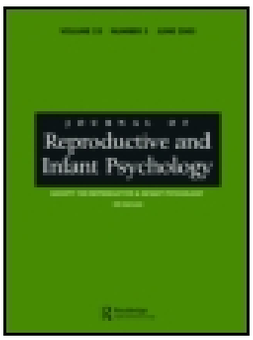

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Effects of maternal stress and/or anxiety interventions in the first 1000 days:Systematic review of reviews

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ABSTRACT

Objective: Effective interventions are needed to mitigate effects of stress and anxiety from conception and up to two years postpartum (the first 1000 days), but it is unclear what works, for what populations and at what time points. This review aimed to synthesise evidence from existing reviews of the effects of stress and anxiety interventions.

Methods: A systematic review of systematic reviews was conducted. PsycINFO, CINAHL, MEDLINE and the Cochrane databases were searched (inception to January 2020). Reviews were eligible if they examined effects of interventions during the first 1000 days on women's stress and/or anxiety. Extracted data were narratively synthesised. Review quality was assessed using existing recommendations including the AMSTAR tool .

Results: Thirty-four reviews were eligible for inclusion; 21 demonstrated high methodological quality. Cognitive behavioural therapy demonstrates some beneficial effects for anxiety across the first 1000 days for general and at-risk populations. Support-based interventions demonstrate effects for stress and anxiety for at-risk mothers in the postpartum. Music, yoga and relaxation demonstrate some effects for stress and anxiety, but studies are limited by high risk of bias.

Conclusion: Existing evidence is inconsistent. Cognitive behavioural therapy and support-based interventions demonstrate some benefits. Further methodologically and conceptually robust research is needed.

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Stress; anxiety; interventions; perinatal; 1000 days

Introduction

Conception to two years postpartum (the first 1000 days) is a transitional period during which an estimated 30% (Glover, 2011) and 15–20% (Dennis et al., 2017; National Mental Health Division HSE, 2017) of women experience stress and anxiety, respectively. Stress and anxiety are distinct yet highly related psychological constructs (Glover, 2011) associated with adverse obstetric, maternal and child outcomes, including higher risk of maternal depression (Norhayati et al., 2015), lower maternal–child attachment and responsivity (Respler-Herman et al., 2012), risk of preterm birth (Lobel et al., 2008), low birth weight (Witt et al., 2014), child health and developmental outcomes (Ingstrup et al.,

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Supplemental data for this article can be accessed here.

2012; King & Laplante, 2005). Stress and anxiety during the first 1000 days arise from social, psychological, and sociodemographic factors (Bayrampour et al., 2018; Dunkel Schetter, 2011; Raikes & Thompson, 2005). They also arise from stressful life events (Bayrampour et al., 2018), including changing roles and responsibilities (Huizink & De Rooij, 2018; Huizink et al., 2017), having a child who is unwell (Saisto et al., 2008) and/or requiring admission to the neonatal intensive care unit (NICU; Loewenstein et al., 2019). Stress and anxiety can develop at any time during the first 1000 days, and levels can fluctuate over time (Farewell et al., 2018; Rallis et al., 2014). Prenatal stress is also associated with postpartum distress (Huizink et al., 2017), indicating potential longitudinal effects.

Interventions developed to reduce and/or prevent stress and anxiety differ by type, content and foci, including, for example, cognitive behavioural therapy (CBT), psychoeducation, social support, relaxation and mindfulness. Interventions have targeted both general and vulnerable populations, including those experiencing or at risk for stress and/or anxiety, or who have experienced stressful life events. Interventions targeting more vulnerable populations are suggested to have greater effects (Fontein-Kuipers et al., 2014), although it remains unclear what interventions are best suited to what vulnerable populations. It is similarly unclear what interventions are most effective in general populations, and there is a lack of clarity about the impact of timing of intervention delivery on outcomes in both populations. Identifying effective interventions for women across the first 1000 days is critically important to improve maternal and child outcomes.

Bringing together findings from reviews of different interventions across the first 1000 days is essential to identify the most effective interventions, including for potentially vulnerable subgroups of women. Systematic reviews of reviews facilitate examination of the overall body of evidence that exists for a particular topic and enable the findings of individual reviews to be compared and contrasted (Aromataris et al., 2015). This is useful when reviews, potentially demonstrating heterogeneity, already exist (Aromataris et al., 2015). Systematic reviews of reviews consolidate findings across reviews to answer questions that are broader in scope than the original reviews (Higgins et al., 2020). By synthesising a broad body of evidence, systematic reviews of reviews can provide clearer information for healthcare decision-makers including researchers, healthcare providers, and patients (Higgins et al., 2020; Wolfenden et al., 2021). Given the diversity and heterogeneous findings for interventions for stress and anxiety in the first 1000 days noted in existing reviews, and the urgent need to better support women during this period, a systematic review of reviews provides a useful and efficient approach to examine effectiveness of stress and anxiety interventions in the first 1000 days. The aim of this systematic review of reviews is to examine the effectiveness of interventions for stress and anxiety during the period from conception to two years postpartum. This includes examination of effects in vulnerable populations, and by timing of intervention delivery and intervention characteristics.

Methods

Searches

This review is registered on PROSPERO (CRD42020165613) and conducted and reported in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) statement (Moher et al., 2009). PsycINFO, CINAHL, MEDLINE and the Cochrane databases were searched from inception to January 2020. Reference lists of identified reviews were also searched.

Search terms

Search terms were designed to maximise identification of different intervention types through the use of a single 'intervention' term, and specific terms related to types of interventions, such as 'cognitive behaviour* therapy'. See Supplementary File 1.

Eligibility criteria

Studies were eligible for inclusion if they were a published systematic review, or a systematic review including a meta-analysis, that: (1) examined effects of interventions delivered at any point from conception to two years postpartum; and (2) included women from conception, during pregnancy and/or the first two years postpartum; and (3) examined effects on maternal stress and/or anxiety. Only studies published in English were eligible; there were no restrictions on date of publication.

Screening and data extraction

Two reviewers (KMS, CF) independently screened titles and abstracts against eligibility criteria; Cohen's Kappa statistic indicated good inter-rater agreement ($\kappa = .74$, $p < .0005$); disagreements were discussed and resolved by consensus or recourse to a third reviewer (SR). Full-texts were screened against eligibility criteria by two reviewers (KMS, CF), with 100% reviewer agreement. Data were extracted using a standardised data extraction form by one reviewer (KMS) and checked by a second reviewer (CF). Data extracted included: review author, publication year, review focus, search strategy, participant characteristics, intervention characteristics, and results of the interventions on stress and anxiety outcomes; see Supplementary File 2. Findings of intervention effects were extracted at the level of included reviews rather than the original studies (Aromataris et al., 2015). Where reviews reported outcomes other than stress or anxiety, only stress and anxiety findings were extracted. The number of studies included in these reviews that reported on stress and anxiety and those that reported on additional/other outcomes were also noted.

Quality assessment

Methodological quality was assessed using the 11-item assessment of multiple systematic reviews (AMSTAR) tool (Shea et al., 2009) and recommendations from Smith et al. (2011). Two reviewers (KMS, CF) independently rated the quality of half the included reviews each, with all ratings cross-checked by the third reviewer (SR).

Data synthesis

Findings from individual reviews were narratively synthesised and are presented by timing of intervention delivery and/or review focus, as prenatal, postpartum, or perinatal; findings are also presented separately for general and vulnerable or 'at-risk' populations within these time periods. Vulnerable populations include women experiencing or at risk of mental health issues, and mothers of infants born preterm, with low birth weight and/or requiring admission to the NICU. Findings are also presented for intervention characteristics including intervention length, delivery (e.g. group or individual) and intervention components or types. All findings are synthesised at the level of the included reviews rather than the original studies (Aromataris et al., 2015); only those findings for stress and anxiety outcomes are included and presented in the narrative synthesis.

Results

The systematic search strategy identified 1188 unique reviews. Following title, abstract and full-text screening against eligibility criteria, 34 reviews were eligible for inclusion (Figure 1). Characteristics of reviews are presented in Table 1. Overall, the quality of included reviews was high; 21 reviews rated as high quality, six reviews were medium quality and seven reviews were low quality. Review components demonstrating lower quality included duplicate study selection and data extraction, and provision of full details of included and excluded studies (Supplementary File 3). Reviews were rated as high quality unless otherwise stated below. Details of population and intervention information for sub-group examinations are presented in Table 2.

Prenatal interventions

Thirteen reviews examined prenatal interventions; eight reviews examined intervention effects in general pregnant populations and five examined intervention effects in vulnerable populations.

General populations

In general pregnant populations, findings from three reviews of mindfulness interventions demonstrated inconsistent effects for stress and anxiety (Dhillon et al., 2017; Hall et al., 2016; Matvienko-Sikar et al., 2016). There were no effects of exercise on anxiety in one review (Davenport et al., 2018); inconsistent effects were reported for non-pharmacological interventions, including mind–body, psychological, educational and support-based interventions in another review (Evans et al., 2019). Two reviews of music interventions demonstrated reductions in anxiety relative to controls (Corbijn van Willenswaard et al., 2017; Lin et al., 2019); no effects were observed for stress in one of these reviews, which demonstrated medium methodological quality (Corbijn van Willenswaard et al., 2017). Relaxation interventions, operationalised as muscle relaxation, massage and yoga, were reported to reduce anxiety and stress in one low-quality review (Fink et al., 2012).

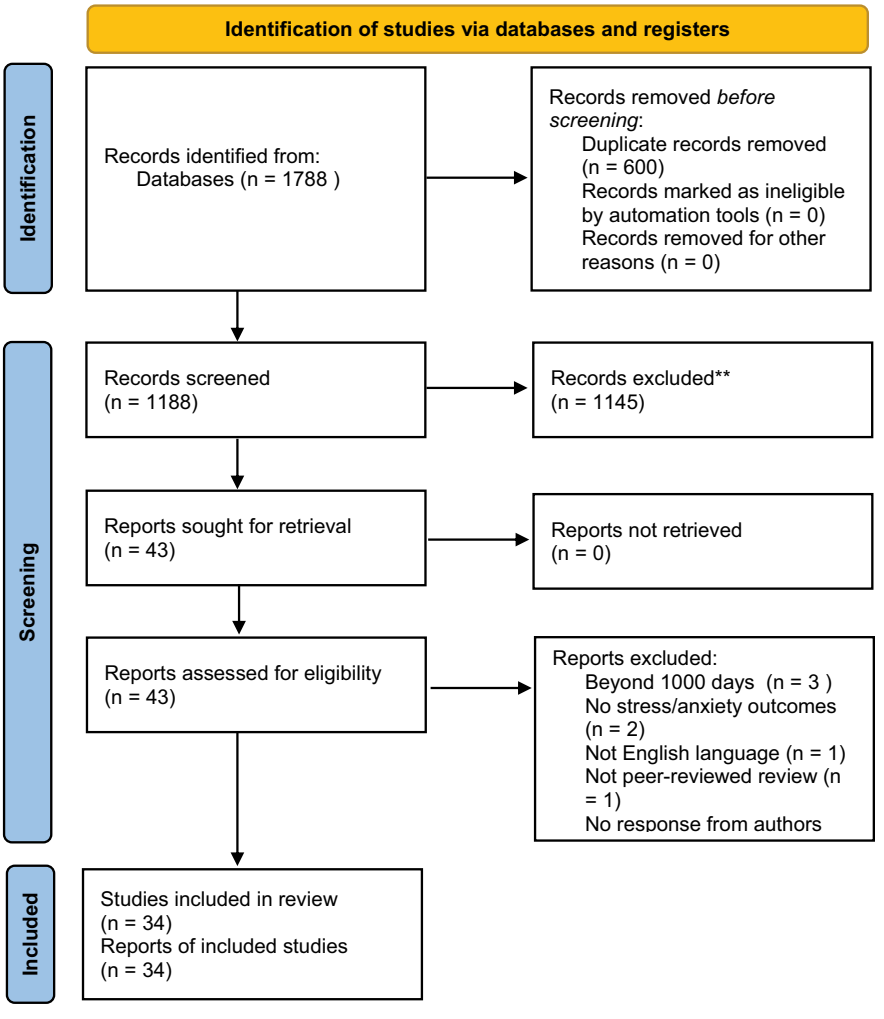

Figure 1. Review of reviews flow diagram

Vulnerable populations

Five reviews examined interventions delivered to at-risk pregnant women. One review examining interventions including educational components or treatment regimens for women with pregnancy-specific anxiety and/or fear of childbirth reported no effect for pregnancy-specific anxiety (Stoll et al., 2018). One review of interventions for treating antepartum mental disorders identified one CBT intervention only which focused on anxiety disorder and demonstrated within-group anxiety reductions (Van Ravesteyn et al., 2017). One low-quality review of theory and group-based psychological interventions for women with elevated symptoms and/or high risk of perinatal mental health issues reported no effects for mindfulness, CBT or interpersonal therapy (IPT) interventions (Wadephul et al., 2016). Use of mindfulness interventions for women meeting self-report or diagnostic criteria for depressive or anxiety disorder demonstrated inconsistent

Table 1. Characteristics of included reviews.

Authors (year)	Focus of review	Participants	Databases used/search range (years)/restrictions	No. papers included (no. papers examining stress and/or anxiety)	Intervention(s)	Timing of intervention delivery	Findings	Quality of studies included in review
Prenatal Interventions								
High Review Quality								
Davenport et al. (2018)	To examine the effects of exercise on depression and anxiety during pregnancy, as well as potentially persisting postpartum effects	Pregnant women without contraindication to exercise (n = 131,406)	MEDLINE, EMBASE, PsycINFO, Cochrane Database of Systematic Reviews, Cochrane Central Register of Controlled Trials, Scopus and Web of Science, CINAHL Plus with Full-text, Child Development & Adolescent Studies, ERIC, Sport Discus, ClinicalTrials. Searched: Inception to 2017 No restrictions reported	52 (22)	Exercise, conceptualised as any bodily movement resulting in energy expenditure above resting levels and including frequency, intensity, duration, volume or type of exercise	Pregnancy Delivered in either first, second or third trimesters	No effect of exercise on prenatal state anxiety symptoms in RCT designs (SMD: 0.06, 95% CI −0.04 to 0.15, I^2 = 0%), inconsistent effects in other study designs. No effect of exercise on prenatal odds of state anxiety (OR: 1.12, 95% CI 0.85 to 1.48, I^2 = 0%) No effect for prenatal trait anxiety symptoms in RCT designs (SMD: −0.21, 95% CI −0.63 to 0.20, I^2 = 0%); inconsistent effects in other study designs No effect for odds of prenatal trait anxiety No effect for postpartum state anxiety (SMD: 0.01, 95% CI −0.10 to 0.12, I^2 = 0%) Low to very low quality of evidence for outcomes	Very low to low-quality evidence

(*Continued*)

Table 1. (Continued).

Authors (year)	Focus of review	Participants	Databases used/search range (years)/restrictions	No. papers included (no. papers examining stress and/or anxiety)	Intervention(s)	Timing of intervention delivery	Findings	Quality of studies included in review
Dhillon et al. (2017)	To examine the effects of mindfulness-based interventions during pregnancy on mental health outcomes including stress, anxiety and depression	Pregnant females (n = 221)	Cochrane Library, MEDLINE, EMBASE, Science Citation Index, and Conference Proceedings Citation Index Searched: inception to 2017 No language restrictions	14 (12)	Mindfulness-based interventions, operationalised as practices incorporating mindfulness, such as mindfulness-based yoga, mindfulness-based cognitive therapy, mindfulness-based stress reduction, acceptance and commitment therapy	Pregnancy Delivered in first, second or third trimesters	No effects for anxiety in RCT designs (−0.31, 95% CI −1.11 to 0.49, p = 0.45) but a reduction observed in non-RCTs (−0.48, 95% CI −0.86 to −0.10, p = 0.01) No effects for stress in RCT designs (−1.23, 95% CI −2.58 to 0.12, p = 0.07) but reduction observed in non-RCTs (−3.28, 95% CI −5.66 to −0.89, p = 0.007) Overall quality of studies was weak	Overall weak quality
Evans et al. (2018)	To examine the effectiveness of non-pharmacological interventions for women with symptoms of mild to moderate anxiety during pregnancy	Pregnant women at any stage of pregnancy and of all parities; also including pregnant women from general populations and women with symptoms of mild to moderate anxiety (n ranged from 25 to 2212)	Medline, CINAHL, Maternity and Infant Care database from MIDIRS, PsycINFO, The Cochrane Database of Systematic Reviews, Cochrane Register of Controlled Trials, EMBASE, CRD, SSCI, ASSIA, HTA, Library, JBI, Evidence-Based Practice Database and AMED Searched: 1990–2016 English language publications only	25 (25)	All nonpharmacological interventions, including physical, cognitive, behavioural, and other complementary methods	Pregnancy Delivered at varying times from 8 to 40 weeks gestation	Identified interventions included mind–body, psychological, educational and supportive Inconclusive results overall No effect for self-reported state anxiety in three mindfulness interventions (median = 0.09; 95% CI = −0.32 to 0.49) Due to statistical heterogeneity of studies, and clinical heterogeneity related to intervention type, timing and duration, meta-analyses were not conducted overall	Unclear risk of bias overall

(*Continued*)

Table 1. (Continued).

Authors (year)	Focus of review	Participants	Databases used/search range (years)/restrictions	No. papers included (no. papers examining stress and/or anxiety)	Intervention(s)	Timing of intervention delivery	Findings	Quality of studies included in review
Hall et al. (2016)	To examine effectiveness of mindfulness interventions to support perinatal mental health (e.g. stress, anxiety, depression)	Pregnant women of any age and at any time during pregnancy (n = 235)	ovidMEDLINE, AMED, CINAHLplus, EMBASE, Psyc-INFO, Proquest Central, Google Scholar, OpenGrey, Grey Literature Report, Mindfulness Research Monthly Searched: 1980–2014	9 (6)	Mindfulness training, including practices that use mindfulness with other modalities	Pregnancy Delivered in first, second or third trimesters	Five of six studies reported no significant effect of mindfulness for stress. Effect reported for anxiety reduction in four preApost intervention studies. Two RCTs reported no effect of the intervention relative to the control Methodological issues and risk of bias in reviewed studies Study quality not reported	Significant methodological issues overall
Lin et al. (2019)	To evaluate relationship between music interventions and prenatal anxiety	All pregnant women, nulli- or multi-parous, at any gestational age, with either low-risk or high-risk pregnancies (n = 1482)	Cochrane, PubMed, Embase, PsycINFO, CINAHL Airiti Library, and PerioPath Inception to 2019 No language restrictions	11 (11)	Music interventions, including music therapy administered by a HCP and music medicine, involving listening protocols delivered by medical/ healthcare team	Prenatal Delivered in first, second and/or third trimesters	Effect of music interventions on anxiety levels, with intervention participants reporting significantly lower anxiety than control conditions (SMD = −0.42; 95% CI, −0.83 to −0.02; I^2 = 91%) Significant reductions found for using music interventions at home but not in medical setting High risk of bias for all studies	High risk of bias overall

(*Continued*)

Table 1. (Continued).

Authors (year)	Focus of review	Participants	Databases used/search range (years)/restrictions	No. papers included (no. papers examining stress and/or anxiety)	Intervention(s)	Timing of intervention delivery	Findings	Quality of studies included in review
Loughnan et al. (2018)	To examine effects of psychological interventions during the perinatal period for the treatment of clinical anxiety	Women over 18 years who are pregnant or are ≤12 months after childbirth. Women must met criteria for clinical anxiety and/or depression, based on a validated self-report measures or diagnostic interview (n = 127)	PsycINFO, Medline, Cochrane Central Register of Controlled Trials and PubMed, CINAHL, Maternity and Infant Care Searched: Inception to 2017 English language studies only	5 (5)	Psychotherapeutic interventions of any psychological treatment modality or delivery mode	Prenatal Conception to 12 months postpartum	One MBCT intervention demonstrated reductions in 'statistically and clinically significant' anxiety Three CBT-based interventions, including one with a combined pharmacologic component, demonstrated within-group reductions in anxiety relative to controls Inconsistent methodological quality	Not reported for all studies
Matvienko-Sikar et al. (2016)	To examine effects of mindfulness interventions on prenatal well-being	Pregnant women	Medline, Academic Search Complete, PsycArticles, PyscInfo, CINAHL, and Web of Science Searched: Inception to 2015 English language studies only	8 (7)	Mindfulness interventions of 6–10 weeks duration	Prenatal Delivered at varying times across pregnancy	Only one of six interventions reported a reduction in perceived stress resulting from the intervention Inconsistent effects for pregnancy-specific stress Six of seven studies reported effects for anxiety, although these were inconsistent across studies when examined at state and trait levels Poor methodological quality overall	Variable risk of bias

(*Continued*)

Table 1. (Continued).

Authors (year)	Focus of review	Participants	Databases used/search range (years)/restrictions	No. papers included (no. papers examining stress and/or anxiety)	Intervention(s)	Timing of intervention delivery	Findings	Quality of studies included in review
San Lazaro Campillo et al. (2017)	To assess the effect of stress-interventions for pregnant women with a history of miscarriage	Pregnant women with a history of previous miscarriage (n = 0)	PubMed, Cochrane Library, CENTRAL, EMBASE, Web of Science, CINAHL Maternity & Infant Care Database, Science Direct, EBSCOhost, ProQuest Nursing and Allied Health Source, CLINICAL TRIALS, JSTOR and Clinical trials website Searched: 1995–2016	0 (0)	All types of non-pharmacological interventions	Pregnancy	No studies were identified that report on stress-reduction interventions for women at risk of miscarriage	No studies identified for inclusion
Stoll et al. (2018)	To summarise: Effects of nonpharmacological prenatal interventions on pregnancy specific anxiety and/or fear of childbirth**	Pregnant women experiencing pregnancy-specific anxiety and/or fear of childbirth (n = 2656)	PubMed, Mendeley Searched: Inception to 2017 No restrictions reported	7 (2)	Interventions, educational components, or treatment regimens for pregnancy-specific anxiety or fear of childbirth	Pregnancy	No statistically significant effect for pregnancy-specific anxiety in RCTs of a CBT intervention or a centring pregnancy intervention Low methodological quality overall	Only studies with moderate to high quality, as assessed by the Effective Public Health Practice Project Quality Assessment Tool, were included
Van Ravesteyn et al. (2018)	To provide an overview of controlled trials examining pharmacological or non-pharmacological interventions for antepartum mental disorder	Pregnant women with a diagnosed mental disorder (n = 2779)	MedLine, PsychInfo, EMBASE, clinicaltrial.gov, The ICTRP Search Portal Searched: Inception to 2016 No language restrictions	29 (1)	All pharmacological and non-pharmacological treatments for antepartum mental disorder, including antenatal disorder Delivered at varying times during pregnancy	Pregnancy Delivered at varying times during pregnancy	Only one intervention identified for anxiety disorder, a CBT intervention which demonstrated reductions in anxiety following each session and postpartum Moderate to high risk of bias overall	Variable risk of bias
Medium Review Quality								

(*Continued*)

Table 1. (Continued).

Authors (year)	Focus of review	Participants	Databases used/search range (years)/restrictions	No. papers included (no. papers examining stress and/or anxiety)	Intervention(s)	Timing of intervention delivery	Findings	Quality of studies included in review
Corbijn van Willenswaard (2017)	To examine effects of music-based interventions in addition to standard care on stress or anxiety, as compared to standard care only/ other comparison groups.	Pregnant women $n = 1261$	CINAHL, CENTRAL, EMBASE, MEDLINE, PsycInfo and Web of Science Searched: 1978–2016 No restrictions reported	5 (5)	Music-based intervention that could be passive (involving listening to music) or active (involving group workshops, lessons or therapy)	Pregnancy Delivered in either first, second or third trimesters	No difference for stress (SMD −0.06; 95% CI −0.20 to 0.09; $p = 0.44$) or pregnancy-specific stress (SMD-0.02; 95% CI −0.19 to 0.15; $p = 0.80$) relative to controls Intervention demonstrated reductions in anxiety relative to controls (SMD −0.21; 95% CI −0.39 to −0.03; $p = 0.02$) Studies had high risk of bias overall.	Overall methodological quality was moderate to weak
Low Review Quality Fink et al. (2012)	To review the effects of relaxation during pregnancy on maternal well-being, pregnancy outcomes, and fetal and neonatal outcomes	Pregnant women ($n = 1929$)	PubMed Searched: 1980–2011 No restrictions reported	21 (11)	Relaxation interventions including progressive muscle relaxation, yoga, an imagination technique, or massage therapy	Pregnancy Delivered at varying times during pregnancy	Interventions identified categorised as relaxation, massage and yoga Anxiety and self-reported stress levels decreased in all interventions Inconsistent effects for cortisol	Not reported

(*Continued*)

Table 1. (Continued).

Authors (year)	Focus of review	Participants	Databases used/search range (years)/restrictions	No. papers included (no. papers examining stress and/or anxiety)	Intervention(s)	Timing of intervention delivery	Findings	Quality of studies included in review
Wadephul et al. (2016)	To systematically examine effects of psychologically focused antenatal group interventions for women at risk of or with elevated symptoms of depression, anxiety and/or stress	Pregnant women with elevated baseline symptoms and/or at high risk of perinatal mental illness (n = 3693)	CINAHL, PsychINFO, MEDLINE Search time frame not reported No restrictions reported	15 (+4 qualitative) (unclear how many are stress-/anxiety-focused)	Any theory-based psychological intervention that took place in a group setting during pregnancy	Pregnancy Delivered at varying times during pregnancy	CBT, IPT and Mindfulness interventions identified No effect for anxiety in three CBT interventions; reduced anxiety noted in two mindfulness interventions at post-test but these studies were of poor quality Inconsistent effects across CBT, IPT and mindfulness interventions for self-reported stress Two CBT interventions reported reductions in cortisol levels Low quality overall	Variable risk of bias
Postpartum Interventions								
High Review Quality								
Dol et al. (2017)	To examine the effect of eHealth interventions used in NICUs on parent-related and infant outcomes	Parents or primary caregivers of infants requiring care in a NICU. Primary caregivers did not include paid health professionals (n = 777 infants)	PubMed, PsycINFO, CINAHL and EMBASE. No date of searching given No restrictions on publication date	8 (3)	Any eHealth intervention in the NICU, including communication, education or a combination of both	Postpartum Delivered in the NICU	No effects found for stress or anxiety, with outcomes measured inconsistently Quality of evidence rated as low to very low based on GRADE criteria	Low to very low

(*Continued*)

Table 1. (Continued).

Authors (year)	Focus of review	Participants	Databases used/search range (years)/restrictions	No. papers included (no. papers examining stress and/or anxiety)	Intervention(s)	Timing of intervention delivery	Findings	Quality of studies included in review
Lau et al. (2017)	To examine efficacy of therapist-supported iCBT in improving postpartum stress, anxiety, and depressive symptoms	Women over 18 years who have given birth within the last 2 years (n = 1523)	EMBASE, PubMed, CINAHL, Academic Search Completed, PsycINFO, PsycARTICLES, Cochrane Library, Web of Science, Scopus, and ProQuest Dissertations and Theses, ClinicalTrials.gov, WHO International Clinical Trials Registry Platform, and International Standard Randomised Controlled Trial Searched: Inception to 2017	8 (6)	Therapist-supported iCBT This is therapist-guided a therapy involving provision of feedback and answering questions, and which can include interactive internet features to get access to psychological treatment Timings of delivery not reported	Postpartum Birth to 2 years postpartum	Effect of interventions on stress symptoms (.84, 95% CI 0.65–1.03), with a significant overall effect (Z = 8.52, P < .001); differences observed based on participant health condition Small to medium effect (d = .36) of interventions on anxiety (Z = 4.07, P < .001) Studies demonstrated inconsistent methodological quality	Majority had low risk of bias
Mendelson et al. (2017)	To review effects of NICU interventions on maternal anxiety and depressive symptoms	Parents with an infant in the NICU (n = 1044)	No language restrictions PubMed, EMBASE, PsychInfo, Cochrane, and CINAHL Searched: inception to 2015	12 (9)	Psychotherapeutic, behavioural, educational, or complementary and alternative interventions for parents with an infant in the NICU and that are delivered primarily in the NICU	Postpartum	Interventions included 6 educational interventions, one support-based intervention, one trauma focused CBT intervention, and one CBT and attachment intervention No effect of interventions for anxiety (−0.12 (95% CI, −0.29 to 0.05, p = 0.17). High risk of bias overall	Variable risk of bias

(*Continued*)

Table 1. (Continued).

Authors (year)	Focus of review	Participants	Databases used/search range (years)/restrictions	No. papers included (no. papers examining stress and/or anxiety)	Intervention(s)	Timing of intervention delivery	Findings	Quality of studies included in review
Mirghafourvand et al. (2017)	To examine the impact of the creating opportunities for the parent empowerment (COPE) programme on the mental health of parents with infants in the NICU	Parents of premature infants with gestational age between 26 and 37 weeks, with a birth weight of less than 2500 g and who are hospitalised at the NICU (n = 532)	Cochrane database, PubMed, Scopus, Google Scholar, Proquest, Science Direct, SID, Magiran, Iranmedex 2000–2015 Only articles in Persian and English included	4 [4]	Creating opportunities for parent empowerment (COPE) programme. Behavioural training intervention focused on improving parenting role, including caring for the infant, and parent knowledge and ideas about their premature infants	Postpartum Delivered in NICU and one week after discharge	Mothers in the COPE interventions reported less stress (−1.72 (95% CI: −1.97, −1.47) and state anxiety (−1.01 (95% CI: −1.48, −0.53) than control participants High risk of bias overall	Unclear risk of bias
Seiiedi-Biarag et al. (2019)	To determine the effects of CBT on anxiety, depression, PTSD and stress	Mothers of infants born preterm, with a gestational age <37 weeks (n = 455)	Medline, Scopus, EMBASE, Web of Science, Psycinfo, Cochrane Library, Google Scholar, SID, Iran Medex and Magiran Inception to 2018 Included articles in English and Persian only	4 (3)	Cognitive behavioural therapy, including DBT, metacognitive therapy, cognitive processing, rational-emotive behavioural therapy, MBCT, schema-focused therapy and problem-solving	Postpartum Delivered during NICU stay	Effect for CBT on anxiety in two studies, with intervention participants reporting lower anxiety than controls (SMD = −0.38; 95% CI: −0.61 to = 0.15; p = .001) No effect for stress (MD = −1.27; 95% CI: −2.68 to −0.14) Low to moderate risk of bias	Generally low risk of bias

(*Continued*)

Table 1. (Continued).

Authors (year)	Focus of review	Participants	Databases used/search range (years)/restrictions	No. papers included (no. papers examining stress and/or anxiety)	Intervention(s)	Timing of intervention delivery	Findings	Quality of studies included in review
Song et al. (2015)	To examine effects of psychosocial interventions that aim to reduce the intensity of maternal postpartum stress	Primiparous or multiparous women, aged 19 years of over, experiencing stress during the postpartum period (total *n* not reported but M = 121.07, SD = 68.41)	MEDLINE, EMBASE, CINAHL, ProQuest Searched: 1994 to 2012 English language studies only	14 (14)	Any psychosocial intervention to reduce postpartum stress	Postpartum	Effect of all types of interventions on stress (standard mean difference −1.66, 95% confidence interval [CI] [−2.74, −0.57], $p = .003$, $I^2 = 93\%$) In subgroup analyses supportive stress-management programmes were effective (standard mean difference −0.59, 95% CI [−0.94, −0.23], $p = .001$, $I^2 = 64\%$), but educational programmes and interaction promoting programmes were not effective Quality not reported	Only studies of high methodological quality, as evaluated using Joanna Briggs Institute's Critical Appraisal Checklist for Experimental Studies, were included
Medium Review Quality								

(*Continued*)

Table 1. (Continued).

Authors (year)	Focus of review	Participants	Databases used/search range (years)/restrictions	No. papers included (no. papers examining stress and/or anxiety)	Intervention(s)	Timing of intervention delivery	Findings	Quality of studies included in review
Bastos et al. (2015)	To assess the effects of debriefing compared with standard postnatal care for the prevention of psychological trauma in women following childbirth	Women who had given birth within one month of the intervention being offered, could be of any age and had any type of birth (n = 718)	Cochrane Depression, Anxiety and Neurosis Group (CCDAN) clinical trials registers, CENTRAL, MEDLINE, EMBASE, PsychINFO, Maternity and Infant Care, CINAHL Searched: 1806–2013 No restrictions applied	8 (2)	Postnatal debriefing (semistructured post-birth discussions to provide women opportunities to speak about their birth experiences with midwives)	Up to 1 month postpartum	Inconsistent effects but overall estimate in favour of debriefing over standard care One small trial demonstrated reduction in anxiety (RR 0.14, 95% CI, 0.05, 0.37) in obstetrically low-risk group up to 3 months postpartum One study reported no significant difference in anxiety (RR 0.18; 95% CI 0.02 to 1.42) at 3 months postpartum, with point estimate in favour of debriefing Variable methodological quality with most studies scoring as low quality	Most studies were of low quality

(*Continued*)

Table 1. (Continued).

Authors (year)	Focus of review	Participants	Databases used/search range (years)/restrictions	No. papers included (no. papers examining stress and/or anxiety)	Intervention(s)	Timing of intervention delivery	Findings	Quality of studies included in review
Bennett et al. (2007)	To examine the impact of home-based support, for socially or economically disadvantaged women who recently gave birth, on maternal and infant health and on infant development	Disadvantaged families with mothers over 19 years of age and at least one child less than 12 months of age at the start of the study (n = 4751)	Cochrane CENTRAL, MEDLINE, CINAHL, PsycINFO, ASSIA, Sociological Abstracts, LILACS Searched: 1960s–2006 No language restrictions	11 (5)	Home-based support delivered by professional or specially trained lay professionals in the form of one or more home visits	Up to 12 months postpartum	No evidence of effect of home visiting for anxiety or stress related to parenting Only one study examined anxiety as an outcome, with no effect The only study examining stress did not use a validated measure and so results are not presented Three studies examining parenting stress found no significant differences overall One of these studies reported an effect for one subscale of the PSI ('child reinforces parent') at 6 weeks but not at 12 months Variable risk of bias	Generally low quality
Bieleninik et al. (2016)	To review effects of RCTs of music therapy interventions, versus standard care (including combined with other therapies) for preterm infants and their caregivers during NICU stay and following discharge	Premature infants (≤37 weeks) and their parent/caregivers (n = 179)	PubMed/ Medline, PsycINFO, EMBASE, Cochrane Database of Systematic Reviews, CINAHL, ERIC, Web of Science, and RILM Searched: Inception to 2016 No restrictions	14 (3)	All forms of music therapy carried out by, or in consultation with, a trained music therapist, conducted in hospital, community, or home settings	Postpartum Infants postmenstrual age (sum of GA and chronological time since birth) at start of study was 27 to 47 weeks	Positive short-term effect of music therapy on short-term maternal anxiety outcome identified in meta-analysis (SMD: −1.82 (−2.42 to − 1.22) p < .001). High heterogeneity between studies Variable risk of bias	Designs generally judged to be accurate but lack of clarity on sequence generation, allocation concealment and blinding
Low Review Quality								

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Table 1. (Continued).

Authors (year)	Focus of review	Participants	Databases used/search range (years)/restrictions	No. papers included (no. papers examining stress and/or anxiety)	Intervention(s)	Timing of intervention delivery	Findings	Quality of studies included in review
Brett et al. (2011)	To identify effective interventions for communicating with, supporting and providing information for parents of preterm infants	Parents who have had a preterm infant (i.e. ≤36 weeks' gestation) (*n* = not reported)	Medline, EMBASE, PsychINFO, the Cochrane library, CINAHL, Midwives Information and Resource Service, Health Management Information Consortium, and Health Management and Information Service Searched: 1980–2009 English language studies only	72 (unclear how many are stres-s/anxiety-focused)	Interventions for communicating with, supporting and providing information for parents of preterm infants	Postpartum Parents who have had a preterm infant (i.e. ≤36 weeks' gestation) Delivered in NICU and after discharge	A range of interventions identified including individualised developmental and behavioural care; behavioural assessment scales; breastfeeding, kangaroo-care and infant massage programmes; support forums; stress alleviation; preparing parents to meet infants; communication and information sharing; discharge planning; home support Six studies of individualised developmental and behavioural care programmes, incorporating positive and responsive interactions, demonstrated significant reductions in stress; one study reported no effect Two studies reported reductions in stress 4 and 16 weeks following parent-led peer support groups in the NICU Two studies reported reductions in stress following psychotherapy There were no effects for assessment scale programmes Variable quality of evidence overall	Variable quality

(*Continued*)

Table 1. (Continued).

Authors (year)	Focus of review	Participants	Databases used/search range (years)/restrictions	No. papers included (no. papers examining stress and/or anxiety)	Intervention(s)	Timing of intervention delivery	Findings	Quality of studies included in review
Perinatal Interventions								
High Review Quality								
Lavender (2016)	To examine current evidence evaluating interventions used by women experiencing stress, anxiety or depression in the perinatal period to improve their mental health	Women in the perinatal period from conception to 12 months postpartum experiencing stress, anxiety or depression (n = 196)	CINAHL, Medline, Mosby's Index, PsycINFO, EMBASE and Maternity & Infant Care Database Searched: 2005–2015 Restricted to English language or papers translated to English	4 (3)	Perinatal mental health interventions	Perinatal Conception to 12 months postpartum	Reduction in anxiety observed for the behavioural activation intervention, the mindfulness intervention, and one MBCT intervention Studies considered methodologically sound by review authors	Only high-quality studies included (as indicated by a score of ≥7 on the Critical Appraisal Skills Programme tool)
Loughnan et al. (2019)	To examine effects of internet-delivered interventions developed to treat clinical levels of perinatal depression, anxiety or comorbid depression and anxiety	Women over 18 years who are pregnant or are ≤12 months after childbirth. Women must met criteria for clinical anxiety and/or depression, based on a validated self-report measures or diagnostic interview (n = 595)	PsycINFO, Medline, Cochrane Central Register of Controlled Trials, EMBASE, PubMed, CINAHL, and Maternity and Infant Care Searched: Inception to 2018 English language studies only	7 (5)	Internet-delivered psychotherapeutic interventions. These could be delivered as any therapy modality and must explicitly focus on reducing perinatal anxiety and/or depressive symptoms	Perinatal Delivered across trimesters of pregnancy and in postpartum although postpartum timings not reported in original studies	Large within-groups mean effect size for anxiety (g = 1.08, 95% CI 0.80–1.36, p < .01) Moderate between-groups effect size for anxiety (g = 0.54, 95% CI 0.24–0.85, p < .01) Identified CBT and behavioural activation-based interventions delivered during pregnancy and postpartum. No interventions tailored for anxiety outcomes Overall high risk of bias	Variable risk of bias

(*Continued*)

Table 1. (Continued).

Authors (year)	Focus of review	Participants	Databases used/search range (years)/restrictions	No. papers included (no. papers examining stress and/or anxiety)	Intervention(s)	Timing of intervention delivery	Findings	Quality of studies included in review
Maguire et al. (2017)	To synthesise evidence of effects of CBT for perinatal anxiety from clinical trials	Women during the perinatal period from conception to ≤12 months after childbirth (n = 726)	PsychINFO, Scopus, and PubMed Searched: Inception to 2018 English language studies only	13 (13)	Cognitive behavioural therapy Delivered across trimesters of pregnancy and in postpartum; postpartum timings not reported	Perinatal Delivered across trimesters of pregnancy and in postpartum; postpartum timings not reported	Large effect of CBT (k = 14; d = 0.90; 95% CI: 0.63–1.17) from pre to post intervention and from pre intervention to follow-up (k = 7; d = 0.93; 95% CI: 0.53–1.33) Large effects were also reported when RCTs only were included in the meta-analysis Larger effect sizes were observed for anxiety-specific interventions and interventions including a form of exposure Quality was low overall	Overall highly variable study quality
Marc et al. (2011)	To examine effects of mind–body interventions on anxiety during perinatal period	Women of any age at any point during pregnancy or up to one month after birth (n = 556)	Cochrane Pregnancy and Childbirth Group's Trials Register Searched: Inception to 2018 No restrictions	8 (8)	Mind–body interventions, that aim to alter negative thinking related to anxiety, modify perceptions of stressful event, lead to adapted behaviour and coping	Perinatal Pregnancy and up to 1 month postpartum	Range of interventions delivered during pregnancy of first 4 weeks postpartum Effects of 5 imagery interventions were inconsistent One hypnotherapy intervention demonstrated no effect on anxiety, cortisol levels or maternal heart rate One yoga intervention demonstrated a reduction in anxiety One autogenic training intervention demonstrated no effect Poor study quality overall	Variable risk of bias

(*Continued*)

Table 1. (Continued).

Authors (year)	Focus of review	Participants	Databases used/search range (years)/restrictions	No. papers included (no. papers examining stress and/or anxiety)	Intervention(s)	Timing of intervention delivery	Findings	Quality of studies included in review
Pinquart and Teubert (2010)	To estimate the mean effects of interventions reported in randomised studies to ease the transition to parenthood	Parents during pregnancy and/or up to 6 months postpartum	PsychInfo, Medline, Psyndex, ISI Web of Knowledge Searched: Inception to 2009 No restrictions reported	142 (unclear)	Interventions containing a parenting education component aimed at improving parenting Delivered at varying times during pregnancy and up to 6 months postpartum	Perinatal Pregnancy and up to 6 months postpartum	Range of diverse interventions identified, the majority of which commenced after birth Small to very small effects for levels of parenting stress at post-test (k = 26, d = .20, CI 95% 0.11 to 0.29, Z = 4.31, Q = 45.04) No significant long-term intervention effects for parenting stress (k = 6, d = .31, CI 95% −0.27 to 0.89, Z = 1.06, Q = 64.25) Quality not reported	Studies with low methodological quality (based on drop-out rates and equivalence of intervention and control conditions) were excluded
Medium Review Quality								
Nillni et al. (2018)	To review literature on treatment of anxiety, depression and trauma-related disorders during pregnancy	Women aged 18 or over during pregnancy or up to 1 year postpartum who meet self-report or diagnostic criteria for PTSD, MDD, PD, SAD, GAD, specific phobia, or OCD (total n not reported)	PsycINFO, PubMed Searched: Inception to 2017	78 (5)	Interventions to treat depression, anxiety, and trauma-related disorders during the perinatal period All types of interventions were included	Perinatal Pregnancy and up to 12 months post partum	Cognitive behavioural interventions only were identified in relation to anxiety and trauma- and stress-related disorders CBT interventions demonstrated beneficial effects for anxiety overall although intervention types differed impacting on interpretation Moderate to high risk of bias overall	Variable risk of bias

(*Continued*)

Table 1. (Continued).

Authors (year)	Focus of review	Participants	Databases used/search range (years)/restrictions	No. papers included (no. papers examining stress and/or anxiety)	Intervention(s)	Timing of intervention delivery	Findings	Quality of studies included in review
Taylor et al. (2016)	To review the effects of mindfulness-based interventions in the perinatal period on stress, anxiety, depression and mindfulness skills	Women during the perinatal period, from pregnancy to one year postpartum (n = 595)	PsychInfo, ProQuest, Web of Science, Scopus, Cochrane Library Searched: Inception to 2016 No reported restrictions	17 14	Mindfulness-based interventions operationalised as MBCT or MBSR or an intervention described as based on principles and practices of mindfulness	Perinatal Pregnancy up to one year postpartum	Only one intervention conducted postnatally Pre–post effects reported for anxiety (g = 0.49 (95% CI [0.27, 0.71], p < .01)) and stress, and g = 0.51 (95% CI [0.38, 0.65], p < .01); effects remained significant at follow-up and larger effect sizes for women at risk of mental health issues No effects of interventions relative to controls for anxiety (z(6) = 0.14, g = −0.02, 95% CI [−0.35 to 0.31], p = .89) or stress symptoms (z(7) = 0.93, g = −0.16, 95% CI [−0.49 to 0.17], p = .35) Low to moderate study quality overall	Low to moderate quality
Low Review Quality								

(*Continued*)

Table 1. (Continued).

Authors (year)	Focus of review	Participants	Databases used/search range (years)/restrictions	No. papers included (no. papers examining stress and/or anxiety)	Intervention(s)	Timing of intervention delivery	Findings	Quality of studies included in review
Ashford et al. (2016)	To provide an overview of computer and web-based interventions targeted at mental health issues during pregnancy, postpartum (up to 1 year) or following pregnancy loss*	Women in the perinatal period; from pregnancy to one year postpartum (n = 1591)	Academic Search Complete, CINAHL, Cochrane Library, EMBASE, Gender Studies Database, Medline, PsychINFO, PsychARTICLES, PubMed, Web of Science, Scopus, ProQuest Searched: Inception to 2014 No language restrictions	11 (8)	Computer and web-based interventions designed to prevent or improve mental health issues	Pregnancy and up to 12 months postpartum	Overall no evidence of effectiveness of interventions for stress or anxiety There were inconsistent effects across studies conducted during pregnancy and postpartum in randomised and non-randomised trial designs Interventions included CBT, relaxation, and behavioural activation Average to high methodological quality overall	Majority received average to high methodological quality scores
Athanasopoulou and Fox (2014)	To examine whether Kangaroo Mother Care intervention can attenuate the adverse psychological effects of a premature birth	Caregivers, mother and fathers (biological or otherwise) of preterm (≤37 weeks) and low birth weight infants (n = 718 dyads; 146 triads)	Academic Search Complete, Alternative Medicine, BMJ Journals Collection, Cochrane Library, PsycArticles, PsycINFO, PubMed, ScienceDirect, Web of Science Date range and restrictions for search not stated	13 (5)	Kangaroo Mother Care (mother–infant skin-to-skin contact on mother's chest in a frontal position with the infant's head turned sideways)	Birth to 3 months postpartum	Inconsistent results Three studies reported reductions in stress, one of which also reported reductions in anxiety. Two studies reported no effect for stress Results did not appear to be influenced by intervention duration (i.e. duration of skin-to-skin contact) High risk of bias	Not reported
Sheffield and Woods-Giscombé (2016)	To systematically examine the effects of perinatal yoga on women's health and well-being during the perinatal period	Women of all ages during the perinatal period (n = 667)	CINAHL, PubMed, PsycINFO, EMBASE Searched: Inception to 2013 English language studies only	13 (5)	Yoga interventions	Perinatal	Five studies reported significant reductions in anxiety post intervention Three of four studies examining stress reported statistically significant reductions High risk of bias	Variable quality

(*Continued*)

Table 1. (Continued).

Authors (year)	Focus of review	Participants	Databases used/search range (years)/restrictions	No. papers included (no. papers examining stress and/or anxiety)	Intervention(s)	Timing of intervention delivery	Findings	Quality of studies included in review
Shi and MacBeth (2017)	To examine effects of mindfulness-based interventions on common mental health difficulties, particularly stress, anxiety and depression	Pregnant women, either primigravida or multigravida, meeting self-report or diagnostic criteria for a depressive or anxiety disorder (n = 640)	PubMed, PsychInfo, Cochrane Library, Ended Searched: 1980–2016 No restrictions reported	17 (12)	Mindfulness-based interventions, including MBCT, MBSR and mindfulness-informed yoga	Perinatal Pregnancy to 1 year postpartum	Nine of 12 studies reported reductions in anxiety, with varying effect sizes Effects of interventions on stress were inconsistent High risk of bias overall	Moderate to high risk of bias

ASSIA, Applied Social Sciences Index and Abstracts; CBT, Cognitive behavioural therapy; CDSR, Cochrane Database of Systematic Reviews; CI, confidence interval; CINAHL, Cumulative Index to Nursing and Allied Health Literature; CRD, Centre for Reviews and Dissemination; DBT, Dialectical Behaviour Therapy; GA, gestational age; GAD, Generalised Anxiety Disorder; HCP, Healthcare Professional; HTA, Health Technology Assessment; iCBT, Internet-based Cognitive Behavioural Therapy; IPT, Interpersonal Therapy; JBI, Joanna Briggs Institute; MBCT, Mindfulness-based Cognitive Therapy; MBSR, Mindfulness-based Stress Reduction; MDD, Major Depressive Disorder; Medline, Medical Literature Analysis and Retrieval System Online; MIDIRS, Midwives Information and Resource Service; NICU, Neonatal Intensive Care Unit; OCD, Obsessive Compulsive Disorder; PD, Personality Disorder; PTSD, Posttraumatic stress disorder; RCT, randomised controlled trial; SAD, Seasonal Affective Disorder; SSCI, Social Sciences Citation Index; SMD, standardised mean difference; WHO, World Health Organisation

*Posttraumatic stress measured in relation to pregnancy loss not included in current review as the focus of the review is on stress and anxiety during pregnancy and postpartum.

**Findings for fear of childbirth are not included here because while fear of childbirth is related to pregnancy-specific anxiety, as it is a distinct construct.

Table 2. Population and intervention information for subgroup examination.

Authors (year)	Population (clinical or not clinical)	Intervention duration	Intervention delivery	Role of intervention components or types	Additional factors
Ashford et al. (2016)	Subclinical Majority self-selected participants, rather than clinical referral	Weekly contact ranging from 4 to 17 weeks	Individual Computer-/web-based	Multiple components, with no reporting of differential effects	All developed and tested in Western and high-income countries
Athanasopoulou and Fox (2014)	Subclinical Severity of stress not reported/discussed here	3 days to 3 months, mostly daily kangaroo care with varying length of contact	Individual	Majority skin-to-skin care only, although some inclusion of nurse support or music No reporting of differential effects of components	A large variation in birth weight, gestational age, amount of kangaroo care parental education and income, and assessment tools
Bastos et al. (2015)	Varying levels of stress/anxiety from universal populations to existing trauma or distress	One to four debriefing sessions, with first sessions delivered between 48 hours of birth to one month post birth	Individual	No reporting of differential effects of components	All studies conducted in high-income countries
Bennett et al. (2007)	Not clearly stated but appears to be varying severity	Ranged from 9 to 13 visits per year, from 3 months to 5 years	Individual	No reporting of differential effects of components	All studies conducted in English-speaking high-income countries
Bieleninik et al. (2016)	Not stated but appears to be subclinical	Ranged from 2 to 6 sessions, over 2–14 days, with varying duration of exposure	Individual	All effective studies used live music with kangaroo care	n/a
Brett et al. (2011)	Not stated but appears to be subclinical	Not stated	Unclear, although majority of stress focused appear individual	Coping and problem-solving strategies were beneficial; relaxation, support, and psychotherapy were also beneficial	Majority of studies conducted in the USA
Corbijn van Willenswaard (2017)	Not stated but appears to be subclinical	Ranged from single 30-minute session to daily sessions of 30 minutes for 2 week s	Individual	No reporting of differential effects of components	Majority of studies conducted in Asia Two studies included high medical risk

(*Continued*)

Table 2. (Continued).

Authors (year)	Population (clinical or not clinical)	Intervention duration	Intervention delivery	Role of intervention components or types	Additional factors
Davenport et al. (2018)	Clinical Exceeding a specific anxiety threshold via questionnaire or diagnosis by a qualified professional	Ranged from 1 to 7 days per week, the duration of exercise ranged from 20 to 75 min per session	Not stated	Yoga demonstrated an improvement in anxiety	Some trials included women using antidepressants
Dhillon et al. (2017)	Not stated but appears to be subclinical	Ranged from 6 to 9 weeks	Group and individual	No reporting of differential effects of components	Majority of studies conducted in high-income co
Dol et al. (2017)	Not stated but appears to be subclinical	Not stated but all interventions conducted during NICU stay	eHealth Individual/ parent dyad	No reporting of differential effects of components	Issues related to intervention implementation may have influenced outcomes
Evans et al. (2018)	Subclinical Mild to moderate anxiety	Ranged from 1 to 14 sessions	Group and individual	No reporting of differential effects of components	Some studies included women based on obstetric complications, social risk factors, previous pregnancy loss; were African American; or were attending for amniocentisis
Fink et al. (2012)	Subclinical Low to no distress	Single sessions to 8 week long interventions	Group and individual	No differences in intervention components or focus; all relaxation approaches reduced anxiety	Studies predominantly included health women not experiencing distress
Hall et al. (2016)	Not stated but appears to be subclinical	Ranged from 6 to 10 weeks	Group and individual	Interventions including MBSR components and/or adapted from MBSR demonstrated effects for anxiety	All studies conducted in high-income countries
Lau et al. (2017)	Subclinical Participants with depressive symptoms and post-traumatic stress but not based on clinical referral	Not stated	Individual Internet-based	Differences not found for different intervention types	All studies conducted in high-income countries
Lavender (2016)	Not stated but appears to be subclinical	6–8 sessions	Group and individual	No reporting of differential effects of components	All studies conducted in high-income countries
Lin et al. (2019)	Not stated but appears to be subclinical	Ranged from a single session to daily for 12 weeks	Individual	Listening to music chosen by participant at home demonstrated effect, while listening to music selected from study list in medical setting did not	n/a

(*Continued*)

Table 2. (Continued).

Authors (year)	Population (clinical or not clinical)	Intervention duration	Intervention delivery	Role of intervention components or types	Additional factors
Loughnan et al. (2019)	Clinical Clinical levels of anxiety based on clinical cut-off scores on a validated self-report measure, or a formal diagnostic interview	Ranged from 6 to 15 weeks	Internet-delivered Individual	No reporting of differential effects of components	All studies conducted in high-income countries
Loughnan et al. (2018)	Clinical Clinical levels of anxiety based on clinical cut-off scores on a validated self-report measure, or a formal diagnostic interview	Ranged from 4 to 12 weeks	Group and individual sessions	No reporting of differential effects of components	All studies conducted in high-income countries
Maguire et al. (2017)	Not stated but appears to be subclinical	Ranged from 2 to 12 sessions	Group and individual In-person and online	No difference between interventions that were anxiety-specific and those that were not; or between brief or standard CBT. Larger effect sizes were observed for individual than group CBT	n/a
Marc et al. (2011)	Not stated but appears to be subclinical	Ranged from a single session to daily activity for 4 weeks	Group and individual In-person and self-guided	Imagery demonstrated effect in comparison to music	n/a
Matvienko-Sikar et al. (2016)	Not stated but appears to be subclinical	Ranged from 6 to 10 weeks	Group	No reporting of differential effects of components	All studies conducted in high-income countries
Mendelson et al. (2017)	Half of the studies had participants with clinically significant anxiety symptoms at baseline	Duration unclear for number of studies, although a range of 3–6 weeks observed	Individual	Intervention approach or duration did not influence anxiety outcomes	Predominantly low-income participants; majority white participants
Mirghafourvand et al. (2017)	Not stated but appears to be subclinical	Duration of 2–4 days after labour to one week after discharge	Individual	No reporting of differential effects of components	n/a
Nillni et al. (2018)	Clinical Diagnosis or based on elevated levels on clinician administered or self-report measures	Timing of delivery not reported	Group and individual	No reporting of differential effects of components	Cut-offs for clinical diagnosis varied between studies

(*Continued*)

Table 2. (Continued).

Authors (year)	Population (clinical or not clinical)	Intervention duration	Intervention delivery	Role of intervention components or types	Additional factors
Pinquart and Teubert (2010)	Not stated but appears to be subclinical	Ranged from 1 day to 50 months (average duration: 15 months)	Group and individual	Interventions focused mostly on mothers had larger effect sizes than interventions focused on couples	59% of participants were members of ethnic minorities and 56% had completed high school education
San Lazaro Campillo et al. (2017) No interventions identified	Not stated but appears to be subclinical	No interventions identified	No	interventions identified	No interventions identified
Seiiedi-Biarag et al. (2019)	Not stated but appears to be subclinical	Not stated	Not stated	No reporting of differential effects of components	All studies conducted in high-income countries
Sheffield and Woods-Giscombé (2016)	Not stated but appears to be subclinical	Ranged from 6 to 16 weeks (average: 11.5 weeks); 20–120 minutes per session	Group and individual	Effects found to be significant regardless of type of yoga	n/a
Shi and MacBeth (2017)	Not stated but appears to be subclinical	Ranged from 60 to 10 weeks (average: 8 weeks), with sessions ranging from 1.5 to 2.5 h (average: 2 h)	Group	No reporting of differential effects of components	Majority of studies conducted in high-income countries
Song et al. (2015)	Not stated but appears to be subclinical	Ranged from 6 weeks to 18 months	Individual/ family-based	Supportive stress management demonstrated effects compared to treatment as usual; educational and interactional interventions did not	Majority of studies conducted in high-income countries Majority of studies included women with preterm infants, drug abusing women, low-income mothers, and 'highly distressed' women
Stoll et al. (2018)	Not stated but appears to be subclinical	Ranged from 5 to 10 sessions for anxiety outcomes	Group and individual	No reporting of differential effects of components	All studies conducted in high-income countries
Taylor et al. (2016)	Not stated but appears to be subclinical	Ranged from 4 to 10 weeks	Group, individual, dyadic	No reporting of differential effects of components	All studies conducted in high-income countries Some participants also engaged in psychotherapy or taking medication during intervention
Van Ravesteyn et al. (2018)	Clinical Women with a diagnosed mental disorder	2 sessions for anxiety disorders	Group	No reporting of differential effects of components	Majority of studies conducted in high-income countries

(*Continued*)

Table 2. (Continued).

Authors (year)	Population (clinical or not clinical)	Intervention duration	Intervention delivery	Role of intervention components or types	Additional factors
Wadephul et al. (2016)	Subclinical but did focus on elevated baseline symptoms or at risk for perinatal mental illness	Ranged from 4 to 12 sessions	Group	No evidence of differences between CBT, IPT or mindfulness interventions No evidence for impact of length, group size or other components	n/a

CBT, Cognitive Behavioural Therapy; IPT, Interpersonal Therapy; MBSR, Mindfulness-based Stress Reduction; n/a, not applicable; NICU, neonatal intensive care unit.

effects for stress and some benefits for anxiety in another low-quality review (Shi & MacBeth, 2017). No studies of interventions for pregnant women with a history of miscarriage were identified in a final review (San Lazaro Campillo et al., 2017).

Postpartum interventions

Eleven reviews focused on interventions delivered in the postpartum period.

General populations

Two reviews were identified for general populations. One review of internet-delivered CBT interventions for women who had given birth in the last two years reported reductions in stress symptoms and anxiety (Lau et al., 2017). One medium-quality review of postnatal debriefing for women who had given birth in the last month found no effect of debriefing on anxiety (Bastos et al., 2015).

Vulnerable populations

Seven reviews examined interventions for mothers of infants born preterm, low birth weight and/or requiring admission to the NICU. CBT reduced anxiety but not stress for mothers of preterm infants in one review (Seiiedi-Biarag et al., 2019). Psychotherapeutic, behavioural, educational, or complementary and alternative interventions (Mendelson et al., 2017), and e-health interventions generally (Dol et al., 2017), did not demonstrate effects on anxiety or stress for mothers of infants in the NICU. Individualised, support-based and educational interventions reduced stress for mothers of preterm and low birth weight infants in two reviews (Brett et al., 2011; Mirghafourvand et al., 2017) and reduced anxiety for mothers of preterm infants in one review (Mirghafourvand et al., 2017). However, one of these reviews was rated as being of low quality (Brett et al., 2011). Music therapy demonstrated short-term reductions in anxiety for mothers of preterm infants in one medium-quality review (Bieleninik et al., 2016). Effects of kangaroo care were inconsistent for mothers of preterm and low birth weight infants in one low-quality review (Athanasopoulou & Fox, 2014).

Two reviews examined other vulnerable populations. One was a review of psychosocial interventions for women experiencing stress in the postpartum period, which reported reductions in stress for support-based stress-management programmes (Song et al., 2015). A medium-quality review of home-based support delivered by a professional or trained lay-professional for economically disadvantaged women who gave birth in the last 12 months found no evidence of positive effects of home visiting on stress or anxiety (Bennett et al., 2008).

Perinatal interventions

Ten reviews focused on interventions delivered across the perinatal period. Six reviews were conducted in general populations.

General populations

One review of mind–body interventions, including hypnotherapy and yoga, reported inconsistent effects across interventions (Marc et al., 2011). One review of parenting education interventions reported small to very small positive effects for interventions on parenting stress, with no long-term effects (Pinquart & Teubert, 2010). One review of CBT interventions reported reductions in anxiety within groups and relative to controls (Maguire et al., 2018), while a low-quality review examining computer and web-based interventions, including CBT, relaxation and behavioural activation found no evidence of effects for stress or anxiety (Ashford et al., 2016). One medium-quality review of mindfulness interventions reported within-subjects reductions in stress and anxiety but no effects relative to controls (Taylor et al., 2016). Finally, one low-quality review of yoga interventions reported reductions in anxiety and stress, although the studies included were of high risk of bias (Sheffield & Woods-Giscombé, 2016).

Vulnerable populations

Four reviews focused on at-risk populations during the perinatal period. One review of psychotherapeutic interventions for women meeting self-report or diagnostic criteria for anxiety and/or depression reported within-group reductions in anxiety for a mindfulness-based cognitive therapy (MBCT) intervention and three CBT interventions (Loughnan et al., 2018). Another review of internet-delivered psychotherapeutic interventions for women meeting self-report or diagnostic criteria for anxiety and/or depression reported reductions in anxiety relative to controls for CBT and behavioural activation interventions (Loughnan et al., 2019). Similarly, a review of perinatal mental health interventions for women experiencing stress, anxiety and depression reported reductions in anxiety for one behavioural activation intervention, one mindfulness intervention and one MBCT intervention relative to controls (Lavender et al., 2016). A medium-quality review of interventions to treat depression, anxiety and trauma-related disorders identified one CBT intervention that demonstrated reductions in anxiety (Nillni et al., 2018).

Intervention characteristics

Three reviews examined intervention length and reported no differences in outcomes based on intervention duration (Maguire et al., 2017; Mendelson et al., 2017; Wadephul et al., 2016). Eighteen reviews included group interventions or interventions including a group component but did not examine intervention effects by group format. Eleven reviews included individual interventions; a greater proportion of reviews examining individual interventions (63.63%) reported beneficial effects than reviews of group interventions (44.44%). Reviews of group interventions were more likely to report inconsistent findings (33.33%) and less likely to report null findings (22.22%) than reviews of individual interventions (18.18% and 36.36%, respectively).

Fourteen reviews examined potential differences in intervention effects by intervention components or 'type'. Reviews rated as high-quality reported that music interventions were more effective when participants listened to music of their choosing in their own home than the music provided by the study team and in a medical setting (Lin et al., 2019). Imagery was reported as more effective than music for reducing anxiety in one review (Marc et al., 2011). Davenport et al. (2018) reported that yoga had a beneficial effect on prenatal anxiety; other forms of exercise did not. Interventions based on or

including mindfulness-based stress-reduction components were reported as more effective than other mindfulness interventions in one review (Hall et al., 2016). Song et al. (2015) reported that support-based interventions are more effective than educational or interactive interventions, while Mendelson et al. (2017) found no difference between psychotherapy, behavioural or educational interventions. No differences were found for therapist-delivered iCBT (Lau et al., 2017). One review reported that interventions focusing on women only were more effective than interventions including couples (Pinquart & Teubert, 2010).

Discussion

The current review identified 34 reviews examining effects of interventions for stress and/or anxiety during the first 1000 days. Intervention effects were inconsistent across included reviews and although the quality of the included reviews was high, reviews reported variable quality of included studies. Overall, this systematic review of reviews found insufficient evidence to definitively recommend any one intervention in pregnancy, postpartum, or across the first 1000 days from conception to two years postpartum, for either vulnerable or general populations. However, several potentially useful interventions were identified including CBT, support-focused interventions, music interventions and yoga and relaxation.

CBT demonstrated more consistent benefits for maternal anxiety than other intervention approaches, which is unsurprising as it is a well-validated treatment for anxiety in diverse populations (Maguire et al., 2018; Van Dis et al., 2019). The current review provides some support for the effectiveness of CBT across online and in-person group and individual modalities. Findings for maternal stress were less-frequently examined, limiting the inferences that can be made for this outcome. Support-focused interventions demonstrated benefits for both stress and anxiety but only in the postpartum period. Support-based interventions involve individualised or group-based provision of emotional, practical, and/or social support by healthcare professionals, and/or peers, partners, family and friends (Evans et al., 2019; Song et al., 2015). Support-based interventions were predominantly examined in the postpartum period, and further examination of effects during pregnancy would be beneficial. Music, yoga and relaxation interventions also demonstrated some reductions in stress and anxiety across the perinatal period in the included reviews, although reviews reported poor quality of included studies, indicating a need for more robust research to better determine intervention effects. Importantly, reviews reported no adverse effects of these approaches, or other approaches demonstrating inconsistent effects, such as exercise.

The findings of this review highlight a significant focus on depression, which has been noted previously for midwifery-delivered perinatal mental health interventions (Alderdice et al., 2013). This is evidenced by the high number of included reviews examining depression in addition to stress and anxiety, which were identified even though the literature search focused solely on stress and anxiety. Although highly associated, anxiety and stress conceptually differ from depression (Eysenck & Fajkowska, 2018). Similarly, where reviews examined both stress and anxiety, there was a greater focus on effects of interventions on anxiety than stress. Although anxiety and stress are also highly associated, they are distinct constructs with potentially differential mechanisms of effect on

maternal and child outcomes (Glover, 2011). As perinatal distress is a complex and multifaceted construct (Wadephul et al., 2020), future trials of interventions should incorporate a broad range of outcomes, including stress and anxiety (Alderdice et al., 2013).

This review noted that most reviews examining vulnerable populations focused on mothers of preterm or low birth weight infants, and infants in the NICU. While these populations highly deserve stress and anxiety reduction supports, there is less evidence of the role of interventions in 'general' populations. Given the prevalence rates of perinatal stress and anxiety (National Mental Health Division HSE, 2017), general populations may include women with varying levels of stress and anxiety and women at-risk due to alternative predisposing factors. Further, only three reviews examining interventions related to other external sources of stress were identified; one of these represented an empty systematic review (San Lazaro Campillo et al., 2017). Given increasing the increasing impact of external stressors such as coronavirus disease 2019-related factors (Moyer et al., 2020) and climate-related natural disasters (Harville et al., 2010) on perinatal mental health, development and examination of interventions for stress and anxiety in the context of such stressors are needed.

Clearer understanding of effective intervention components is needed to guide future intervention development also. As less than half of included reviews examined the role of intervention components, no clear pattern can be identified for intervention components or types in the current review. Future research should also give greater consideration to timing of intervention delivery and how this may map on to women's needs across the first 1000 days. The reviews included in this review did not tend to examine the timing of the intervention delivery. Stress and anxiety can fluctuate over the first 1000 days (Farewell et al., 2018) and fluctuations may be compounded by differences in population type, with different vulnerabilities or predisposing factors eliciting higher or lower levels of distress at different time points. In-depth examinations of women's experiences and needs across the first 1000 days are essential to inform future intervention development and delivery (Alderdice et al., 2013).

The current review includes reviews of heterogeneous intervention types, which limits inferences that can be made about overall effectiveness across reviews. However, the aim of this systematic review of reviews was to provide an overview of the current state of the evidence supporting interventions for perinatal stress and anxiety. Thus, it was expected that a range of interventions would be examined. There is also heterogeneity related to the focus of some reviews on the modality of intervention delivery (e.g. internet-delivered) or a broader range of interventions (e.g. non-pharmacological interventions). These reviews tended to report more inconsistent effects, most likely due to the heterogeneity of the intervention 'types' included. Despite these limitations, this systematic review of reviews reaffirms the conclusions of some individual reviews and further highlights that interventions such as CBT and support-focused interventions demonstrate the most consistent benefits of the interventions reviewed. Synthesising a broad range of interventions in a systematic review of reviews provides up-to-date conclusions on the effects of stress and anxiety interventions in the first 1000 days beyond conclusions that can be obtained from individual reviews of more specific intervention types (Smith et al.,

2011). The findings of the current review therefore provide a definitive synthesis of intervention effects to inform future research and practice to reduce stress and anxiety from conception and up to two years postpartum (Smith et al., 2011).

Conclusions

There is limited evidence to definitively support any one type of intervention across the first 1000 days. Findings of this review provide some evidence for CBT as a useful approach to address anxiety across the first 1000 days in general and vulnerable populations; individualised support-based interventions can reduce stress and anxiety for vulnerable populations in the postpartum. There is a need for more robust examinations of intervention effects, which adopt multifaceted conceptualisations of perinatal mental health and take population, intervention timing and delivery modality into account. Improving research on intervention effects in the first 1000 days is needed to better develop and implement effective interventions with the potential for real and meaningful change in the lives of women and infants.

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