**	