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Investigating the potential effectiveness of telehealth delivered CBT for women suffering from PPD in NZ: a meta-analysis

A thesis

submitted in partial fulfilment

of the requirements for the degree

Master of Applied Psychology in Behaviour Analysis

[School of Psychological and Social Sciences]

at

The University of Waikato

by

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THE UNIVERSITY OF
WAIKATO
Te Whare Wānanga o Waikato

2026

Abstract

Post-partum depression (PPD) is a severe mental health condition that affects women within 12 months following childbirth. Negative maternal consequences can range from low postpartum mood to more severe symptoms including suicide. Negative consequences for infants include infanticide and in the long-term, poor behavioural, cognitive and emotional outcomes. The current rate of PPD in New Zealand (NZ) rests between 12-18% with an increased prevalence reported for Māori, Pacific and Asian peoples. Multiple factors – patient driven and systemic driven – present significant barriers to women seeking treatment. One established treatment is cognitive behavioural therapy (CBT), which is available in NZ but not easily accessible. A potential way to improve accessibility is treatment delivery via telehealth, which involves the use of information and communication technologies (ICT) to access health care services remotely. This meta-analysis analysed six randomised controlled trials (RCTs) to investigate the viability of telehealth delivery of CBT for PPD from 2015 to 2025 to determine if telehealth as a treatment modality was effective in treating PPD. From the six RCTs, pre and post treatment scores were used to determine the overall effect size of d=5.76. Five RCTs reported that telehealth delivery was an effective approach to treat PPD. Options to deliver this service in the NZ context need to be investigated by stakeholders with the intention of improving outcomes for mothers and infants.

Acknowledgements

The process of writing this thesis has challenged me to believe in my abilities, to problem-solve and persevere beyond my previous limits. Along the way I have acquired many more skills and knowledge, and it is my hope to use them to help others in my future career.

I want to express my thanks to my supervisor Tania Blackmore who was always available when I needed clarity and pushed me to do more than I thought I was capable of. I am grateful for her support and reassurances that I could rise to this challenge. I would also like to thank the staff at the Department of Mathematics, School of Computing and Mathematical Sciences at The University of Waikato for your valuable assistance with my statistical analysis.

I would like to thank my family for their love and support and for giving me strength to see out this academic year.

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Investigating the potential effectiveness of telehealth delivered CBT for women suffering from PPD in NZ: a meta-analysis

Post-partum depression (PPD) is a severe mental health condition that can affect women within 12 months following childbirth. The Diagnostic and Statistical Manual of Mental Disorders – Fifth Edition (DSM-5) (American Psychiatric Association, 2013) defines PPD as a major depressive episode for which the specifier "with peripartum onset" can be applied if the most recent episode occurs during pregnancy or in the four weeks following delivery and extending to the first year postpartum. Symptoms indicative of PPD can include persistent sadness, guilt, anxiety, fatigue and difficulty engaging in daily functioning (Khamidullina et al., 2025). Often mistaken for "baby blues", PPD is much more significant with potentially negative consequences for both mother and child. Women suffering from PPD have described their symptoms as feeling sad all the time, feeling uninterested in their baby, experiencing guilt for that disinterest, having a lack of motivation for everyday tasks (personal hygiene and meal preparation etc) and engaging with intrusive thoughts of harming either themselves or their babies (Ponzini et al., 2021). A more serious maternal consequence can include postpartum mood (major depressive or manic) episodes with psychotic features (characterised by delusions, hallucinations, and formal thought disorder) which affects 1 in 500 to 1 in 1000 deliveries (American Psychiatric Association, 2013). The most severe negative consequences for both mother and child include infanticide, which is most often associated with postpartum psychotic episodes. Maternal depression during the first year postpartum is also associated with long-term negative consequences such as poor behavioural, cognitive, and emotional outcomes for children (Sockol, 2015). Additionally, up to 20% of postpartum maternal deaths are a result of suicide due to untreated PPD (Khamidullina et al., 2025).

Who suffers from PPD?

As of 2025, PPD impacts approximately 10-20% of postpartum women globally, with its prevalence influenced by hormonal, psychological, genetic, socio-economic and socio-cultural factors (Khamidullina et al., 2025). Hormonal factors refer to the neuroendocrine mechanisms that play a part in the development of PPD (Khamidullina et al., 2025). For example, altered stress hormones (cortisol), HPA -axis dysfunction, flaws in thyroid function and fluctuations in reproductive hormones (oestrogen, progesterone, testosterone, oxytocin and prolactin) are interrelated and are associated with depressive disorders. Contributing psychological factors include existing psychiatric illness and comorbid psychiatric disorders which can be strong predictors for developing PPD (Harrington et al., 2024). Antenatal depression is a primary predictor and risk factor with neuroticism as a key vulnerability factor (Provencio et al., 2026). While recent meta-analyses have concluded that no single candidate genes or gene sets reliably predict depression phenotypes, having a familial history of mental health issues is also a strong risk factor for PPD, suggesting a possible genetic link (Harrington et al., 2024).

In addition to genetic factors, socio-economic factors such as low income are barriers to PPD diagnosis and treatment. These factors are especially relevant to low income or developing nations where mental health is often underfunded (Khamidullina et al., 2025). Socio-cultural factors also have a role in the epidemiology of PPD (Khamidullina et al., 2025). Different cultures and ethnic groups each have their own unique beliefs or actions related to cultural/ethnic/personal understandings. For instance, somatisation (psychological distress expressed as physical symptoms, such as chronic pain, fatigue, or digestive issues, that lack a clear medical explanation) is a prominent expression of PPD in Hispanic, Asian and African cultures rather than the sadness, guilt, anxiety and fatigue expressed by women in Western nations (Bashiri & Spielvogel, 1999). PPD itself is not inherently a Western

diagnosis, but the way it is understood, reported, and managed is deeply shaped by Western culture, highlighting the need for culturally sensitive approaches to diagnosis and treatment (Bashiri & Spielvogel, 1999). A higher prevalence of PPD may also be observed in women who have a history of mood or anxiety disorders, persistent infant health problems, marital difficulties, experiences of adverse life events such as childhood or adulthood sexual abuse and prenatal stress in comparison to those who did not suffer any adverse life events (Hanach et al., 2021).

The NZ context

According to New Zealand's (NZ) Ministry of Health (MoH) (2021), the rate of PPD in NZ is between 12-18% which sits within the global average of 10-20%. Some populations within NZ report an increased prevalence of PPD, particularly Māori, Pacific and Asian peoples (MoH, 2021). The higher rates of PPD in Pacific and Asian communities may be attributed in part to the stress that immigrant populations experience due to acculturation and lack of traditional support systems and practices (Bashiri & Spielvogel, 1999). As an example, a traditional supportive practice for new mothers in Chinese culture is a month-long confinement period known as "Zuo Yue-zi." During this time, the mother rests at home; avoids cold foods, drinks, and activities; and follows dietary restrictions to restore balance in the body. Special postpartum foods and herbs are consumed to aid recovery and are provided by her own mother or mother-in-law (Foong et al., 2021). Such traditionally supportive practices may not be as readily accessible to new mothers who have emigrated away from their extended family to NZ. Compounding this issue, barriers in accessing mental health services in NZ are widely documented, with greater difficulties being faced by Māori women. Such barriers can include negative attitudes held by health professionals, the impact of colonisation, which has led to and cultivated institutional and systemic racism (Meredith et al., 2024), and "Māori disproportionately carrying the burden of social inequities, and

stigma" (Hayward et al., 2025, p. 2). This is reflected in the figures on maternal mental health that show that 60% of the women who died by suicide in pregnancy or within six weeks postpartum between 2006-2017 were Māori (Mental Health Foundation of New Zealand: Mauri Tū Mauri Ora, 2025). It is important to acknowledge the issues surrounding the perpetuation of racism in NZ as they contribute to the prevalence of PPD within the Māori, Pacific Island and Asian communities. These issues were investigated by Bncares and Atatoa-Carr (2016) who examined data from the Growing Up in New Zealand (GUiNZ) longitudinal study (Morton, 2012) to determine the impact of racism on rates of PPD. It was discovered that Māori, Pacific and Asian women who had experienced racism and racial discrimination during their life were 66% more likely to suffer from PPD compared to women who did not report these experiences (Bncares & Atatoa-Carr, 2016). Furthermore, experiences of racism and racial discrimination are associated with higher levels of maternal stress during pregnancy which can lead to poor child outcomes such as preterm birth, small for gestational age, developmental delays and behavioural abnormalities. Another concerning statistic is the fact that as recently as 2022, the infant mortality rate is significantly higher for Māori, Pacific and Asian communities (Health New Zealand: Te Whatu Ora, 2025). Taken together, the higher prevalence of PPD and poor access to services mean that PPD is a significant issue for these populations.

How is it measured?

When being assessed, PPD is typically measured using the Edinburgh Postnatal Depression Scale (EPDS) which was developed and validated by Cox, Holden and Sagovsky (1987) in Edinburgh, UK. The EPDS was developed to address the ongoing failure to identify depression in the postpartum period and to address limitations in existing scales e.g., a lack of face validity for childbearing women (Cox et al., 1987). Consequently, the EPDS is a useful screening test for depression following childbirth, is more acceptable to women who may not

regard themselves as being unwell and is simple to use for health practitioners without specialist knowledge of psychiatry to administer, complete and refer women to the appropriate mental health services where a formal diagnosis can be made and treatment options discussed (Cox et al., 1987). Due to its ease of use, the EPDS quickly became a widely used tool for assessing perinatal mood in new mothers globally and has been translated in to more than 60 languages (Cox, 2019). The EPDS consists of a 10-item self-report measure designed to screen women for symptoms of emotional distress during pregnancy and the postnatal period (Cox, 2019). Low EPDS scores (0-9) indicate mild symptoms of distress, mid-range scores (10-12) represent moderate symptoms of distress, higher scores (13+) suggest moderate to severe distress and scores above 19 suggest severe distress. A maximum score of 30 on the EPDS indicates a high likelihood of severe PPD (Cox, 2019). In addition to severity, a large score indicates the need for immediate action regarding intervention and treatment to ensure the wellbeing of mother and infant.

Existing treatments and Interventions

Following a positive assessment, treatment for PPD typically includes one or a combination of different methods that might combine psychological, pharmacological, lifestyle interventions and psychotherapeutic/alternative treatments. Psychological treatments typically include talk therapies such as Cognitive Behaviour Therapy (CBT), Acceptance Commitment Therapy (ACT), Interpersonal Therapy (IPT), Counselling and, Psychodynamic Psychotherapy (Mental Health Foundation of New Zealand: Mauri Tū Mauri Ora, 2025). First-line pharmacological therapy for moderate-to-severe PPD is typically a selective serotonin reuptake inhibitor (SSRI), known more generally as anti-depressants (Frieder et al., 2019). According to the Growing Up in NZ study by Morton (2012), approximately 3-5% of pregnant women in NZ use antidepressant medication during pregnancy with usage rates for depression increasing slightly within the first three months postpartum. The rate of

antidepressant use does not match the higher rate of PPD in NZ (12-18%) which indicates women may be seeking other treatment options or leave their PPD untreated. Lifestyle interventions can include making changes to exercise and dietary habits and increasing family and social support for mother and baby (Khamidullina et al., 2025). Psychotherapeutic or alternative treatments encompass a range of different options from omega 3 fatty acid and vitamin D3 supplementation, to electroconvulsive therapy (ECT) and bright light therapy (Thomson & Sharma, 2023). A specific national number for ECT treatment of PPD is not officially tracked but a retrospective study by Lundin et al. (2025) showed that of 7126 individual ECT treatments in NZ for 333 patients from July 2004 to July 2021, the primary reason for seeking ECT treatment was depression (n=5840) where PPD (n=65) was included within that number.

At the less extreme end of treatment, aromatherapy, hypnotherapy, massage and mirimiri (traditional Māori hands-on spiritual healing) are also alternative treatments available to new mothers (Mental Health Foundation of New Zealand: Mauri Tū Mauri Ora, 2025) though engagement with these services is not published in national datasets. Of all the available treatments for PPD, research has found that in severe cases, a combination of psychotherapy and pharmacotherapy is required (Khamidullina et al., 2025). However, despite the efficacy of this combined treatment, women with PPD have moderate-to-high rates of decisional conflict when considering antidepressant treatment, particularly during pregnancy and many find psychotherapies more acceptable than pharmacotherapies (Frieder et al., 2019). Decisional conflict is often associated with fears that the taking of prescribed medications may have adverse effects on themselves, their infants and/or their ability to breastfeed(Thomson & Sharma, 2023). Additionally, there is a perceived stigma attached to any deviation from the societal norm that childbearing is a happy occasion, a perception that the need to take anti-depressants strongly conflicts with (Mickelson et al., 2017). This

reluctance to accept anti-depressants as first-line treatment means that mothers suffering with PPD often prefer to explore psychological treatment options such as CBT (Pettman et al., 2023).

CBT

CBT is a behavioural therapy whose origins lie in the field of behaviour analysis. CBT belongs to the second wave of behavioural therapy which was characterised by the addition of cognitive components(Kohlenberg et al., 1993), giving an integration of both behavioural and cognitive elements. Pioneered by Albert Ellis (1957), Aaron Beck (1963) and Donald Meichenbaum (1977), CBT facilitates behavioural change via the elimination or replacement of an individual's problematic thoughts (Wills, 2012). Within CBT, the cognitive component focuses on changing how an individual thinks by identifying negative or unhelpful thoughts and providing techniques to replace them with more realistic or positive ones. A general CBT framework is depicted in Table 1 which provides an overview of the behavioural components that focus on changing individual actions or habits by breaking negative patterns and developing healthier behaviours (Craske, 2017).

As such, CBT has two overarching goals; to reduce symptoms and improve quality of life, and engender long-term, positive effects that are self-maintained by individuals engaged in therapy who have developed specific skills and strategies (Craske, 2017). The therapeutic process is facilitated and guided by the therapist or clinician, but it is the clients who learn and practice the skills necessary to become agents of change. The process itself contains a number of components beginning with a functional assessment (see appendix A for definition) by the therapist that determines the client's behaviour and how it presents itself, emotions and cognitions and their functional relationship to each other, and other factors that contribute to the problem (Craske, 2017). Subsequent components consist of the client learning skills and strategies that are applicable to them. These skills and strategies can

include cognitive restructuring, self-monitoring, relaxation, behavioural reversal of social skills and assertiveness, problem-solving training, behavioural activation, behavioural contracting, habit reversal, exposure therapy, response prevention, and self-instruction training (see appendices for further description).

CBT can be adapted to treat many mental health conditions such as substance use disorder, schizophrenia and other psychotic disorders, depression and dysthymia, bipolar disorder, anxiety disorders, somatoform disorders, eating disorders, insomnia, personality disorders, anger and aggression, criminal behaviours, general stress, distress related to pregnancy complications and female hormonal conditions (Hofmann et al., 2012). CBT has been widely examined as a psychological treatment for depression, is recommended in most treatment guidelines and has documented efficacy across different formats, ages, target groups and settings (Cuijpers et al., 2023).

Table 1

Generic Template of the CBT Process

Phase	**Intervention Aims/Goals**
Assessment	Discussion about suicidal tendencies reduce the risks of them occurring. Current depressive episode investigated to uncover precipitators, contextual factors, moderators, course severity and functional impairment so a baseline of current behaviour and mood can be established. The establishment of a reciprocal therapeutic relationship between client and therapist is a primary driver of success.
Acute	Learning to pay attention to emotions and body states as depression can interfere with them. Learning to differentiate between approach/avoidant impulses and engaged/disengaged behaviour.

	Plan activities that encourage approach behaviour and initiate a positive cycle of behaviour and an upward spiral of mood. Engage in behaviours that test and re-evaluate beliefs that are negatively biased. Overcome inflexible self-focus and increase meta-cognitive awareness of mental and bodily events. Counteract the tendency to process information in an abstract, conceptual or generalised way that is common for depression by engaging in and remembering concrete, detailed sensory information which can be facilitated through Socratic questioning. Taking notice of internal questions, de-centring them and reflecting on their impact is an effective strategy to counteract ruminative questions that are abstract, unanswerable and lack utility.
Relapse Prevention	Sessions are less frequent but not terminated at the end of the acute stage. Booster sessions invest in future well-being. Focus is on the treatment process, reviewing strategies that were most helpful. Depression makes it hard to remember details and reviewing and synthesising the learning process makes it more available and generalisable to daily life. Preparing for and learning how to respond to triggers and challenges by considering types of events that could precipitate a downward spiral or mood/behaviour. Accepting that challenges will happen and having the skills to problem-solve. Be able to spot early signs of relapse including symptoms, somatic states, emotions, thoughts or behaviour. Staying well means monitoring oneself and planning for future setbacks. Testing learning and skills by actively facing challenges or remembering difficult times. Find out what effects they have and learn to reverse them. Timing during this phase is important but the value is to find out the robustness of remission or recovery.

There are several different relaxation methods that are helpful in treating depression such as muscle relaxation training, different forms of meditation or yoga, controlled breathing and imagery.

Note. Table contents adapted from Barton et al (2019). See appendices for further explanation of the CBT process and techniques.

The CBT process

Applied to treat depression, the CBT the process typically consists of three distinct phases which have their own components. The assessment phase (usually 2–3 sessions), the acute phase (typically 12–18 sessions but can be as few as 10 or as many as 50 when treating severe chronic cases), and the relapse prevention phase (usually 2–6 sessions depending on need). Most clients receive between 18–24 sessions in total; but the total number of sessions can vary (Barton & Armstrong, 2019). Table 1 gives an overview of what the CBT process may entail for someone suffering from depression. This process can then be added to or modified to be an effective treatment for mothers with PPD (see appendix C for full CBT process).

CBT treatment of PPD

Research has investigated the effectiveness of CBT to treat PPD. Van Lieshout et al. (2017) conducted an RCT where 34 women were recruited and completed a 9-week CBT group course. Eligible participants were ≥18 years-old, had an infant <12 months, and an EPDS score >10 (suggesting moderate PPD). At baseline, the participants were pregnant (at risk of PPD) or nine months postpartum with a diagnosis of major depressive disorder. The first half of the weekly therapist led, clinic-based, 2-hour group intervention consisted of core CBT content, and the second half involved psychoeducation and guided discussion on topics relevant to women with PPD e.g., sleep hygiene and breastfeeding. Participants showed statistically significant improvements on all study outcomes including the EPDS, Beck

Depression Inventory II (BDI-II), Social Provisions Scale (SPS), Dyadic Adjustment Scale (DAS) and the Postnatal Bonding Questionnaire (PBQ). Large effect sizes were seen on the EPDS (d=1.97) and 79% of participants experienced a clinically significant decrease in EPDS scores. These findings suggest that CBT was associated with a clinically significant decrease in depressive symptoms and significant improvement in social support, mother-infant bonding, -and partner relationship quality. Post intervention, participant feedback reported high levels of satisfaction with the group format, demonstrating that group delivered CBT can be effective in the treatment of PPD (Van Lieshout et al. 2017).

In a later RCT, Van Lieshout et al. (2022) recruited 57 women to complete a 9-week, CBT group course. Eligible participants were ≥18 years-old, had an infant <12 months, and an EPDS score≥10. The intervention was led by public health nurses (PHNs) who had received CBT training with support from a perinatal psychiatrist. The first half of the 2-hour group session consisted of core CBT content, and the second half included psychoeducation and discussion of topics relevant to PPD (sleep support etc) which was co-led by mothers and PHNs. The experimental group reported a clinically significant decrease in EPDS score from 16.1 to 10.8 (B=5.35, $p<0.01$) and improvements in secondary outcomes such as worry, mother-infant bonding and social support. A key finding was that public health nurses with limited previous psychiatric training were able to facilitate CBT and that group format was again effective.

What is the issue?

CBT has been the most practiced behavioural therapy in NZ since the 1980s (Mathieson et al., 2022) where individual therapy in private settings is the most common modality for delivery. While CBT is a successful intervention for PPD, several issues contribute to the ongoing suffering of postpartum women in NZ. As previously mentioned, patient factors include the stigma attached to suffering from PPD and seeking treatment for it.

New mothers suffering from PPD often feel ashamed of admitting they feel anything other than joy at a time when they 'should' be celebrating and feeling grateful following the birth of their child. These emotions contribute to the stigma attached to seeking treatment for their PPD symptoms (Urban et al., 2025). Additional patient-driven barriers to seeking treatment can include a lack of time and transport, complex social issues involving alcohol and substance abuse, family violence, and insecure housing which leads to poor connections with primary healthcare services which can be compounded by strict, inflexible rules and qualifications that applicants must meet to qualify for programs and services (MoH, 2021).

Systemic factors allude to the mental health workforce in NZ. A 2021-2022 report by the New Zealand Psychologist Board acknowledged that of the 3795 practicing psychologists in NZ, many leave the public workforce to practice in private settings which currently employs around 33% to 46% of NZ's qualified psychologists some of whom have dual roles in the public and private sector (Wall et al. 2025). Private care represents a cost and availability barrier to patients with private psychologist appointments typically starting at $200. In addition, the public workforce has less opportunity for growth and development because of the workforce shift to private settings. As stated by Mathieson et al. (2022, p. 11) "there is an expanding private health system with increasing numbers of people purchasing medical insurance to avoid long waiting lists for treatment. This development is not without controversy, the fees are beyond the means of many people, and it is argued that private medical insurance is drawing resources away from the public health system."

A further complication is that 'CBT therapist' is not a standalone registered or accredited profession in NZ. Instead, mental health professionals (such as psychologists or counsellors) are registered under their primary qualification and may have additional training and experience in CBT, which means potential patients may need to research and verify their specific expertise (Mathieson et al., 2022). Furthermore, systemic inequities include a lack of

specialist providers, a lack of flexibility in treatment delivery, a lack of service provision in the public workforce, and, as mentioned, the prohibitive cost of private treatment (MoH, 2021). Geographical distance is also a factor that hinders access to treatment provision with providers typically located in major urban areas (Mathieson et al., 2022). Although there is little difference in the prevalence of mental health conditions between urban and rural areas,13% of NZ's population live rurally areas but use mental health services less than their urban counterparts (The Royal Australian and New Zealand College of Psychiatrists, 2025).These barriers make seeking treatment difficult to navigate for those suffering from PPD while also adjusting to the challenges of motherhood.

Telehealth

One treatment approach worth investigating to address some of these patient-driven and systemic barriers is treatment delivery via telehealth. Telehealth involves the use of digital information and communication technologies (ICT) to access health care services remotely to manage health care (Cheng et al., 2022). Technologies can include computers and mobile devices, such as tablets, smartphones and technology platforms such as ZOOM, Microsoft Teams and Google Meet. More recently, telehealth has evolved from human use of digital ICT to the inclusion of artificial intelligence (AI) and in the contemporary context, AI driven telehealth technologies are now being used in healthcare systems worldwide with promises to revolutionise healthcare delivery by offering greater accessibility, efficiency and responsiveness to patient needs (Chauhan & Vaidya, 2024). This includes treatment for mental health concerns with AI driven telehealth being employed in early detection and diagnosis with AI-powered screening tools able to analyse patterns in behavioural data to identify individuals at risk of developing mental health disorders (Chauhan & Vaidya, 2024). The COVID-19 pandemic propelled the healthcare landscape into an era of rapid

transformation marked by an unprecedented integration of telehealth (Burrell, 2023). For instance, telehealth platforms facilitated millions of consultations globally, reducing the burden on overwhelmed healthcare facilities during the pandemic (Binsar et al., 2025).
In general, telehealth facilitates telecommunication between patients and healthcare providers and enables care without physical touch but preserves the emotional and intellectual connectedness needed for medical practice and health preservation by expediting patient diagnosis and treatment (Campion et al., 2021). The format of telehealth treatment options can range from online workshops led by a therapist, online courses led by trained peers with lived experience, or smartphone applications designed to be used at the client's own pace. Additionally, telehealth can provide preventative care and health promotion (Wang, 2023).

In the NZ context, according to the Mental Health Foundation of New Zealand: Mauri Tū Mauri Ora (2025), telehealth options currently available that can potentially address PPD include 24/7 phone or text services such as Lifeline and Healthline which have a general focus on mental health and well-being and PlunketLine, a 24/7 parenting and advice helpline. An online option is a free CBT based programme that includes a module for postpartum women called Just a Thought. This course consists of stand-alone digital content with no interaction with trained professionals. Further expansion of telehealth options developed for NZ women with PPD has the potential to mitigate the current service barriers as well as be readily available to those who choose treatment.

Contrasting meta-analyses have addressed the efficacy of telehealth, with some detailing the failures of telehealth interventions while others extoll their virtues. Peters et al. (2021) conducted a meta-analysis and systemic review on the effect of telehealth on hospital service use (e.g., length of hospitalisations) and reported that overall, small to moderate reductions were achieved using telehealth. It was also noted that, despite a large number of included studies (n=127), uncertainties around the magnitude of effects remained, and not all

effects were statistically significant. Likewise, Linardon et al. (2024) conducted a meta-analysis (n=176) studying the overall efficacy of mental health apps for symptoms of depression and found small, non-significant effects for depression and generalised anxiety disorder (GAD). Similarly, Bright and Doody (2023) conducted an integrative review that included feedback from telehealth participants who described unsatisfactory experiences engaging with telehealth. For example, participants described the care they received as being "better than nothing" but "not nearly as good as in person" (Bright & Doody, 2023, pp.1121). In contrast, several meta-analyses have reported on the effectiveness of telehealth interventions. For example, Heitkemper et al. (2017) conducted a systematic review and meta-analysis to examine the effect of health information technology (HIT) diabetes self-management education (DSME) interventions on glycaemic control in medically underserved patients. Their findings concluded that telehealth interventions were successful because they incorporated interaction with educators similar to in-person DSME. In addition, a meta-analysis by Kou and Chen (2025) systematically evaluated the effectiveness and safety of telemedicine to improve management of patients with rheumatoid arthritis. They concluded that telehealth was successful in identifying and evaluating disease activity. Moreover, by including patients as a central factor in the decision-making process, telemedicine improved equitable results and offered individualised treatment regimens. The contrasting results of these meta-analyses and reviews suggest that the success of telehealth interventions may be subject to the quality of their design and content.

Telehealth has been utilised to treat PPD with CBT. Milgrom et al. (2016) conducted an RCT to test the efficacy of a 6-session internet intervention (the MumMoodBooster program) in a sample of 43 postpartum women with a clinical diagnosis of depression. The MumMoodBooster program is a CBT intervention, is highly interactive, includes a partner website, and was supported by low-intensity telephone coaching. At the end of the study,

79% of women in the treatment group (15/19, two withdrew from the RCT) who completed the program via the internet no longer met the diagnostic criteria for depression on the Structured Clinical Interview for DSM-IV (SCID-IV). This contrasted with the control group where only 18% (4/22 of women in the control group who completed the post-trial questionnaire) reported remission of PPD symptoms. Depression scores on the Beck Depression Inventory-II (BDI-II) showed a large effect favouring the intervention group (d=.83, 95% CI 0.20-1.45). Small to medium effects were found on the Personal Health Questionnaire-9 (PHQ-9) and on measures of anxiety and stress. Adherence to the program was good with 86% (18/21) of users completing all sessions; satisfaction with the program was rated 3.1 out of 4 on average. These results suggest that for this CBT program, delivery online was an effective treatment option for women clinically diagnosed with PPD.

An online modality was also used by Urban et al. (2025) in a mixed methods study. Twenty-nine participants with infants younger than 1-year-old and symptoms of PPD participated in a synchronous 1-day online CBT group intervention. The online workshop was delivered by a CBT licensed psychotherapist and the workshop itself contained four modules: 1. Understanding the reasons for negative moods. 2. Cognitive techniques. 3. Relaxation techniques and 4. Acting successfully. Depressive symptoms significantly reduced post intervention (t=3159; p=0.004; d=0.608). Mean EPDS scores showed a reduction in depressive symptoms with pre-intervention scores of 15.97 (SD=4.13) and post intervention scores of 13 (SD=4.99). Two weeks after the intervention, most participants were still using the techniques they had learned in their daily lives. The online format and structure were rated as helpful for its flexibility and accessibility and could support mothers after birth by teaching CBT strategies to cope with PPD. Participants in this study observed a decrease in their PPD symptoms and EPDS scores and reported that the experience of receiving therapy via telehealth was helpful. In another study, Varambally et al. (2024)

examined the experiences of participants who were >18 years old, had an infant < 12 months old and had an EPDS score > 10. Participants attended a 1-day in person (n=94) or 1-day online CBT-based workshop (n=95) for PPD and their experiences participating in either modality were compared. Participants from both modalities reported an improvement in learning to manage PPD symptoms that were able to be integrated into daily life. Participants also reported they appreciated the opportunity to join a community of individuals with shared experiences with one participant was quoted as saying;

> "After the workshop, I could see the whole picture. I saw how my perception of myself, my ability to communicate with my support network and the significance of asking for things for myself mattered . . . . I sometimes [experience anxiety now] but far less, and I feel much more in control. I am a calmer and happier Mom than before I signed up" (Varambally et al., 2024, p. 510).

Finally, a literature review by Kambeitz-Ilankovic et al. (2022) reported that CBT delivered via telehealth was as effective as in-person CBT – a modality that has historically been considered as the gold standard (David et al., 2018).

What this thesis looks at

Given the demonstrated effectiveness of CBT for PPD, the current study presents a meta-analysis to assess whether telehealth modalities are effective to deliver CBT for PPD. Results from RCTs of telehealth modalities from Australia, Brazil, Canada, Iran and Portugal were synthesised for this purpose. Currently, there are no free-to-use online programmes/workshops or smartphone-based apps based on CBT principles that are targeted to women who are suffering from PPD in NZ. This meta-analysis hypothesises that CBT tailored towards mothers experiencing PPD and delivered via telehealth modalities can effectively lessen the PPD symptoms of women suffering from mild to moderate PPD and is a treatment option worthy of further investigation that may ease the existing barriers to treatment and fill a gap in current PPD treatment options.

Method

The inclusion criteria for this study were as follows: randomised control trial, timeframe of 2015-2025, female, postpartum/postnatal depression, pre and post intervention data available, participants assessed for depression by a clinician via the EPDS, EPDS score as the primary outcome and published in English. The exclusion criteria included: no control group, pre-2015, antenatal/perinatal, male, couples, adolescent, prevention, anxiety, pregnancy, unavailability of pre/post intervention data, non-assessed and not published in English.

The methodological approach was informed by the Cochrane Handbook for Systematic Reviews of Interventions with reporting informed by the PRISMA 2021 statement (Page et al., 2021). The following databases were searched from the 9th of September to the 16th of October 2025: Gale Academic, Ebsco Cinahl, Springer Nature Link, Sage Journals, PubMed, Ovid Medline, ProQuest and Google Scholar. The keyword search method was used with the exception of Ovid Medline which was searched using a MESH search. The keyword search terms included: postpartum depression AND cognitive behavioural therapy, custom date 2015-2025, peer-reviewed, and English.

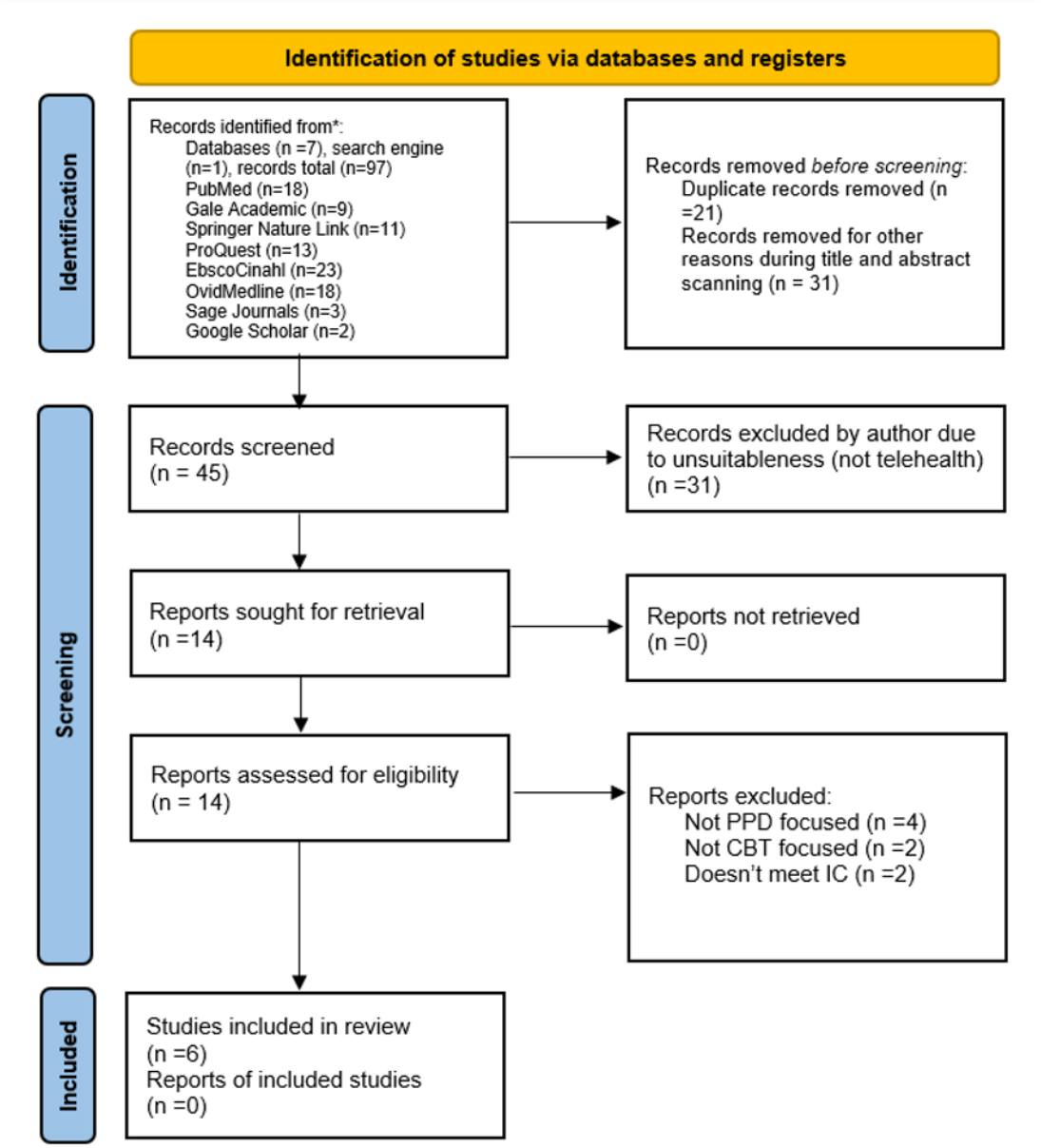
The MESH search terms used were: 1.Postpartum depression AND cognitive behavioural therapy 2. limit 1 to yr=”2015 – 2025” 3. limit 2 to (“all adult(19 plus years)” and (behavioural sciences journals or nursing journals) and English and (adaptive clinical trial or classical article or clinical study or comparative study or randomised controlled trial or “systematic review”) and humans only (removes records about animals)”and five stars and last 10 years)(18 items)

The search returned 97 results which included items that had CBT delivered via telehealth modalities. The number of discarded studies included; duplicates (*n*=21), not telehealth focused (*n*=31), feasibility, study protocols or qualitative studies (*n*=31), not PPD

focused (*n*=4), not CBT focused (*n*=2) and did not meet the inclusion criteria (*n*=2). From 97 search results 91 were discarded which left six articles for the meta-analysis. This process is illustrated in **Figure 1.**

Figure 1

PRISMA flowchart of Database Searches and Report/Article Selection Process



Effect measures

The outcome measure was the EPDS scores reported by each RCT (see **Table 2**)., which was used to assess participant PPD symptoms prior to and post intervention. The EPDS scores from each RCT were calculated and reported as means, standard deviations and confidence intervals. These calculations were used to calculate effect sizes for each RCT and further statistical analyses.

Table 2

EPDS Scale Items and Scoring

Edinburgh Postnatal Depression Scale	
1. I have been able to laugh and see the funny side of things: ( ) As much as I always could ( ) Not quite as much now ( ) Definitely not so much now ( ) Not at all	**2.** I have looked forward with enjoyment to things: ( ) As much as I ever did ( ) Rather less than I used to: ( ) Definitely less than I used to ( ) Hardly at all
3. I have blamed myself unnecessarily when things went wrong: ( ) Yes, most of the time ( ) Yes, some of the time ( ) Not very often ( ) No, never	**4.** I have been anxious or worried for no good reason: ( ) No, not at all ( ) Hardly ever ( ) Yes, sometimes ( ) Yes, very often
5. I have felt scared or panicky for no very good reason:	**6.** Things have been getting on top of me:

( ) Yes, quite a lot

( ) Yes, sometimes

( ) No, not much

( ) No, not at all

( ) Yes, most of the time I haven't been able to cope at al

( ) Yes, sometimes I haven't been coping as well as usual

( ) No, most of the time I have coped quite well

( ) No, I have been coping as well as ever

7. I have been so unhappy that I have had difficulty sleeping:

( ) Yes, most of the time

( ) Yes, sometimes

( ) Not very often

( ) No, not at all

8. I have felt sad or miserable:

( ) Yes, most of the time

( ) Yes, quite often

( ) Not very often

( ) No, not at all

9. I have been so unhappy that I have been crying:

( ) Yes, most of the time

( ) Yes, quite often

( ) Only occasionally

( ) No, never

10. The thought of harming myself has occurred to me:

( ) Yes, quite often

( ) Sometimes

( ) Hardly ever

( ) Never

Note. Questions 1, 2 and 4 (without an *) are scored 0, 1, 2, 3 with top box scored as 0 and the bottom box scored as 3. Questions 3, 5-10 (marked with an *) are reverse scored, with the top box scored as a 3 and the bottom box scored as 0 (The Black Dog Institute, 2025).

Risk of bias assessment

The Egger's test of linear regression was used to calculate effect size estimates on the standard errors within the six RCTs weighted by their inverse variance to detect and quantify any publication bias. Egger's testing was deemed the most appropriate method of bias testing for meta-analyses with small sample sizes (Michael, 2025). Pre-calculated data was imported into IBM Statistical Package for the Social Sciences (SPSS) version 31to perform the Egger's test and create a funnel plot to illustrate bias testing results.

Heterogeneity tests

To determine heterogeneity, Cochran's Q Statistic was the most appropriate method for meta-analyses as it determines if the results of multiple independent studies vary significantly from one another rather than just by random chance (Kulinskaya & Hoaglin, 2023). The data from the six RCTs was entered into Microsoft Excel to calculate the Q statistic. In addition, the I^2 statistic was calculated to find out exactly what percentage of the variance was real rather than random. These calculations were performed with guidance from the Department of Mathematics, School of Computing and Mathematical Sciences at The University of Waikato.

Visual analyses

The displays in this meta-analysis used to illustrate the data from the individual RCTs and the meta-analysis via Tables and Figures were created in Microsoft Excel and SPSS version 31.

Results

The six RCTs featured were conducted across five different countries (Australia, Brazil, Canada, Iran and Portugal). Study participants were all women aged 18 years or older who had given birth within the last 12 months at the time of recruitment for each study, with a diagnosis of depression as cited in the DSM-V (American Psychiatric Association, 2013) or reporting depressive symptomology that was validated by the EPDS (Cox et al., 1987). To be eligible for intervention, the participants in all six studies underwent pre-intervention screening using the EPDS and had EPDS scores of a minimum of at least 9, which indicated mild PPD symptoms to EPDS scores of >13 indicating moderate to severe PPD symptoms.

Intervention/RCT characteristics

To qualify for inclusion, the RCT interventions were required to explicitly target PPD using CBT-based interventions that were delivered to participants via telehealth modalities. The CBT-based interventions were defined as interventions that used CBT principles and techniques in their respective RCTs to treat participants. This included input from professionals and trained peers with the exception of Zuccolo et al (2024) whose intervention consisted of a smartphone app with no extra input from professionals or otherwise. **Table 3** details the particulars of each RCT.

Table 3

Characteristics of the RCTs Included in the Meta-Analysis

RCT	*N*	Program name	Symptoms	Intervention	CBT content	Primary outcome
Branquinho et al. (2024)	Treatment group *n*=16 Control group *n*=14	Be a Mom Coping with Depression, web-based	Mild to moderate PPD symptoms	Treatment group: 7 sessions with a psychologist and 6 in a web-based programme alternating weekly. Active control: access to guided web-based intervention.	Acceptance, cognitive defusion, values-based behavioural activation.	EPDS
Jannati et al. (202)	Treatment group *n*=39 Control group *n*=39	Happy Mom, mobile app	Moderate PPD symptoms	Treatment group: mobile application following a linear program with a total of 8 lessons over 8 weeks. Storytelling format where participants follow the story of women who are also suffering with PPD and learning how they managed	Behavioural activation, self-monitoring, cognitive restructuring, problem-solving and social skills training.	EPDS

				their PPD symptoms. Control group: TAU		
Loughnan et al. (2019)	Treatment group *n*=65 Control group *n*=55	Mumentum postnatal, web-based	Mild to moderate PPD symptoms	Treatment group: internet delivered cognitive behavioural therapy (iCBT). 3 modules over a total of 6 weeks. Compulsory lockout period of 5 days between modules. Program was supervised by professionals. Control group: TAU	Cognitive restructuring, problem-solving, behavioural activation, exposure therapy, assertiveness and behavioural contracting.	EPDS as one of 3 primary outcomes.
Merza et al. (2024)	Treatment group *n*=77 Control group *n*=67	No name, web-based	Mild to moderate PPD symptoms	Treatment group: led by trained peer facilitators in a 9-week, synchronous online CBT intervention for 2 hours each week.	Cognitive restructuring, behavioural activation, problem-solving and relaxation techniques.	EPDS

				Control group: waitlisted for the intervention.		
Van Lieshout et al. (2021)	Treatment group *n*=161 Control group *n*=192	No name, web-based	Mild to moderate PPD symptoms	Treatment group: 1-day online CBT workshop facilitated by professionals. Control group: waitlisted for the intervention and access to TAU.	Cognitive restructuring, problem-solving, behavioural activation and assertiveness.	EPDS
Zuccolo et al. (2024)	Treatment group *n*=106 Control group *n*=109	Motherly, mobile app	Mild to moderate PPD symptoms	Treatment group: 6 modules presented as interactive experiences and used at the participants own pace. Control group: access to psychoeducational app called COMVC.	Problem-solving, cognitive restructuring, relaxation techniques and behavioural activation.	EPDS

Comparators

Table 3 depicts the range of symptoms, intervention framework, CBT content and control conditions for all six RCT's. Branquinho et al. (2024) included an active control group that did not receive psychologist delivered content. Jannati et al. (2020) and Loughnan et al. (2019) included control groups that received TAU (treatment as usual, the standard, routine care or existing treatments available in a community or healthcare system). Merza et al. (2024) and Van Lieshout et al. (2021) included control groups that were on the waitlist to receive treatment at the conclusion of the RCT and were free to receive TAU in the interim. Zuccolo et al. (2024) included a control group that was given access to an app that did not contain any CBT content or lessons.

Outcomes

EPDS scores were a primary outcome of each study. For study 2, it was the only outcome measure. Studies 1, 3, 4, 5 and 6 had additional primary outcome measures and/or had secondary outcomes that included the Hospital Anxiety and Depression-Anxiety Subscale (HADS-A), the Generalised Anxiety Disorder Scale (GAD-7), the Patient Health Questionnaire (PHS), the Social Phobia Scale (SPS), the Personality Belief Questionnaire (PHQ), the Infant Behaviour Questionnaire Revised Scale (IBQ-R), and the Scale to Assess Therapeutic Relationships New Patients (STAR-P).

Blinding

Participants in RCT's 1,2 and 3 were not blind to experimental groups and were able to receive TAU and/or be waitlisted for treatment. RCT's 4,5 and 6 did not explicitly state that participants were blind to experimental groups as they were either in an active control group, were able to receive TAU or were waitlisted to receive treatment. The approach to blinding by the six RCT's was in consensus with ethical practices stating that participants

cannot be blind to experimental conditions in situations where having knowledge of their treatment is necessary for their immediate clinical care (Senn & Chalmers, 2021).

Data Extraction

The data extracted included the mean scores, standard deviations, and confidence intervals of the EPDS scores from all six RCT's prior to and post intervention. These data were then entered into Microsoft Excel to calculate effect sizes (Cohen's d). IBM SPSS version 31 was used to make forest plots of pre and post intervention data to provide an illustration of intervention effectiveness.

Data synthesis

Analysis of statistical measures indicated extremely large effect sizes for RCTs 1 – 5. A large effect size is typically d = 0.8 and above. The exception to these extremely large effect sizes was the RCT by Zuccolo et al. (2024), d = -0.5, 95% CI [11.7, 13.8] which indicates little to no effect. The *Q* statistic = 38.13 was very high, indicating the variability in effect sizes between studies was greater than would be expected by chance. The I^2 of 88% suggests that the total variation among study effect sizes was due to true heterogeneity rather than chance or random error (Field & Field, 2018). The pooled effect size of >5 reflects the average difference across all studies.

Table 4 depicts the mean outcomes, effect sizes and lower and upper bound 95% confidence intervals of each RCT. As seen in Table 4, standard deviations increased slightly in the RCTs by Branquinho et al. (2024), Loughnan et al. (2019), Van Lieshout et al. (2021), and Zuccolo et al (2024) which indicates participant EPDS scores were further spread from the mean post intervention and showed greater variability. Standard deviations for the RCTs by Jannati et al. (2020) and Merza et al. (2024) decreased slightly which indicate the participant EPDS scores were clustered closer to the mean post intervention with lower variability. The confidence intervals are further evidence of the spread of data. With the

exception of Zuccolo et al. (2024), the effect sizes for all studies were extremely large which indicates that this intervention has a meaningful, real-world impact. However, it is important to bear in mind that these effect sizes are estimated on the basis of relatively small sample sizes within each RCT. Therefore, it is possible the true population effect is overestimated (Lakens, 2013).

Table 4

Summary Table of Sample Sizes, EPDS Pre and Post Intervention Mean Differences and Standard Deviations, Effect Sizes and Confidence Intervals

RCTs	Pre Treatment				
	M	*SD*	*N*		
Branquinho et al. (2024)	18.19	2.86	16		
Jannati et al. (2020)	17.42	2.8	39		
Loughnan et al. (2019)	14.91	3.15	65		
Merza et al. (2024)	16.91	4.71	77		
Van Lieshout et al. (2021)	16.47	4.41	161		
Zuccolo et al. (2024)	17.1	3.9	106		
	Post Treatment				
				95% CI	
	M	*SD*	*d*	LL	UL
Branquinho et al. (2024)	9.19	3.97	7.02	7.25	11.3
Jannati et al. (2020)	8.18	1.5	5.54	7.7	8.6
Loughnan et al. (2019)	8.82	4.96	6.89	7.6	10
Merza et al. (2024)	10.2	4.32	7.55	9.2	11.1
Van Lieshout et al. (2021)	11.65	4.83	8.09	10.9	12.3
Zuccolo et al. (2024)	12.75	5.52	-0.53	-5	-3.2

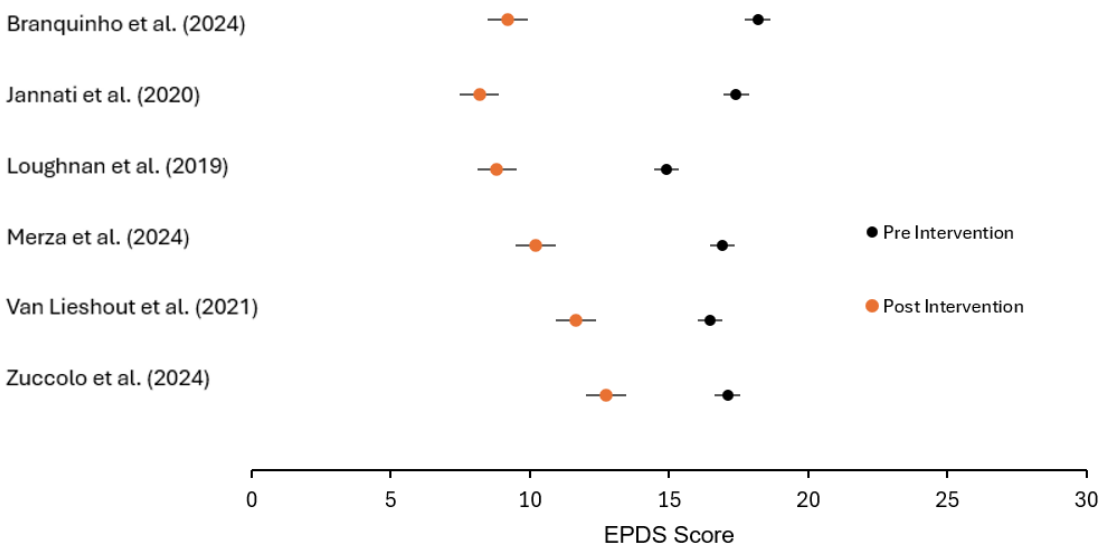
Mean scores

Figure 2 is a visual representation of pre versus post intervention EPDS scores for the RCT treatment groups. Large mean differences are depicted with the exception of Zuccolo et al. (2024). The EPDS mean scores prior to, and post intervention show that EPDS symptoms that were moderate to severe pre-intervention decreased to mild to moderate post-intervention for each study. This can be seen in Figure 2 where there are easily observable divergences between pre and post EPDS score markers. The largest decreases in mean EPDS scores were reported by Branquinho et al. (2024) and Jannati et al. (2020) whose participants reported mild to severe PPD symptoms >13 pre-intervention. Post-intervention, the mean EPDS scores for both of these RCTs decreased significantly (by 9 $p<0.00$, and 9.24 $p<0.001$ respectively) and participants from both RCTs reported milder PPD symptoms. The participants in Loughnan et al. (2019) and Merza et al. (2024) reported smaller but still significant drops in EPDS mean scores. Pre-intervention EPDS mean scores were >13 indicating moderate to severe symptoms, and post-intervention EPDS mean scores decreased (by 6.09 $p<0.001$, and 6.71 $p<0.001$ respectively) and participants from both of these RCTs reported milder PPD symptoms. The participants in Van Lieshout et al. (2021) reported a smaller but still significant drop in mean EPDS score. The pre-intervention mean EPDS score was >13 indicating moderate to severe symptoms and the post-intervention EPDS mean score had decreased by 4.82, $p<0.001$ and participants reported milder PPD symptoms. The participants in Zuccolo et al., 2024 reported a decrease in mean EPDS score. The pre-intervention mean EPDS score was >13 indicating moderate to severe symptoms, and the post-intervention mean score decreased by 4.35 and participants reported milder PPD symptoms. However, the significant decrease in Zuccolo et al. (2024) is made void by the large post-intervention standard deviation (SD=5.32, p=0.60). Participants EPDS scores were more spread out from

the sample mean which indicates this study had inconsistent results e.g., some participants reported a decrease in symptoms while others did not.

Figure 2

Scatterplot of Mean differences for RCT Treatment Groups, Pre vs Post Intervention Comparison of EPDS Scores



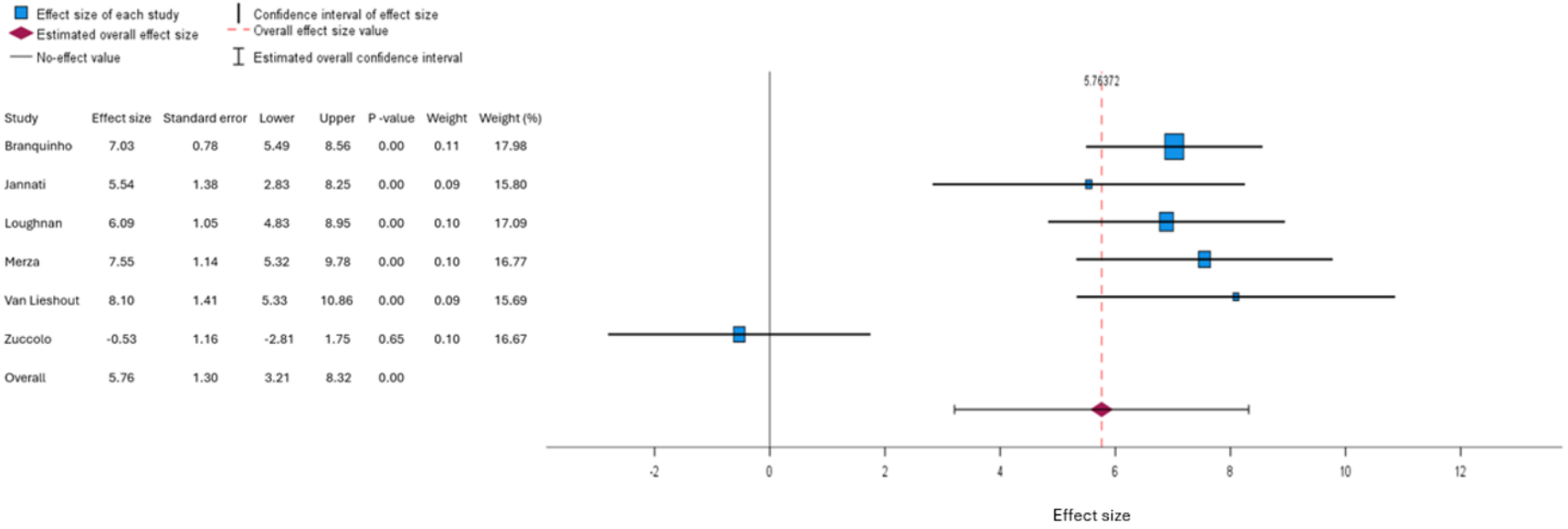
Overall effects

Figure 3 illustrates a forest plot of effect sizes, confidence intervals (upper and lower limits), p-values, and estimated overall effect sizes for all six RCTs. A very large overall effect size of d=5.76 across all RCTs can be seen. In addition, Branquinho et al. (2024) had a large effect size paired with narrow confidence intervals which indicates this study was the most precise with the lowest margin of error and the greatest weight i.e., the closest to a true population effect. The study by Van Lieshout et al. (2021) had the least weight (and therefore the least influence on the overall effect size) and the study by Zuccolo et al. (2024) crossed the vertical line of 'no effect' which indicates that the study results were non-significant and add no value to the meta-analysis. The heterogeneity measures of Tau2 = 8.83, H2 =8.18 and I^2 = 0.88 (or 88%) indicate the high level of total variability in the meta-analysis results is

due to true differences between the studies (e.g., varying populations, dosages, or study designs) rather than just random sampling error.

Figure 3

Forest Plot of Effect Sizes, Confidence intervals (upper and lower limits), P-values, and Estimated Overall Effect Sizes



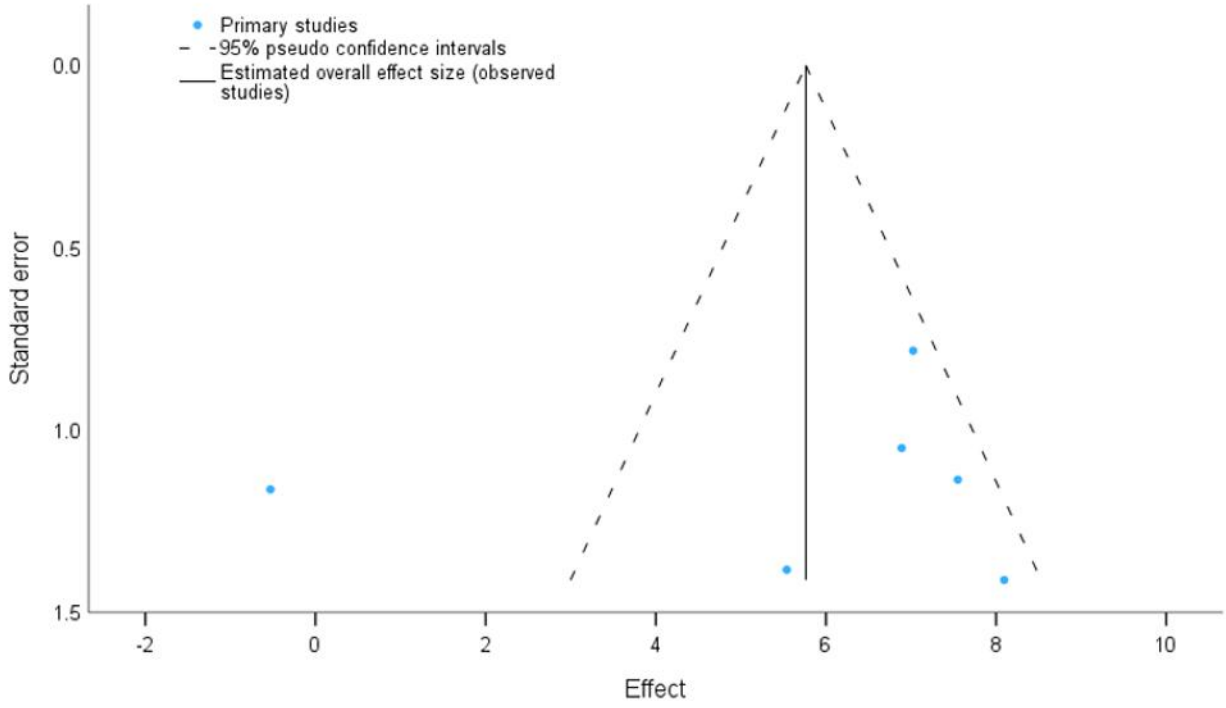
Note. Model: Random-effects model. Heterogeneity: Tau-squared 8.83, H-squared = 8.18, I-squared = 0.88.

Publication bias

Figure 4 illustrates a funnel plot depicting publication bias testing (Egger's test) results for all six RCTs. The Egger's test is commonly used to assess potential publication bias in a meta-analysis via funnel plot asymmetry. An Egger's linear regression test indicated no significant publication bias (intercept = 6.54, 95% CI [−15.63, 28.71], t = 0.81, p = 0.459). The asymmetry of the funnel plot in Figure 4 is likely due to small study effects which is confirmed by the fact that the smaller sample sizes from some of the included studies reported large effect sizes.

Figure 4

Funnel Plot Testing for Publication Bias



Discussion

The aim of this research was to assess via meta-analysis published studies investigating the effectiveness of CBT delivered telehealth for PPD. Specifically, was hypothesised that CBT tailored towards mothers experiencing PPD and delivered via telehealth modalities could effectively reduce PPD symptoms. The results from five of the six individual RCTs reported that telehealth interventions were effective at reducing EPDS scores with very large effect sizes (Cohen's $d > 5.0$). The results of this meta-analysis $d = 5.76$ suggest that CBT delivered to women with scores of 9 (mild) to >13 (moderate to severe) via telehealth modalities is a viable intervention that is worthy of further investigation and development.

An important finding was that the level of human involvement/facilitation in the interventions seemed to correspond to the effect size. To illustrate this point, Branquinho et al. (2024), Merza et al. (2024) and Van Lieshout et al. (2021) reported high levels of interaction between participants and therapists or trained peers. These three RCTs also had the largest effects sizes of $d = 7.02$, 7.55 and 8.09 respectively. Jannati et al. (2020) and Loughnan et al. (2019) had less interaction between participants and therapists and had correspondingly smaller (but still significant) effects sizes ($d = 5.54$ and 6.89). Zuccolo et al. (2024) had zero interactions between participants and therapist and reported a negative effect size ($d = -0.53$). These findings are consistent with other research Meyerhoff et al. (2021), Borghout et al. (2021) and Mohr et al. (2011) that has suggested that a level of human interaction is important when considering telehealth delivery of CBT.

Interpretations and relationships in the data

The exception to the overall efficacy of the RCTs was the study by Zuccolo et al. (2024) who reported negative findings. This study involved the use of an app to deliver the CBT content, where the authors suggested that insufficient app engagement throughout the

trial may have resulted in the negative findings. While not specific to PPD, a recent meta-analysis by Tsai et al. (2022) reported that apps aimed at reducing postnatal depression were ineffective, noting that few were subjectively rated to be of high-quality quality (Feldman et al. 2021, as cited in Tsai et al. 2022). Zuccolo et al. (2024) stated that their findings were in line with those of Tsai et al. (2022) and proposed investigating which factors could facilitate participants to engage more with standalone smartphone apps. Zuccolo et al. (2024) suggested that a lack of engagement with the app may have been due to a lack of behavioural change which led to a lack of response contingent reinforcement (e.g., participants did not engage with the app and consequently did not benefit from the purpose of the app which was a potential reduction in PPD symptoms). In addition, participants did not experience positive reinforcement (e.g., participants did not experience positive reinforcement in the form of reduced PPD symptoms as they did not engage with the app that may have provided that positive reinforcement) and the consequent ineffectiveness of their trial. This is noteworthy considering that the app included psychoeducational content on how to implement behavioural activation to increase engagement in rewarding behaviour and to solve problems that hinder access to rewards (as defined by each participant). It is also important to note that the strictly smartphone app-based intervention by Zuccolo et al. (2024) was the only study that did not include guided lessons and or check-ins with professionals or trained peers during the intervention which may have been an additional factor contributing to its ineffectiveness. A scoping review by Kidman et al. (2024) investigated why lifestyle and mental health mobile apps may be ineffective. There were multiple contributing factors, including those related to user experiences and a lack of features and content. Mobile app users who experienced confusing or difficult experiences while using apps were more likely to discontinue app use. Similarly, mobile apps were reported as having a lack of features

including a lack of variety or options, the app was not engaging or effective, they lacked accountability and perhaps most importantly, lacked professional interaction or input.

It is important to contextualise these results and identify the patterns and relationships within the data that contributed to the positive findings of five from six studies. As previously mentioned, all included studies, with the exception of Zuccolo et al. (2024), incorporated guided lessons and/or sessions that were facilitated by professionals or trained peers that occurred in timetabled sessions. The delivery of these interventions shares a key component with CBT treatment: behavioural activation. By engaging in guided sessions or having scheduled meetings with professionals or trained peers, participants are activity scheduling, which is the premise of behavioural activation (see appendices for definition). This encourages participants to regard treatment as a series of appointments with themselves where they can approach activities that they may be avoiding and analyse the function of their cognitive processes that serve as a form of avoidance (Veale, 2008). Furthermore, it allows participants to refocus on their goals and valued directions in life as well as serving as a check-in with professionals or peers.

Another important factor that may have contributed to the success of CBT delivered via telehealth, identified by Branquinho et al. (2024), is the impact of supportive accountability and its contribution to the formation of the therapeutic alliance. Supportive accountability is a widely used model/method of intervention delivery in telehealth and provides users with clear expectations for intervention use, regular monitoring, and a sense that coaches are trustworthy, benevolent, and have expertise that enhances engagement in the intervention (Meyerhoff et al., 2021). Therapeutic alliances are collaborative, trusting relationships that form between a healthcare provider and client and is the primary driver of positive therapy outcomes (Stubbe, 2018). For example, in the study by Branquinho et al. (2024), treatment group participants reported feeling more committed to engage in the

sessions with a psychologist than the purely web-based program (control group). Supportive accountability and the establishment of strong therapeutic alliances are not exclusive to clients and healthcare professionals. Merza et al. (2024) employed trained peers who had recovered from PPD to facilitate online CBT sessions for their treatment group. Post intervention, those participants reported that the peer-facilitators provided a space for mutual openness and trust where they felt understood, supported and encouraged (Merza et al., 2024). Moreover, trained peer-delivery was declared by the researchers as being on par with professional-delivery of online CBT and was an important factor in their trials large positive effect size. A supplementary benefit of group-delivered CBT was the support available to the participants. According to Buhagiar and Mamo (2023), group support directly impacts the sense of isolation and loneliness that is particularly felt in the postpartum period.

Another compelling suggestion made by four of the six RCTs was that telehealth delivered CBT could be appropriate as part of a stepped-care model of treatment. For example, telehealth-based programmes could act as early phase interventions for PPD and could offer mothers the option to self-refer and self-manage their symptoms (Loughnan et al., 2019). Additionally, limited clinician resources can then be directed to more high-risk mothers and those who do not respond to telehealth delivered CBT. Importantly, a stepped-care model could also make CBT treatment available for mothers with PPD while they are on a waitlist for face-to-face treatment (Branquinho et al., 2024). While not a perfect solution, this option may address one of the barriers to accessing treatment in NZ, which includes a lack of access to CBT practitioners. According to López-López et al. (2019), hybrid CBT interventions, including both face-to-face sessions and multimedia features, are a possible modality that warrant further research. Moreover, in a context where CBT is often not accessible for patients who could benefit from it, multimedia and hybrid interventions could constitute promising alternatives to improve coverage for depressed adults.

Implications and generalisations

The findings of this meta-analysis provide evidence that telehealth modalities of CBT delivery dedicated to women with PPD were effective and therefore could feasibly be investigated within the NZ context to address service shortfall. For example, the sample groups included in this meta-analysis were derived from both Western and non-Western nations, and the interventions and outcome measures were adapted to accommodate the differences in language, culture and customs. These factors in addition to the large effect sizes would suggest that a telehealth CBT intervention for PPD is worth further investigation in the NZ context. However, the process of developing and delivering such a service in NZ would require careful consideration. For example, developers would need to evaluate the needs of the population it intends to support. This includes the fact that Māori, Pacifica and Asian populations experience a higher rate of PPD, face greater inequities within the NZ healthcare system and hold different cultural viewpoints around childbirth, the postpartum period and mental health (Foong et al., 2021; Gurney et al., 2021; Hayward et al., 2025). As an example, a fully Westernised approach may be less effective due to NZ being a multicultural nation with Māori making up a combined 46% of the population (Collins, 2024). Therefore, the adaptations needed to ensure a culturally safe and effective intervention should include consultation with stakeholders (such as Iwi and local DHBs) to evaluate what works for whom and under what conditions (Bonell et al., 2018).

The benefits to NZ society and the healthcare sector are numerous. As of March 2026, the current female population in NZ is 2.68 million which equates to 50.28% of the total population (Aotearoa: & StatsNZ, April 2026). Of that 50.28%, 12-18% of women who give birth are estimated to suffer from PPD (MoH, 2021). These figures combined with the dearth of existing treatment options mean that any service or resource that can address the lack of available care for women suffering from PPD has the potential to make a positive and

meaningful impact. Telehealth delivery of CBT can remove or reduce patient driven treatment barriers equating to a lack of time or transport and poor connections with primary healthcare providers (MoH, 2021). For example, telehealth can reduce the indirect costs of healthcare such as travel, childcare and time away from employment therefore reducing stress for mothers with PPD (MoH, 2021). However, an important implication of this research is that human interactions within telehealth interventions seem to be an essential component of their success or failure. As reported in the findings above, factors such as supportive accountability and the therapeutic alliance are the most important components in the effectiveness and adherence of online interventions (Santarossa et al., 2018). For example, the RCTs included in this meta-analysis where the researchers facilitated interactions with their participants recorded high effect levels and the one study that did not failed to find a significant effect. Therefore, the conditions in which CBT delivered via telehealth are the most effective are those that facilitate interactions between participants and therapists.

Though they are not the target of these interventions, children also stand to benefit from them as mothers who receive CBT for PPD via telehealth report improvements in the mother-infant relationship which leads to better child and societal outcomes in the future (Van Lieshout et al., 2021). Telehealth can also act as an equity positive tool that might help to overcome socio-economic barriers to health care access for Māori and Pacific mothers. In addition, it can reduce cultural barriers that prevent access to a service that was not necessarily designed to align with Māori, Pacific and Asian worldviews of health (Gurney et al., 2021). The benefits to NZ society gained by developing telehealth delivered CBT for PPD are supplementary to the benefits for mothers and children. As stated by Onarheim et al. (2016), existing literature indicates that healthier women and their children contribute to more productive and better-educated societies. Furthermore, the development and economic performance of nations depend, in part, upon how each country protects and promotes the

health of women. In short, societies that prioritise women's health will likely have better population health overall and will remain more productive for generations to come (Onarheim et al., 2016).

Limitations

Several limitations are evident in this meta-analysis. First and foremost, the small sample size of only six RCTs and the relatively small number of participants within those RCTs (see **Table 3**) can cast doubt on the results as sampling error is more likely to occur and larger sample sizes are more indicative of the wider population (Field & Field, 2018). While the inclusion of RCTs only is considered the highest level of clinical evidence (Metelli & Chaimani, 2020), they can also fail to translate to real life scenarios. None of the RCTs included originated from NZ, which questions the applicability of this intervention modality as there is no existing evidence or support for CBT for PPD that has originated in NZ. However, Australia, Canada and NZ share parliamentary democracies, similar legal and health systems, high standards of living, and close cultural ties (O'Sullivan, 2024). Therefore, it is not unreasonable to extrapolate these findings to the NZ context. A high level of heterogeneity (Q = 38) may be a concern as it indicates that studies or data points differ significantly, reducing statistical power and limiting the ability to generalise findings (Field & Field, 2018). The RCT's focus was on the change in pre and post intervention EPDS scores but they failed to account for any moderating factors such as time, support and other variables that could have contributed to an improvement in PPD symptoms and a reduction in EPDS scores. The exclusion of severe cases of PPD (scores >19) by each RCT may contribute to significant bias, impairs generalisability (external validity), and limits the understanding of the full spectrum of the disease (Patino & Ferreira, 2018). Also, analyses were restricted to the post-intervention period, because of inconsistent reporting and how follow-up assessments were conducted (if at all). Lastly, analyses could only be conducted on symptom

change and not on other, clinically meaningful outcomes such as remission, recovery, or deterioration. As with the control groups (including active control groups), the treatment groups in this meta-analysis were able to access TAU or routine care at any time. This highlights the need for three-armed RCT trials in the future between telehealth only, telehealth plus TAU/routine care and TAU/routine care only.

Recommendations and future directions

Further research is necessary to not only identify the most effective elements of telehealth CBT for PPD but to establish the most effective way it could be delivered in NZ. Developing a telehealth intervention for NZ women requires a phased approach that blends human-centred design with strict regulatory and cultural standards (Health New Zealand: Te Whatu Ora, 2026). The NZ Telehealth Forum and Resource Centre (2017)outlines a number of regulations, standards and guidelines on the role of telehealth in NZ. Critical steps include establishing clinical need, securing data privacy, aligning with Te Whatu Ora guidelines, and co-designing with diverse demographic groups to ensure equity and accessibility. The purpose of these guidelines is to make the establishment of any new service efficient and effective.

These guidelines also highlight the importance of cultural considerations when developing telehealth interventions for use in NZ. Therefore, the needs of Māori, Pacific and Asian peoples must be considered during the development process. According to Gurney et al. (2021) this would include consideration of Te Tiriti o Waitangi and equity as core guiding principles.

Werkmeister et al. (2023) states that as there has been a steady increase in clients accessing services and poor clinician retention in NZ, there have been growing concerns about clinician burnout and workforce support. Furthermore, limited funding has imposed

resource constraints which hinders service provision and development. Thus, it is important to consider these current shortfalls when developing a telehealth CBT intervention for PPD.

When considering how to successfully establish a dedicated online and smartphone-based CBT intervention that can bridge the service gap for women suffering from PPD, it is important to consider options that deviate from those that are already available (e.g. clinic based, one-on-one therapy). Offering easily accessible therapeutic content that has been used successfully to treat PPD by providing an opportunity for mothers, their families, local health providers (midwives and general practitioners) and the wider community to establish supportive local networks, there is a potential for the therapeutic effects of CBT to have greater reach and benefits. The reasoning behind establishing such a network is that 'many hands make light work.' For example, women experiencing symptoms of PPD could self-refer to a telehealth CBT treatment program, which would have the capacity to promote resources in each locality that women can also seek help from. Since CBT via telehealth is appropriate for mild to moderate PPD symptoms, it could also be part of a stepped healthcare model where mothers with severe PPD symptoms are then referred to appropriate healthcare professional (e.g., general practitioners or psychologists). Accounting for the shortage of mental health professionals in NZ and of professionals trained to deliver CBT, a community of peers with lived experience of PPD could be trained to deliver CBT via telehealth for mothers with PPD symptoms as per Merza et al. (2024). According to Powell et al. (2024), collaborative, community-owned approaches can bring together experience, networks, local knowledge, and other resources to form locally driven, place-based initiatives that can address complex issues effectively. This community could be a first port of call for those seeking treatment for PPD which would potentially lighten the load of psychologists who would oversee the community in a supervisory role. This community has the potential to expand into a nationwide heath initiative for mothers with PPD symptoms much like other

such organisations that support new mothers in NZ. For example, Bellyful: Kia manawa reka i te aroha (2025) is a volunteer-led charity nourishing whānau and connecting communities by delivering free meals to families with babies and young children who are without a support network. Another example is Well Women (2026), grassroots, volunteer-led organisation operating out of Pukekohe Maternity Hospital that seeks to address the gap in maternal mental health support. Today, Well Women runs five in-person Peer Support Groups across three locations, plus one online group, making their services more accessible to women across NZ. If a model of intervention based on Merza et al. (2024) can be established, there is the potential to sustain a pool of trained peers who could facilitate telehealth delivery of CBT for PPD. This is due to pro-sociality (reciprocity and altruism) where help from non-relatives is associated with altruism toward strangers which is a channel for the development of pro-social behaviour between non-related individuals (Cassar et al., 2026). What this means for a CBT intervention is that women who were helped by trained peers then go on to become trained peers themselves, ready to assist subsequent new mothers with managing their PPD symptoms. The establishment of such networks promise new avenues to promote several policy interventions (pertaining to maternity health) and attract governmental support in the form of funding. The benefits from community led health initiatives are not limited to those that participate in them. Benefits reach into the future and affect different facets of society. For instance, literature indicates that healthier women and their children contribute to more productive and better-educated societies (Onarheim et al., 2016). This study adds to the existing research that telehealth delivered CBT for PPD is effective when it is developed and facilitated by trained professionals and/or peers and could be a viable option for PPD treatment in NZ. Olesch (2024) describes healthcare as an industry centred on human interaction and trust, and while technology can enhance efficiency, it remains a supportive tool rather than the foundation of care. Furthermore, successful

telehealth ventures are those that integrate digital tools seamlessly into the patient journey, enhancing rather than replacing the human touch.

Conclusion

This thesis investigated the suitability of telehealth delivered CBT for women with PPD in NZ. Contextual factors such as who is most at risk of developing PPD in NZ and barriers to women seeking treatment were identified as patient and systemic driven. Among an array of therapeutic options, CBT was established as a proven treatment for PPD where telehealth was shown to be effective as a mode of delivery. Five of the six RCTs delivered positive results which enabled examination of factors to extrapolate to the NZ context. Lastly, it was acknowledged that community led initiatives are more likely to be effective and that investment into the well-being of mothers and children reaps societal benefits in the future.

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Appendix A

Behaviour analytic and CBT skills definitions

Functional analysis (FA) a systematic method to understand why someone does something, focusing on the function or purpose of a behaviour by examining its triggers (antecedents) and what happens afterwards (consequences). It identifies the environmental context and reinforcing outcomes that maintain a behaviour, helping therapists find healthier ways for clients to meet the same needs (Cooper et al. 2020).

Positive reinforcement is a response followed immediately by the presentation of stimulus change that results in similar responses occurring more often (Cooper et al., 2020). Response contingent reinforcement is when a positive stimulus is provided following a specific desired behaviour (Thompson & Iwata, 2005).

CBT skills and techniques

Behavioural activation/Activity scheduling: developed specifically as a treatment for depression, it originated from instrumental conditioning models, in which depressed mood was attributed to proportionately more punishers than positive reinforcers. To counter this disproportionate reinforcement schedule, clients are encouraged to increase access to positive reinforcers often using activity logs and scheduling to increase engagement in pleasant activities. Functional analyses are useful in identifying specific types of activities that would act as positive reinforcers for clients. Behavioural activation can also be used to counter avoidance of life challenges and associated negative emotions (Craske, 2017, p. 80).

Behavioural contracting: Another strategy driven by reinforcement principles is behavioural contracting, or contingency contracting. Simply, this represents a statement of a set of behaviours to be followed, and related positive and negative consequences to be carried out conditionally on compliance or noncompliance with the plan. Contracting depends on an initial functional analysis that indicates the antecedents and consequences of current

behavioural patterns and that suggests ways for modifying antecedents or alternative consequences necessary to initiate and maintain behavioural changes (Craske, 2017, p. 83).

Behavioural experiments: are planned experiential activities used to test the validity of a person's irrational thoughts, negative predictions, or unhelpful beliefs. Instead of just discussing fears theoretically, individuals use these experiments to gather real-world data and test their assumptions directly.

Cognitive restructuring/Reframing: Cognitive restructuring refers to the act of identifying ineffective patterns in thinking and changing them to be more effective. More effective can mean triggering less negative emotion, seeing things more clearly, or enabling more skilful behaviour. Cognitive restructuring builds on your ability to accurately recognize automatic thoughts and feelings. Typically, cognitive restructuring includes following several steps that therapists teach their clients such as recognising and recording the situation, thoughts, and feelings, then picking one automatic thought from the list you created, develop different points of view about the situation, then, crafting an alternative response (Angeles, 2020).

Exposure therapy: primarily used to treat anxiety, exposure therapy can also be used to treat substance abuse disorders, eating disorders and more. It is developed directly from the principles of extinction and involves a systematic and repetitive approach to either phobic stimuli or stimuli that produce craving. Central to exposure is systematic desensitisation which involves gradually exposing clients to a fear-inducing stimulus while they are in a relaxed state. Systematic desensitisation is conducted in imagination, and relaxation is included to compete with and inhibit the anxiety response. Therefore, it is important that the relaxation response is stronger than the anxiety response. Exposure to phobic stimuli is graded so that anxiety is maintained at low levels and images of the feared stimulus are organised in a hierarchy from least to most anxiety provoking. Treatment progresses to the

next item on the hierarchy when the client can imagine the present item with little to no anxiety (Craske, 2017).

Guided discovery/Socratic questioning: therapists use targeted, open-ended questions to help clients examine beliefs, define problems, and identify new perspectives themselves. This collaborative process involves asking informational questions, active listening, summarizing, and synthesizing new information to challenge maladaptive thoughts and foster independent insight

Problem-solving training: used in a variety of difficulties such as anxiety, depression, managing stress and partner conflicts. Clients are taught the skills needed to define the problem and how it formed, to generate as many alternative solutions as possible, make decisions by weighing the cost-benefit ratio, implement effective solutions and then evaluate its success.

Relaxation: relaxation methods are helpful in treating anxiety and phobias, as well as emotional regulation and chronic pain. There are several different methods, some of which require coaching by a therapist until the technique is mastered. These include muscle relaxation training, different forms of meditation and yoga, controlled breathing and imagery.

Self-monitoring: is a tool for evaluating the functional relations among thoughts, behaviours, and emotions, and their antecedents and consequences, as they occur (vs. retrospective report). Self-monitoring is particularly valuable for recording subjective experience, such as appraisals (e.g., “My friends must think i am a fool”) and levels of subjective distress. Moreover, self-monitoring is useful for behaviours or physiological events that are difficult to record otherwise because they occur infrequently (e.g., occasional panic attacks) or under conditions that are difficult to replicate in the presence of the therapist (Craske, 2017, p. 71).

Stress testing: behavioural experiments and exposure exercises designed to safely challenge clients' worst-case assumptions. Instead of avoiding triggers, clients deliberately step into stressful situations to gather real-world data, break the fear cycle, and build resilience.

Thought records/Journalling: used to capture, examine, and restructure negative or irrational automatic thoughts. By documenting specific situations, the resulting emotions, and the thoughts that trigger them, this practice helps individuals identify unhealthy thinking patterns and build more balanced, realistic perspectives.

Appendix B

Table 5

Common Cognitive Distortions

Cognitive Distortions	Definitions and Examples
Dichotomous thinking	Also called all-or-nothing thinking. Situations are viewed in only two categories instead of on a continuum, e.g., "If I don't ace the exams, I'm a failure."
Catastrophising	Also called fortune-telling. The future is predicted negatively without considering other possible, more likely outcomes, e.g., "I'll be so upset, I won't be able to function at all."
Disqualifying or discounting the positive	The person unreasonably tells oneself that positive experiences, deeds, or qualities do not count, e.g., "I aced the exam, but that doesn't mean I'm competent; it was a fluke."
Emotional reasoning	One thinks something must be true because he/she 'feels' (believes) it so strongly, ignoring or discounting evidence to the contrary, e.g., "I know I successfully complete most of my tasks, but I still feel like I'm incompetent."
Labelling	One puts a fixed, global label on oneself or others without considering that evidence might more reasonably lead to a less disastrous conclusion, e.g., "I'm a failure. He's not good enough."
Magnification or minimisation	When one evaluates oneself or another person, or a situation, one unreasonably magnifies the negative and/or minimises the positive, e.g., "Getting a C grade in exams proves how mediocre I am. Getting high marks doesn't mean I'm smart."

Selective abstraction	Also called mental filter. One pays undue attention to one's negative detail instead of seeing the whole picture, e.g., "Because I just passed in one of my exams (but excelled in all the rest) it means I'm not a good student."
Mind reading	One believes that he/she knows what others are thinking, failing to consider other more likely possibilities, e.g., "He assumes that his boss thinks that he is a novice for this assignment."
Overgeneralisation	One makes a negative conclusion that goes far beyond the current situation, e.g., "(Because I felt uncomfortable at the meeting) I don't have what it takes to be a group leader."
Personalisation	One believes that others are behaving negatively because of him/her without exploring alternative explanations for their behaviour, e.g., "My classmate didn't smile at me because I did something wrong."
Imperatives	Also called 'should' and 'must' statements. One has a precise, fixed idea of how one or others should behave, and they overestimate how bad it is that these expectations are not met with, e.g., "It is terrible I got that question wrong as I am a teacher."
Tunnel vision	One only views the negative aspects of a situation, e.g., "My assistant can't do anything right."
Rumination	The habit of obsessively and repetitively replaying negative, stressful thoughts or past mistakes without reaching a solution.

Appendix C

Table 6

The CBT Process

Phase	Sessions	Components	Techniques	Aims/Goals
Assessment	1-3	Risk assessment, clinical assessment and alliance building.	Non-interrogative interviews, measures such as the BDI-11 (1996).	Discussions about suicidal tendencies reduce the risk of them occurring. Current depressive episode investigated to uncover precipitators, contextual factors, moderators, course, severity and functional impairment so baseline of current behaviour can be established.

				The establishment of a reciprocal, therapeutic relationship between client and therapist is the primary driver of treatment success.
Acute	12-18	Approach motivation, behavioural engagement, reflective processing.	Behaviour logs, thought records or journalling, behaviour activation/ Activity planning, behavioural experiments, attentional flexibility, concrete experiences, cognitive restructuring or reframing, answerable questions, guided discovery and or Socratic questioning.	Learning to pay attention to emotions and body states as depression can interfere with them. Learning to differentiate between approach and avoidant impulses and engaged/disengaged behaviour. Learn to resist avoidant impulses and behaviour. Plan activities that encourage approach behaviour and initiate a positive cycle of behaviour and an upward spiral of mood. Engage in behaviours that test and re-evaluate beliefs that are negatively biased. Overcome inflexible self-focus and increase meta-cognitive awareness of mental and bodily events.

				Counteract the tendency to process information in an abstract, conceptual or generalised way that is common for depression by engaging in and remembering concrete, detailed sensory information which can be facilitated through Socratic questioning. Taking notice of internal questions, de-centring them and reflecting on their impact is an effective strategy to counteract ruminative questions that are unanswerable and lack utility.
Relapse prevention	2-6	Consolidate and generalise learning, relapse signatures, cognitive reactivation and stress testing.	Self-monitoring, self-instruction training, problem solving and relaxation.	Sessions are less frequent but not terminated at the end of the acute stage. Booster sessions invest in future well-being. Focus is on the treatment process, reviewing strategies that were most helpful. Depression makes it hard to remember details and reviewing and synthesising the learning process makes it more

available and generalisable to daily life. Preparing for and learning how to respond to triggers and challenges by considering types of events that could precipitate a downward spiral or mood/behaviour. Accepting that challenges will happen and having the skills to problem-solve.

Be able to spot early signs of relapse including symptoms, somatic states, emotions, thoughts or behaviours.

Staying well means monitoring oneself and planning for future setbacks.

Testing learning and skills by actively facing challenges or remembering difficult times. Find out what effects they have and learn how to reverse them.

Timing during this phase is important but the value is to find out the robustness of remission or recovery.

There are several different relaxation methods that are helpful in treating depression such as muscle relaxation training, different forms of meditation or yoga, controlled breathing and imagery.