HTA Austria
Austrian Institute for
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GmbH

Digital health technologies for self-identification of the risk of perinatal mental illness

A systematic review

Final report

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Abbreviations

AIHTA ..... Austrian Institute for Health Technology Assessment
ANRQ ..... Antenatal Risk Questionnaire
App ..... Application
CASP ..... Critical Appraisal Skills Programme
CEBM ..... Centre for Evidence-Based Medicine
COVID-19 ..... Coronavirus Disease 2019
CSQ ..... Client Satisfaction Questionnaire
EPDS ..... Edinburgh Postnatal Depression Scale
HTA ..... Health Technology Assessment
MARS ..... Mobile App Rating Scale
nRCT ..... non-randomized controlled trials
PHQ-2 ..... Patient Health Questionnaire-2
PICO(S) ..... Patient Intervention Comparison Outcome and Study design
PRISMA ..... Preferred Reporting Items for Systematic Review and Meta-Analysis
PRISMA-P ..... Preferred Reporting Items for Systematic Review and Meta-Analysis Protocols
QUADAS-2 ..... Quality Assessment of Diagnostic Accuracy Studies, Version 2
QuADS ..... The Quality Assessment for Diverse Studies
QATSDD ..... Quality Assessment Tool for Studies with Diverse Designs
RCT ..... Randomized control trial
ROBINS-I ..... The Risk Of Bias In Non-randomized Studies - of Interventions
ROBIS ..... Risk of Bias in Systematic Reviews
SD ..... Standard deviation
SUS ..... The System Usability Score
WHO ..... World Health Organization

Executive Summary

Background: Perinatal mental illnesses affect up to 20% of mothers and 10% of fathers worldwide, posing risks to both parents and infants. Early detection is crucial to improve outcomes, yet barriers such as stigma and access to care persist. Digital health technologies may facilitate self-identification, offering a promising alternative for early detection of this disease.

high prevalence; early detection important; digital solution promising

Aim: The aim of this systematic review was to assess the effectiveness and safety as primary outcomes and implementation considerations of digital health technologies for self-identification of the risk of perinatal mental illness, with a focus on social, organizational, and legal aspects as secondary outcomes.

check effectiveness and safety; evaluate implementation aspects

Methods: Following a systematic review approach, a systematic literature search on this topic was conducted using a previously formulated search strategy in the online databases PubMed, CINHAL, Web of Science, PsycINFO and Cochrane Library to identify studies between 2014 and 2024. Data extraction and quality assessment were performed using appropriate critical appraisal tools.

systematic literature search; multiple databases; studies between 2014-2024; quality assessment

Results: Six studies and one review were included, covering mobile applications, web platforms, and text-based interventions. Nevertheless, no generalizable statements could be made for the primary clinical results on effectiveness and safety, as one study of limited quality could be included in this review. The non-clinical secondary results showed good acceptance and usability, but with very heterogeneous study data and some limitations as well. Regarding the organizational and legal aspects, no relevant and appropriate literature could be found.

7 studies included; heterogeneous data; limited clinical evidence

non-clinical secondary outcomes showed good acceptability

Conclusion: Digital self-identification tools for assessing the risk of perinatal mental illness show potential to overcome barriers, to improve mental health and accessibility but require further high-quality research to proof effectiveness and safety, to further establish regulatory frameworks and organizational pathways.

potential to overcome barriers; more research needed; regulation required

Keywords: digital health technology, mental illness, perinatal, self-identification

Zusammenfassung

Hintergrund: Weltweit sind bis zu 20% der Mütter und 10% der Väter von perinatalen psychischen Erkrankungen betroffen, die sowohl für die Eltern als auch für das Kind ein Risiko darstellen. Eine frühzeitige Erkennung ist von entscheidender Bedeutung, um das Outcome zu verbessern, doch bestehen nach wie vor Hindernisse wie Stigmatisierung und Zugang zur Versorgung. Digitale Gesundheitstechnologien können die Entdeckung von perinatalen psychischen Erkrankungen durch Selbstidentifizierung erleichtern und bieten eine vielversprechende Alternative für die Früherkennung.

hohe Prävalenz; Früherkennung wichtig; digitale Lösung vielversprechend

Ziel: Ziel dieser systematischen Übersichtsarbeit war es, die Wirksamkeit und Sicherheit als primäre Ergebnisse und Überlegungen zur Implementierung digitaler Gesundheitstechnologien für die Selbstidentifizierung des Risikos perinataler psychischer Erkrankungen zu bewerten, wobei der Schwerpunkt auf sozialen, organisatorischen und rechtlichen Aspekten als sekundäre Endpunkte lag.

Wirksamkeit und Sicherheit prüfen; Implementierungsaspekte bewerten

Methodik: Nach dem Ansatz eines systematischen Reviews wurde eine systematische Literaturrecherche zu diesem Thema unter Verwendung einer zuvor formulierten Suchstrategie in den Online-Datenbanken PubMed, CINHAL, Web of Science, PsycINFO und Cochrane Library durchgeführt, um Studien zwischen 2014 und 2024 zu identifizieren. Die Datenextraktion und die Qualitätsbewertung erfolgten mithilfe geeigneter kritischer Beurteilungsinstrumente.

systematische Literatursuche ; mehrere Datenbanken; Studien zw. 2014-2024; Qualitätsbewertung

Ergebnisse: Es wurden sechs Studien und eine Übersichtsarbeit eingeschlossen, die mobile Anwendungen, Webplattformen und textbasierte Interventionen abdecken. Dennoch konnten für die primären klinischen Ergebnisse zur Wirksamkeit und Sicherheit keine verallgemeinerbaren Aussagen gemacht werden, da nur eine Studie von begrenzter Qualität in diese Übersichtsarbeit einbezogen werden konnte. Die nicht-klinischen sekundären Ergebnisse zeigten eine gute Akzeptanz und Usability, allerdings mit sehr heterogenen Studiendaten und auch einigen Limitationen. Zu den organisatorischen und rechtlichen Aspekten konnte keine relevante und geeignete Literatur gefunden werden.

7 Studien eingeschlossen; heterogene Daten; begrenzte klinische Evidenz

nicht-klinische sekundäre Endpunkte zeigten gute Akzeptanz

Conclusio: Digitale Selbstidentifizierungsinstrumente zur Bewertung des Risikos perinataler psychischer Erkrankungen haben das Potenzial, Barrieren zu überwinden, die psychische Gesundheit und die Zugänglichkeit zu verbessern, erfordern jedoch weitere hochwertige Forschungsarbeiten zum Nachweis der Wirksamkeit und Sicherheit sowie zur weiteren Festlegung von rechtlichen Rahmenbedingungen und organisatorischen Abläufen.

Potenzial Barrieren abzubauen; mehr Forschung nötig; Regulierung erforderlich

Schlüsselwörter: digitale Gesundheitstechnologie, perinatal, psychische Erkrankungen, Selbstidentifizierung

1 Introduction

1.1 Background

Pregnancy and childbirth are life-changing events which, for some, are accompanied by joy and happiness but, for others, are overshadowed by excessive demands, sadness, or anxiety. With a prevalence of up to 20%, one in five mothers is affected by a perinatal mental illness [1]. Up to 10% of fathers are also affected by this condition [2-4]. To minimise the effects as much as possible, it is particularly important to detect such a disease as early as possible[5]. However, comprehensive screening in the perinatal period is often a challenge for the healthcare system and staff [6-9], as well as there are barriers for those who are affected [10-13]. The steadily improving digital technologies in the healthcare sector could minimise such barriers [14, 15] and contribute to the practical and easy identification of the risk of perinatal mental illness [16].

perinatale psychische Erkrankungen
Mütter & Väter betroffen (10-20 %)
frühe Erkennung besonders wichtig
Potenzial digitaler Technologien Barrieren abzubauen

In the following thesis, the terms *peripartum* and *perinatal*, *prepartum* and *prenatal*, as well as *postpartum* and *postnatal* are used interchangeably. Additionally, the term screening is employed, as in numerous studies and articles, as a general term referring to the self-identification of a disease. These terms will be explained in more detail in the following chapters regarding their use.

synonyme Begriffe

Definitionen in Folgekapiteln

1.1.1 Perinatal mental illness

According to the World Health Organisation (WHO), health is defined as follows: "*Health is a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity*" [17].

WHO-Definition von Gesundheit

Mental health is, therefore, part of the definition of health. Mental illness, as a non-communicable disease, is a major problem in the public health sector. In 2019, over 12% of the global population, i. e. one in eight individuals, experienced at least one mental disorder[18]. Measured by the mortality, 2.2 million deaths were thought to be related to depression and 1.3 million to bipolar disorder in 2010. *The Global Burden of Disease Study 2016* highlighted that 4.8% of total *disability-adjusted life years* (DALY) worldwide were associated with mental illness [19].

psychische Gesundheit als Teil der WHO-Definition

über 12 % der Weltbevölkerung von psychischen Erkrankungen betroffen (2019)

Resulting in this high burden and adverse effects, psychological illnesses belong to the most common disorders during the prenatal and postnatal phases of life [1]. They include depression and anxiety disorders, which occur most frequently and have been extensively researched, but psychosis and post-traumatic stress disorder also belong to perinatal mental illnesses [1]. Depression and anxiety disorders are present in around 15% of women in the period around childbirth [20]. In the *Austrian Depression Report* from 2019, a prevalence of 10-15% in both the antenatal and postnatal period was described [21]. Contrary to the high figures, however, *only* two to three women per 1000 births are admitted to hospital due to a perinatal mental health problem [22].

psychische Erkrankungen rund um Geburt häufig

rund 15 % der Frauen von Depressionen und Angststörungen betroffen

wenige stationäre Aufnahmen

Psychosis occurs in one to two women per 1000 births [23]. Nevertheless, large variations in the figures between low- and high-income countries and between individual countries regarding the incidence of mental illness during pregnancy and after childbirth are probable. The study by Parsons et al. (2012) [24] showed that while the rate of postnatal depression in high-income countries is estimated at around 7-13%, there are still very few studies on middle to low-income countries with an expected higher prevalence. When comparing numbers within a continent, for example between Nepal with a postnatal depression rate of 4.9% and Pakistan with 30.9%, there are also large discrepancies [24].

postpartale Psychose bei 1–2 von 1000 Geburten

große Unterschiede zwischen Ländergruppen

postpartale Depression in HIC: ca. 7–13 %; Datenlage in LMIC begrenzt

Fathers

However, fathers must also be included in relation to perinatal mental health, as they also experience a change in life situation as (expectant) parents. 5-10% of fathers are diagnosed with perinatal depression, and 5-15% with perinatal anxiety disorders [2-4]. Similarly, 1.2% of fathers experience perinatal posttraumatic stress disorder [25].

auch Väter von perinataler Depression & Angststörungen betroffen

In order to shed more light on this topic, it seems important to first define the term perinatal in more detail.

Definition unerlässlich

Definition: "perinatal period"

The word part "peri" comes from the Greek language and means "near". "Natalis" comes from the Latin and means "relating to birth" in English. According to the *Duden* dictionary, the word "perinatal" refers to the period shortly before, during and shortly after childbirth [26]. During the research, it became apparent that the definitions of this term vary greatly in aspects of the time span. When describing perinatal conditions, for example, the WHO defines the period from 22 completed gestational weeks of pregnancy to 7 days after birth [27]. In the fifth edition of the *Diagnostic and Statistical Manual of Mental Disorders* (DSM-5), the period for perinatal mental disorders is described as the complete period of pregnancy up to 4 weeks after birth [28]. In scientific literature, the term is often defined over a broad period of time from pregnancy to one year after birth [5, 14, 29-32]. Due to the different definitions and in order to cover the broad scope of the literature, the term "perinatal" was also used in this review to refer to the rough period of pregnancy, birth and up to one year after birth.

unterschiedliche Definitionen der Perinatalphase:

WHO: 22. SSW – 7 Tage nach Geburt.

DSM-5: Schwangerschaft – 4 Wochen nach Geburt.

Großteil Literatur: Schwangerschaft – 1 Jahr nach Geburt.

Arbeit folgt Ansatz aus Literatur

Definition of "mental illness" concerning pregnancy, birth, and puerperium

Mental disorders are notable malfunctions of thinking, emotions or behaviour that indicate underlying processes and are often associated with significant suffering or functional impairment [28, 33]. Their diagnosis depends on the presence of these impairments, as the distinction from normality is influenced by cultural and social norms [34, 35].

psychische Störungen mit hohem Leidensdruck

kultur- & normabhängig

According to the 11th version of the *International Classification of Diseases* (ICD), perinatal mental disorders are classified as 6E20, 21 or Z "Mental and behavioural disorders associated with pregnancy, childbirth or the puerperium" depending on the symptoms. The prerequisite for such a diagnosis is significant mental and behavioural symptoms, regardless of whether they are related to the event of pregnancy, childbirth, or the puerperium and whether they are an exacerbation or a recurrence. The postnatal period is defined here as 6 weeks after delivery [33].

ICD-11: 6E20, 6E21, Z

Bezug zu Geburt möglich, aber nicht zwingend

postnatal = bis 6 Wochen nach Geburt

Consequences

hohe Belastung für Umfeld & Kind

Perinatal mental illness can have a serious impact not only on the mother, father, and family, but especially on the newborn [36].

bei Babys: geringes Geburtsgewicht, Fehlbildungen
bei betroffenen Müttern: Risiko für Frühgeburt, Komplikationen, Suizid

Maternal mental disorders already might affect the unborn child during pregnancy and can lead to low birth weight [37], physical growth restriction [38], congenital malformation [39], as well as an increased risk for stillbirth and premature birth [40]. For the pregnant woman, it increases the risk of birth complications and mortality [37]. An untreated perinatal mental disorder can affect her health with relapses [41], as well as her social and working life [32]. The gravest consequences go as far as suicide [42]. Problems in mother-child interaction and educational challenges also occur more frequently [38, 39]. Later in life, the child may experience increased behavioural and emotional difficulties, as well as a lower intelligence quotient [38].

Konsequenzen für Kinder im späteren Leben

bei betroffenen Vätern: Bindungsschwierigkeiten, seltenere Suche nach Hilfe

Nevertheless, the consequences for fathers should not be underestimated. While negative effects can arise in parenting and parent-child attachment, men have a low uptake of services and treatments [43] - for example, due to the traditional distribution of roles [44].

hohe gesellschaftliche Kosten, v.a. wegen Folgen für das Kind

Perinatal mental illnesses can further lead to significant consequences for the health system. A study from England estimates that such disorders cause 1.2 billion pounds for mental health care and social services, and additionally 8.1 billion pounds for society for each one-year cohort of births. Approximately two-thirds of the costs are due to the impact on the child [45].

Risk factors

Risikofaktoren zentral

To address the substantial economic and societal burden of perinatal mental illnesses, it is crucial to examine the risk factors that contribute to their prevalence.

soziale Risikofaktoren: Arbeitslosigkeit, niedriges Einkommen & Bildung

Related to public health concerns, risk factors for mental disorders include many aspects of social determinants, such as unemployment, low income, income inequity, low education, low social support, poor environment, and housing conditions [19]. Especially regarding women, this list can be supplemented by domestic violence [46-48] and adverse life events [46, 48-50]. Taken together, inequity and poverty as socio-economic factors increase the prevalence of perinatal mental illness [19].

Ungleichheit & Armut erhöhen Risiko

Risiko für psychische Belastung auch durch Komplikationen in Schwangerschaft & Geburt erhöht

In connection with pregnancy, maternal distress, an unplanned or unwanted pregnancy and conditions that might occur during pregnancy, such as hyperemesis or polyhydramnios, can also pose a risk to mental disorders [49, 51]. Further, demographic drivers could be detected, such as teenage pregnancy or first-time pregnancy at the age of over 30 years [46, 49], being a first-time mother or multipara with three or more children [46, 47, 49, 51]. A paternal age less than 20 or over 35 years can also influence the risk for fathers [49]. Obstetric interventions, obstetric violence, or unexpected complications, for example, cesarean section or perineal tears, can lead to birth-related traumatic experiences. In relation to the child, stillbirths, preterm births, or low birth weight are researched determinants for psychological disorders in the perinatal phase [47, 49, 50].

Alter ebenfalls als Einflussfaktor bei Müttern & Vätern

weitere Risikofaktoren: frühere Erkrankungen, familiäre Vorbelastung, Lebensstil, Persönlichkeit

However, it is important to note that previous mental illnesses, a family history of mental illness, an unhealthy lifestyle, or physical health problems can also contribute to an increased risk [46-49, 51]. Studies moreover show an influence through aspects of personality with low self-esteem, excessive worrying, anxiety sensitivity or fear of birth [46-48].

1.1.2 Screening, self-identification, and early detection

Definition: "screening"

Screening is a medical process that aims to identify people who are at increased risk of a disease or health condition and thus improve health outcomes through preventative measures and prompt treatment [52]. Screening works like a sieve and is intended for the potentially healthy population that does not currently show symptoms of the disease to be identified [52] or is not aware of a present disorder [53]. It can predict a certain probability, but no diagnosis can be made based on a screening alone [52]. According to Raffle et al. (2019) [54], a screening process generally consists of four steps, including the definition of a target group, the performance of screening, the further assessment of positive tested individuals and the provision of treatment for people at risk or who have been diagnosed with the disease.

Screening als Risikoidentifikation und Früherkennung bei potenziell gesunden Personen Ziel: Risikopersonen identifizieren, Prävention & frühzeitige Behandlung

The term screening is often used interchangeably and is utilised very generally for the identification and testing of diseases [52].

allgemein: Identifikation und Testung

Definition: "self-identification"

According to a common dictionary, the term self-identification means "*the assigning of a particular characteristic or categorisation to oneself*"[55].

Selbstidentifikation

In a study by Schomerus et al. (2019) [56], self-identification is described as *"having a mental illness as a dynamic cognitive process that consists of both the spontaneous assessments of current health complaints and the awareness of personal vulnerability to mental illness"* [56, p. 304]. In particular, they emphasise the difficulty of assigning mental symptoms to oneself [57]. This process, therefore, represents a central step towards the perception of a need for help [56]. In contrast to this thesis, Schomerus et al. (2019) [56] consider self-identification as a continuous and non-categorical measure to represent a comprehensive view.

dynamischer Prozess aus Symptombewertung & Krankheitsbewusstsein

kontinuierliches Verständnis & wichtiger Schritt für Hilfebedarf

However, to compare outcomes and measures, a categorical measure of the meaning of self-identification must be considered for this review. In this context, a definition of the term was formulated that describes the meaning in this subject: self-identification of mental illness refers to assessing the risk of perinatal mental illness and becoming aware of this condition by independently answering validated and reliable questionnaires without assistance. This assessment can be done by using digital health technologies (such as websites or applications (apps)).

Selbstidentifikation hier kategorial definiert

eigenständige Risikoabschätzung

validierte Fragebögen, digitale Tools

Various synonyms for the term self-identification are often used in literature, even if they do not always correspond to the same definition. These include, for example, the words self-report, self-assessment, self-detection, self-diagnosis, self-testing, but also the general term screening, as explained in the previous paragraph. The process of self-identification can be seen as early detection of an illness, and therefore in the public health area as secondary prevention.

synonyme Verwendung von Begriffen

Selbstidentifikation als Früherkennung & sekundäre Prävention

Definition: "secondary prevention" / "early detection"

Secondary prevention or early detection aims to recognise pre-stages or initial stages of a disease in the symptom-free population (e.g., parent-child pass). By starting treatment at an early stage, the course of the disease should be positively influenced, and progression prevented or delayed.

Ziel: frühzeitig behandeln, Verlauf verbessern, Verschlimmerung verhindern

Screening is a component of early detection, but not every early detection procedure is carried out in the form of a systematic screening program with a recruitment strategy, defined intervals, and standardised methods [52, 58].

nicht jede Früherkennung ist Screening-Programm

Early detection and barriers to detection

frühe Erkennung & Behandlung entscheidend; ca. 80% unentdeckt ohne standardisiertes Screening

To minimise its adverse effects, it is important to detect perinatal mental illness and start treatment as quickly as possible to prevent the progression of the disease [5]. Nevertheless, without standardised screening, approximately 80% of cases may go undetected [59, 60].

Barrieren: Scham, Schuld, Stigma, Verharmlosung, mangelndes Vertrauen

auch organisatorische Hürden: Zeitmangel, fehlende Kinderbetreuung zahlreiche Hürden im Gesundheitssystem

fehlende Standardisierung bei Behandlungspfaden

Pregnant women, mothers and their partners face several barriers in seeking help, such as feelings of shame, guilt for being a bad mother/father, stigma [11] or fear of consequences for child custody by child welfare services [13]. Lack of trust in health professionals [10], the downplaying of symptoms by medical staff and even the recognition and attribution of symptoms in such a life-changing phase can also prevent those affected from early detection [61, 62]. However, organisational challenges also inhibit (expectant) parents, such as lack of time, lack of childcare, lack of transport and thus difficult access to health facilities [12]. Partners often lack the opportunity for screening in general [63]. On the other hand, the healthcare system faces obstacles in the implementation of standardized screening measures due to a lack of money [8], lack of time, lack of knowledge about the relevance [6], fear of affected person's reactions, lack of assessment tools and lack of further standardized pathways [6, 7, 9].

hohe Akzeptanz von Screening

aber: nur 15–25 % erhalten danach Therapie; Nachsorge entscheidend

Barrieren überwinden + gute Organisation nötig

Behandlung erfordert multidisziplinären Ansatz

Even if it is difficult for those affected to overcome the named barriers, in a study by Kingston *et al.* [64], only four per cent of women refused such a screening if it was offered to them, which indicates a high level of acceptance. However, once the disease has been detected, this does not mean that the person will immediately start treatment. It has been demonstrated that only around 15-25% of those detected by screening receive therapy and support [65, 66]. Above all, this shows that screening alone is not sufficient as a public health intervention to improve health, but that follow-up care is essential [67]. Even if perinatal mental illnesses are recognised, further measures are necessary. It is primarily a matter of overcoming the above-mentioned barriers, but also the organisational coordination, as the management of perinatal mental illness could be difficult and requires a multidisciplinary approach [65].

Früherkennung braucht neue Ansätze

digitale Lösungen mit Potenzial

Accordingly, there is a need for innovative measures for early detection, whereby such approaches must be acceptable to those affected and healthcare professionals, overcome barriers, and be cost-effective, clinically effective [68], and safe [69]. Digital health technologies may contribute to improving the early detection of patients as well as patients at risk, as discussed below.

Tools for self-identification and screening

Instrument ersetzt keine ärztliche Diagnose; genaue Abklärung nötig

To implement effective early detection strategies, reliable tools might be helpful. However, it must be added that such an instrument cannot be used alone to determine whether a person really suffers from this disease. A comprehensive diagnosis process is essential to verify a disease diagnosis [70].

Screening-Prinzipien nach Wilson & Jungner (1968)

According to the "screening principles" by Wilson and Jungner from 1968, such an instrument should be accurate, reliable, acceptable to the specified population, cost-effective and clearly interpretable [71].

Edinburgh Postnatal Depression Scale

EPDS: weit verbreitetes Tool zur Erkennung perinataler Depression

Einsatz postnatal, pränatal & bei Vätern möglich; gut validiert

10 Fragen, Bezug auf letzte 7 Tage, Skala 0-3

One widely used instrument in this context is the *Edinburgh Postnatal Depression Scale* (EPDS), which has proven to be a valuable resource for identifying individuals at risk of perinatal depression. EPDS is a ten-item self-report questionnaire developed in 1987 by Cox, Holden and Sagovsky [72]. The test is designed to identify a woman's risk of developing depressive symptoms in the postnatal period. It can also be used by women antenatally [73] and by partners/fathers [63]. For this assessment, ten short statements referring to depressive symptoms in the last seven days should be rated from zero to three [74]. The EPDS is available and validated in many languages. The English version has been extensively validated in postnatal women with a sensitivity of 81% and a specificity of 88% [75].

Patient Health Questionnaire-2

PHQ-2: Kurzversion von PHQ-9 zur Erkennung postnataler Depression

2 Fragen, validiert

The Patient Health Questionnaire (PHQ-2) was derived from the PHQ-9 questionnaire to assess the risk of postnatal depression. It consists of two questions concerning depressed mood and anhedonia in the past two weeks, with four response possibilities scoring from zero to three [76]. This questionnaire has also been validated and showed a sensitivity of 83% and a specificity of 92% for major depression with a cutoff value of ≥ 3 [76].

The Whooley Questions

Whooley instrument:

Stimmung & Anhedonie

von NICE für perinatale Phase empfohlen

The Whooley depression case-finding instrument consists of two items asking about depressed mood and anhedonia to identify the risk of depression [77]. It is recommended by the National Institute for Health and Care Excellence (NICE) for evaluation in the perinatal period [32]. *The Whooley questions* are validated with a sensitivity of 0.95 (confidence interval (CI) 95%) and a specificity of 0.65 (CI 95%) [78]. A positive test result that indicates an increased risk of depression is assumed if one of the questions is answered with "yes" [77].

The Antenatal Risk Questionnaire

ANQR: 12 Elemente zu psychosozialen Belastungen

Selbstbericht, validiert, auch postnatal einsetzbar

The Antenatal Risk Questionnaire (ANQR) is based on the Pregnancy Risk Questionnaire, consisting of twelve items to assess psychosocial stressors that are related to perinatal mental disorders, above all depression and anxiety disorders. It is a self-report tool and can be used in the postnatal period as well [79]. The questionnaire is validated and recommended by Australia's current clinical practice guidelines for mental health care in the perinatal period [80].

1.1.3 Digital health technologies

Definition

Vielzahl digitaler Gesundheitstechnologien möglich

Digital Health Technologies are defined by the National Institute for Health and Care Excellence [81] as "Apps, programmes and software used in the health and care system. They may be standalone or combined with other products such as medical devices or diagnostic tests" [81, p. 33].

Ziel: bessere Gesundheit & Versorgung, Teil der UN-Nachhaltigkeitsziele

The aim is to improve health outcomes and the healthcare system, in the areas of prevention, detection, diagnosis and treatment with e.g., online tools or trackers [81]. Digital health technologies are highlighted as part of the Sustainable Development Goals [82].

Digital health technologies and perinatal mental health

COVID-19: starker Anstieg digitaler Angebote

In connection with the development of our society and the Coronavirus disease 2019 (COVID-19) pandemic, digital technologies are becoming increasingly popular within mental healthcare. Globally, more people are seeking advice and support on websites, online platforms, cell phones and mobile applications. However, access to these interventions remains uneven and is particularly prevalent in high- to middle-income countries, with access often easier in remote areas than in mental healthcare facilities [83].

ungleicher Zugang, v.a. in Mittel-/Hochlohnländern

digitale Angebote trotz Potenzial mit Risiken verbunden

While such technologies offer potential to improve health and support the path to universal coverage of mental health care, some risks should not be overlooked. Data protection, privacy, security, and accountability should be paramount, as should the wider ethical principles of equality, fairness, and availability. Applications, platforms, or similar digital offers for healthcare use should be well tested and evaluated, as there are already thousands of products on the market [83].

Prüfung & Evaluation notwendig

Vorteile: weniger zeit- & kostenaufwändig, flexibel, anonym

Especially in the area of mental health, digital technologies also offer advantages, such as reduced time and costs due to travel, flexibility and anonymity [83]. "Indeed, the evidence for digital approaches supporting mental health is compelling, with self-help approaches and telemedicine in particular showing strong benefits, including in middle-income countries" [83].

digitale Tools vielversprechend bei perinataler psychischer Gesundheit

überwinden Barrieren

hohe Akzeptanz; v.a. bei sensiblen Themen

Teilnahme an digitalen Befragungen gleich oder höher

Due to the barriers in the specific area of perinatal mental health mentioned in the previous section, which might prevent patients from undergoing screenings or medical examinations, digital technologies appear very promising and forward-looking [64, 84]. There is enormous potential for the healthcare system and the already existing staff shortage through resource-saving use [85, 86]. It can help to overcome barriers such as low health literacy, language difficulties, privacy concerns, access, and reliability of test evaluation [14, 87]. Vanderkruik et al. (2021) [88] pointed out the positive effects of writing down sensitive information (e.g., apps) in a comfortable environment at home compared to discussing it with a doctor. Patients have shown good acceptance and feasibility, especially around violence [89] and postnatal depression due to the sensitive nature of the problem [90]. Other studies have shown the same or even higher participation in digital screenings compared to surveys due to the anonymity [86, 89].

Frage nach Wirksamkeit der digitalen Angebote

As there is already a great deal of digital technology in the areas of mental health [83] in connection with pregnancy, birth, and the postnatal period, the question arises as to which apps and websites are effective and helpful.

hoher Bedarf an wirksamer Früherkennung perinataler psychischer Erkrankungen

In summary, there is a high relevance for the use of effective and early detection for perinatal mental illness [5] and the need to minimise and overcome barriers on the part of those affected [10-13] and healthcare staff [6, 7, 9]. However, there are still some uncertainties in this unregulated market [83].

1.2 Current state of research

Literaturrecherche vorab: viele Studien zu Aufklärung und Therapie

To obtain an initial overview of the state of science and to narrow down the research topic, a non-systematic literature search was carried out in advance. This revealed many studies on educational interventions and therapy support measures, but these were not the target interventions of this review. Rather, the focus should be on the self-identification of the risk of perinatal mental illness, regarding the public health character of secondary prevention.

Fokus: Prävention & Selbstidentifikation

vorliegende Reviews sehr heterogen

The term screening was mostly used in the studies found. Scientific reviews were identified, which, however, showed very heterogeneous data due to a wide variety of interventions such as screening, education, and therapy (e.g. [91, 92]). A systematic review focusing solely on the concept of self-identification, as defined in this thesis, could not be found. Instead, existing studies primarily involved a mix of different interventions.

kein Review zu Selbstidentifkation

aktueller Scoping-Review: Fokus auf Diagnostik & Screening perinatal

One recent scoping review by Spadaro et al. (2022) [69] focused on diagnostics and screening in perinatal mental health. However, applications were identified directly from the app stores (Apple and Google) and for scientific significance, a peer-reviewed study was only available for one application. In total, 14 applications were included and evaluated according to their origin, functionality, engagement features, security, and clinical use. Finally, the authors recommended focusing more on the safety of app use, as well as functions for better networking between healthcare staff and users [69].

14 Apps untersucht

Sicherheit & Vernetzung bemängelt

Feldman et al. (2019): Review zu Risiken & Nutzen von Apps

In the study by Feldman et al. (2021) [91], app stores and scientific databases were searched for a systematic review. Their aim was to summarise the risks and benefits of apps for women with perinatal mental illness in order to provide information for patients and healthcare professionals. This review included not only screening measures but also interventions such as mindfulness training, education, or self-help measures. However, the authors emphasised the need for better collaboration between academia and industry, as some apps without a scientific background, as well as scientific studies without existing technology, were identified [91].

bessere Zusammenarbeit zwischen Industrie und Wissenschaft notwendig

Clarke et al. (2024): digitales Screening

Clarke et al. (2024) [93] published their systematic review on the topic of screening for mental health using digital technologies, which included similar not merely studies on self-identification but also studies on screening interventions. The included literature showed good effectiveness, acceptability, and feasibility [93].

gute Wirksamkeit & hohe Akzeptanz

zwei weitere Studien mit hoher Akzeptanz

Two studies [94, 95] compared online assessment with paper-based screening in a clinic. Both results showed good acceptability of this new type of screening among pregnant women [94, 95].

Einzelstudien zu Selbstidentifikation

z.B.: MGHPDS-App

However, individual studies on the specific topic of self-identification were also found as part of the research. These included the study by Vanderkruik et al. (2021) [88], who published preliminary findings from the pilot study of their app, MGH Perinatal Depression Scale (MGHPDS), with results in sociodemographic data and prevalence rates of perinatal depression measured through their app for improvement and revision.

keine Studien zu organisatorischen & rechtlichen Aspekten

Furthermore, three of the included studies have already been identified, which will be described in more detail in the chapter "3.2 Included studies." [68, 84, 96]. No relevant studies addressing organisational aspects or legal considerations could be detected during the initial overview search.

Additionally, no scientific papers focusing on social issues within the realm of ethics could be found.

keine Studien zu sozialen & ethischen Fragen

1.3 Aim of the study

Based on the theoretical framework, it can be summarised that digital technologies such as apps, platforms, and other web-based tools are increasingly prominent in the healthcare sector [88]. Such instruments offer enormous potential to improve health [83].

wachsende Bedeutung digitaler Tools im Gesundheitswesen

Screening for the risk of perinatal mental illness is already recommended by guidelines and has demonstrated effectiveness and acceptability in some studies, including those examining virtual or mobile formats [95, 97]. Digital self-identification tools, in particular, may help mitigate barriers and external factors that have hindered the implementation of screening measures [14, 87].

Screening auf perinatale psychische Erkrankungen in Leitlinien emfpohlen

A preliminary overview search identified only a limited number of relevant scientific studies on this specific topic of self-identification. This raises the question of whether simple and cost-effective self-identification tools [5] could effectively detect an increased risk of perinatal mental illness and, if proven reliable, could be adopted on a broader scale within the healthcare system.

wenige Studien zu Selbstidentifikation

Frage nach Zuverlässigkeit & Implementierung

As with any digital health technology, the risks associated with data security and privacy must be considered, as highlighted in the chapter on digital health technologies [69]. Further, it is also essential to consider how such anonymous self-identification measures may impact the safety of both patients and professionals, as well as whether they might pose potential risks [83]. Given the increasing use of digital health technologies, it is crucial to evaluate their safety comprehensively.

Risiken: Datenschutz, Privatsphäre, Sicherheit

sorgfältige Sicherheitsbewertung notwendig

While the primary focus of this study was on assessing the effectiveness and safety of digital health technologies, it is equally important to consider the social, organisational, and legal conditions that influence their adoption and integration into healthcare systems. Social factors such as acceptance [34, 35, 64] and availability play a pivotal role in this process [83]. Furthermore, ethical considerations surrounding their use need careful attention as part of the broader societal dimension [83]. High-quality medical diagnostics demand not only precision but also well-defined procedural pathways for follow-up measures and early treatment start, highlighting the critical role of organisational planning [80]. Accordingly, it seems important to have a legal basis as a prerequisite, but also to be able to correctly categorise digital health technologies and use them based on evidence. This underscores the need for a thorough exploration of the legal and organisational implications associated with these technologies.

Primäres Ziel Effektivität & Sicherheit

klare Abläufe für Diagnostik & Nachsorge notwendig

dazu: Rechtsgrundlagen & evidenzbasierte Nutzung erforderlich

However, the initial overview search revealed a lack of studies addressing these topics. Consequently, as a secondary research objective, an overview of these social, organisational, and legal aspects within the field of digital health technology was integrated into the systematic literature search accompanying the primary research question.

Übersicht über soziale, organisatorische & rechtliche Rahmenbedingungen als Zusatzziel

Langzeit-Projekt zu besserer psychischer Gesundheit rund um die Geburt in Tirol mit AIHTA als Partner

The Austrian Institute for Health Technology Assessment (AIHTA) is currently a partner in the long-term third-party funded project on "Co-designing peripartum psychiatric care in Tyrol" (Funding Source: Austrian Science Fund, grant number: CM600 Paul; grant DOI 10.55776/CM6). This project, which is led by the Medical University of Innsbruck, began in April 2022 and is currently in the "co-development phase". A relevant topic in the context of this project is the investigation of digital health technologies for the self-identification of the risk of perinatal mental illness.

Fokus in dieser Arbeit auf Wirksamkeit & Sicherheit digitaler Tools zur Selbstidentifikation

This systematic review, therefore, focuses on the effectiveness and safety of digital health technologies for self-identification of the risk of perinatal mental illness, as this approach could play a significant role in the future. Due to the high prevalence of this disease worldwide and the associated public health challenges, prevention and early detection are particularly important [5].

2 Research question and method

2.1 Research questions

Forschungsfragen zu:

Wirksamkeit & Sicherheit

organisatorischen, rechtlichen & sozialen Aspekten

Based on an initial overview research, detailed considerations, and discussions with the scientific supervisors, a primary and a secondary research question were finally defined a priori and written down in the review protocol. The questions are as follows:

- How effective and safe are digital health technologies for self-identification of the risk of perinatal mental illness in parents and parents-to-be?
- Which social, organisational, and legal aspects have to be considered regarding the implementation of such technologies in the health care system?

2.2 Study design

systematischer Review nach PRISMA 2020 und Cochrane Handbook 6.4

A systematic review study design was chosen for this work, based on the PRISMA (Preferred Reporting Items for Systematic Review and Meta-Analysis) 2020 statement paper [98] and Cochrane Handbook for Systematic Reviews of Interventions (Version 6.4) [99]. This design was chosen to include relevant literature, assess its quality and finally obtain a structured presentation and summary of the results of a specific research topic.

Ziel: präzise Beantwortung der FF; kein bloßer Überblick

In contrast to a scoping review that covers a broader and less specific scope of a subject, the design of a systematic review was chosen to answer clearly formulated research questions [100]. The aim was not to provide an overview of the subject area, but to explore the specific issue of the research question. To obtain an initial overview, an overview literature search was carried out in advance.

Review als Design zur Wirksamkeitsbewertung

Entscheidungsgrundlage soll verbessert werden

Qualitätsbewertung der Evidenz zentral

Especially clinically meaningful questions on effectiveness are typical for systematic papers [100]. In this case, the main aim was to consider evidence on the effectiveness and safety of using digital health technologies for self-identification of the risk of perinatal mental illness. This thesis should help to make further decisions in favour of this type of assessment and to evaluate whether a medical professional recommendation can be made. A systematic review is the most suitable study design for decisions in this regard, as it works according to systematic guidelines, presents processes transparently, minimises bias and makes statements as reliable as possible [101]. Furthermore, it was also of great relevance to assess the quality of the evidence for providing meaningful answers.

Vorgehensweise: von Erfassung des aktuellen Stands bis zur Diskussion der Ergebnisse

In accordance with the processes of systematic reviews, the current status of existing digital health technologies for self-identification around perinatal mental health was determined, research questions were formulated, relevant literature was systematically identified, selected according to the inclusion criteria, and critically evaluated using explicit methods. Furthermore, the results were summarised and finally discussed critically [102].

Review Protocol

As a first step in conducting a systematic review based on the scientific guidelines of the PRISMA-P checklist (Preferred Reporting Items for Systematic Review and Meta-Analysis Protocols) [103] and the Cochrane Handbook for Systematic Reviews of Interventions [99], a review protocol was drawn up before the start of the research. This provides an overview of the topic, the objectives of the review and its endpoints, inclusion and exclusion criteria, as well as the planned methodological approach and a timetable [103]. This protocol was registered at the Open Science Framework (OSF), an open registries network, on July 1st, 2024, with the DOI https://doi.org/10.17605/OSF.IO/H78YQ.

erster Schritt: Review-Protokoll mit Thema, Ziele, Endpunkte, Ein-/Ausschluss-Kriterien, Methodik, Zeitplan

in OSF registriert

2.3 Inclusion and exclusion criteria

2.3.1 PICO(S)

Following the Patient Intervention Comparison Outcome and Study design (PICOS) framework [104], the framework was used to operationalise the research questions, to define inclusion and exclusion criteria and to develop a search strategy. (Table 1)[1]

PICO(S) Framework für Operationalisierung

Table 1: PICO(S) framework

	INCLUSION	EXCLUSION
POPULATION	Parents and parents-to-be during pregnancy, up to one year after birth Including: pregnant women, fathers-to-be, mothers and fathers in the perinatal phase of life, same-gender partners/ co-parents, parents by adoption	Parents outside the perinatal period
INTERVENTION	Digital health technologies for self-identification of the risk of perinatal mental illness All digital health technologies, such as websites, platforms, mobile applications, mobile interventions, and telemedicine "Digital health technologies for self-identification of the risk of perinatal mental illness" refers to assessing the risk of perinatal mental illness and becoming aware of this condition by using digital technologies (such as websites or apps) to independently answer validated and reliable questionnaires without assistance.	Non-digital interventions for self-identification Digital health techno-logies for the prevention or treatment of perinatal mental illnesses Digital health techno_logies for self-identification of mental illness in other parts of life Developing digital health technologies in the named context
COMPARISON	No intervention or common intervention without digital technology. The common interventions include standard instruments for paper-based self-identification, such as the EPDS questionnaire or face-to-face contact with professionals.	Interventions with other digital technologies
OUTCOMES **Main outcomes** **Effectiveness** **Safety**	Early detection and assessment of perinatal mental illness indicated by diagnostic accuracy (sensitivity, specificity) Benefits through the usage of digital health technologies for self-identification (Time to accurate diagnosis, symptom severity, time to treatment, higher detection rate) Safety of data Privacy policies Safety for patients: Consequences of false-negative or false-positive results Missing detection of urgent or emergency cases, or overdetection Inappropriate care pathways Evaluation after usage → complication rate, harms	

[1] The PICO-criteria were selected accordingly after an initial overview research and familiarization with the topic.

Additional outcomes **Social** **Organizational** **Legal**	Safety for professionals: Existence of any risks or negative impacts Availability: Type of technologies available Accessibility Target groups Authorization stage Costs for self-identification Acceptance and usability: Acceptance of this kind of technological interventions Usability of the tools for the named population User engagement Experience of mothers and/or fathers-to-be Experience of health experts Ethics: known and estimated benefits and harms for patients and professionals Impact on autonomy for patients Sphere of privacy Impact on the distribution of health care resources Equity for usage: factors that could prevent a group or person from gaining access to the technology Organizational consequences Effect on the current work process Implementation in the health system Management problems Further pathways Regulation per permission of digital health technologies Laws / binding rules concerning safety, marketing, licensing, acquisition, usage	
STUDY DESIGN	Effectiveness and Safety Domains: Systematic Reviews Randomised controlled trials Non-randomised controlled trials Prospective cohort studies Other Domains: No restrictions in study design	All other study designs No exclusion
Further Restrictions	English and German languages Time period: 2014 until July 2024 for the systematic literature search	Other languages than German or English Literature before 2014[2]

2.3.2 Selection criteria

Inclusion and exclusion criteria were defined before the start of the study and are anchored in the review protocol. They were defined based on literature identified in the preliminary research and discussed by the research team in order to provide a broad spectrum focused on a specific topic of self-identification. As outlined in the PICO(S) table (Table 1), the included study population consisted of expectant parents during pregnancy, as well as parents up to one year after childbirth, which is defined as the perinatal period. In this thesis, the term parents refers to mothers, fathers, as well as same-gender partners, co-parents, and adoptive parents. Studies that included participants who did not relate to the main research question, or those focusing on parents after their child's first year, were excluded.

Ein-/Ausschlusskriterien anhand von Literatur

Einschluss: werdende Eltern ab Schwangerschaft & bis 1 J. nach Geburt

Ausschluss: andere Zielgruppe oder über 1 J. nach Geburt

[2] As digital technologies are a very current and new topic, a literature period of 10 years was set. It is therefore not to be expected that relevant literature could be missing.

Patient

For the intervention criteria, studies involving digital health technologies for the self-identification of the risk of perinatal mental health conditions were considered eligible. As discussed in the introduction, these technologies are used to assess the risk of perinatal mental illness and raise awareness about mental illness by allowing users to complete validated and reliable questionnaires independently, without external assistance. Consequently, traditionally defined screening procedures, which are carried out by medical personnel through a kind of questioning, were not included in this review, although it should be noted that studies using the general term screening for self-identification were included.

Einschluss: digitale Technologien zur Selbstidentifikation

selbständige Anwendung, ohne Fachpersonal

kein klassisches Screening

Intervention

Digital health technologies, as defined in this review, encompass websites, platforms, mobile applications, mobile interventions, and telemedicine, as further detailed in previous chapters. According to this, non-digital interventions for self-identification, digital health technologies aimed at the prevention or treatment of perinatal mental health conditions, and technologies designed for the identification of mental illness in other life stages, as well as the development of digital tools e. g., through design sessions in this context, were excluded.

Websites, Plattformen, Apps, Telemedizin

andere nicht-digitale Ansätze und Formen ausgeschlossen

Comparison

The comparison, as described in the review protocol, was defined as no intervention or conventional assessment that did not involve digital technology. Such interventions included standard paper-based self-identification tools (e.g., the EPDS questionnaire) or face-to-face consultations with professionals. It is important to note that while the concept of self-identification is often difficult to distinguish from screening, the aim of this paper was not to compare traditional paper-based screening methods with virtual screening that is carried out by a doctor or similar professional, as this does not correspond to self-identification.

Vergleich: keine Intervention oder klassische Formen wie Papierfragebogen & Gespräch

Fokus auf Selbstidentifikation

Outcome

The outcome endpoints were created based on the HTA Core Model (version 3.0) [105] in relation to the predefined research questions. These included the two clinical domains, effectiveness and safety, as well as the additional non-clinical social, organisational, and legal domains.

Endpunkte nach HTA Core Model 3.0

Effectiveness was measured based on diagnostic accuracy, using sensitivity, specificity, positive predictive value and negative predictive value, and consistency with the clinical diagnosis, e.g., false-positive values. Further meaningful indicators were mental health symptoms, their severity, time to accurate diagnosis – e.g., whether self-identification led to a faster diagnosis and, according to the screening chain, time until the start of treatment. As part of the primary endpoints, safety in relation to digital health technologies was investigated as well. This outcome compromised safety for patients, safety for professionals, and data security. In this context, the question arose regarding the consequences of false-positive or false-negative results presented in the studies, including the implications of undetected or overdetected conditions, the procedures in place to handle emergencies, and the impact of incorrect diagnoses. Post-intervention evaluation also considered complication rates (e.g., psychosis) and any resulting harm (especially from a psychological perspective). Furthermore, the safety of healthcare professionals was examined as an outcome if data were available. This involved risks or negative effects associated with the measures under investigation when professionals like doctors were involved, e.g., responsibilities or referral pathways. And finally, to capture the data security endpoint, it seemed important to investigate how securely data was handled and whether privacy policies were implemented.

Wirksamkeit: Genauigkeit (Sensitivität, Spezifität, PPV, NPV), Übereinstimmung mit Diagnose, Symptomschwere, Zeit bis Diagnose/Therapie

Sicherheit: Risiken für Pts.: Fehlbefunde, Notfallmanagement, psychische Schäden

Risiken für Fachkräfte Verantwortung, Abläufe Datenschutz & Datensicherheit

However, as secondary outcomes, it appeared just as important to examine social aspects in connection with the use of digital health technology. These included availability and access to digital health technologies for self-identification of the risk of perinatal mental illness as a prerequisite, as well as considerations of acceptance and usability, and ethics. Availability and access were measured through the types of technologies that were available (e.g., app in Google Play Store), the accessibility, i. e., if it was accessible for everyone or only for individuals from Austria, the defined target groups (e.g., women in postnatal period), the authorization stage with a possible legal basis, and the costs, in terms of whether everyone could afford it. The assessment criteria acceptance of technology (e.g., whether it would be used again or recommended to others), usability, user engagement in terms of the use of the technology (e.g., how long the user stayed on the site), and the experience of users and health professionals (if available) were used to evaluate acceptance and usability. As part of the social domain, this review was also intended to spotlight ethical concerns. These included whether there was sufficient awareness about the benefits and risks of digital health technology, whether this restricted the autonomy of users or compromised privacy, and whether digital health technology led to adverse effects and inequalities in the distribution of health goods. For example, the inequality of whether individuals could afford a particular application and the possible negative consequences in this connection were part of this research.

sekundäre Endpunkte: Verfügbarkeit & Zugang zu digitalen Angeboten

Akzeptanz & Nutzbarkeit

ethische Fragen

Kosten & rechtliche Rahmenbedingungen

Autonomie in Bezug auf Datenschutz

Fragen nach negativen Auswirkungen oder Reduktion von Ungleichheit mithilfe digitaler Angebote

In addition to the social aspects, organisational impacts were also considered as secondary outcomes. Further, an understanding of the organisational integration and consequences of these digital health tools was examined. This included investigating potential effects on current workflows, such as saving staff time, and exploring whether digital self-identification tools have been implemented into the healthcare system. It was also of interest to assess what such a procedure would look like if described in the literature, whether there have been any problems in management so far, what issues have been encountered, and whether care pathways have been established for further treatment.

auch organisatorische Aspekte als sekundäre Endpunkte

Integration in Abläufe, Entlastung des Personals, Einsatz in Behandlungspfaden

Given the increasing use of these technologies, legal aspects were also reviewed. This involved exploring the existing legal regulations surrounding

auch rechtliche Aspekte zu Sicherheit, Zulassung, Nutzung & Vermarktung

self-identification tools, including guidelines on security, marketing, licensing, acquisition, and usage.

Studies

In addition to randomised controlled trials (RCTs), for this systematic review, non-randomised controlled trials (nRCTs), prospective cohort studies, and systematic reviews were included for the clinical primary outcomes to keep bias as low as possible. Restrictions were defined for all other study designs, including non-systematic reviews, narrative reports, opinions, case studies, and studies presented as abstract only. The "Tree of Different Types of Studies" from the Centre for Evidence-Based Medicine (CEBM) was used for classification of study designs [106]. For the secondary and non-clinical research outcome, no restrictions were applied regarding study design, as it aimed to encompass all available literature to provide a precise overview.

für Wirksamkeit:
Studien auf RCTs, nRCTs, Kohortenstudien, SRs beschränkt

sekundäre Endpunkte:
keine Design-Beschränkung

Further restrictions

The review was restricted to studies published in English or the German language. As digital technologies are a very current and new topic, a range of 10 years was set for the literature search. The defined period of time spans from 2014 until July 1st, 2024.

Sprache:
Englisch oder Deutsch
Zeitraum: 2014 – 1. 7. 2024

2.4 Systematic literature search

2.4.1 Search strategy

A systematic literature search was conducted using a previously formulated search strategy in the online databases PubMed, CINAHL, Web of Science, PsycINFO and Cochrane Library, as well as the online library of Medical University Vienna on July 1st, 2024. The search strategy of each individual database can be found in the appendix, A1 Search strategy: Systematic literature search. It covered the inclusion criteria for the population and intervention. To achieve this, the terms associated with the population and intervention in the research question were refined into the key phrases "parents," "digital health technologies," "self-identification," and "perinatal mental illness." These phrases were then explored for synonyms using the literature from the prior overview research. Since the outcomes only became relevant during the selection of the literature, one search strategy could be used for all outcome domains. In addition, grey literature was explored, including databases such as The International Network of Agencies for Health Technology Assessment (INAHTA) for Health Technology Assessment (HTA) guidelines, AWMF (Arbeitsgemeinschaft der Wissenschaftlichen Medizinischen Fachgesellschaften e. V.) medical guidelines, and a hand search in scientific journals and additionally in Google Scholar was conducted. After the systematic search mentioned above, reference lists of relevant publications were searched as well.

systematische Suche in PubMed, CINAHL, Web of Science, PsycINFO, Cochrane Library & Bibliothek der MUW

Suchbegriffe: Eltern, digitale Gesundheitstechnologien, Selbst-Identifikation, perinatale psychische Erkrankung

zusätzlich graue Literatur, Leitlinien, Handsuche, Google Scholar, Referenzlisten

2.4.2 Literature selection

Based on the criteria of the PRISMA 2020 statement paper [98], further steps were taken, and relevant studies and literature were selected according to the pre-defined inclusion and exclusion criteria.

PRISMA 2020 Studienauswahl nach Ein-/Ausschlusskriterien

Screening

As a first step of the screening process, the search results detected in the named databases were transferred to the citation and reference management tool EndNote Web (Clarivate Analytics, Philadelphia, PA, USA), and duplicates were removed through the automated deduplication program Deduklick. In the next step, the remaining records were transferred to the research and collaboration platform Rayyan [107] for screening. Some more duplicates were removed through artificial intelligence and manual human selection (Hafner Sophie HS) at Rayyan. Titles and abstracts were independently screened by the lead author (HS) and a second reviewer (Hidaka Yui HY) to determine eligibility. To reduce the risk of bias, these processes were computer-aided and blinded to each other's decisions by Rayyan. This screening process was initially pilot tested with the first 30 studies (in alphabetical order) in a blinded mode. The results were then discussed, and inconsistencies clarified. The remaining studies were screened in a blinded mode as well and unblinded at the end of the process. Disagreements were first discussed between the reviewers and, in the event of further discrepancies, discussed in a meeting with a third researcher and scientific supervisor (Zechmeister-Koss, Ingrid - ZKI). Subsequently, all eligible papers according to the inclusion and exclusion criteria were transferred into a Microsoft Excel spreadsheet for full-text screening, where the literature reference for each study was recorded. The full-text screening was then performed in a blind manner again by the lead author (HS) and the second reviewer (HY). Each study was assigned a unique number in the table, the study design was noted, relevant comments and outcome domains were recorded, and finally, a decision was made whether the study should be included or excluded from the review, with the respective reason for exclusion documented. This procedure was piloted as well, for the first three studies by HS and HY. After screening all texts, the data was deblinded and discussed between HS and HY. If there was disagreement between the two researchers, the third researcher and scientific supervisor (ZKI) was involved in the discussion, and the final inclusion of the studies for the review was determined. Each article excluded in the full-text screening is presented in A2 Table of excluded studies after full text screening in the appendix with the reason for exclusion.

EndNote + Deduklick: Duplikate entfernt

Rayyan: KI + manuell gescreent, verblindet durch 2 Reviewer (HS, HY)

Pilottest: 30 Titel/Abstract, Diskussion bei Uneinigkeit

Volltext-Screening in Excel, verblindet, Pilottest: 3 Volltexte

Uneinigkeiten von drittem Reviewer (ZKI) geklärt

Ausschlüsse mit Begründung im Appendix (A2)

Essential information was lacking in three papers; therefore, the corresponding authors were contacted and asked to provide supplements. A response was given by two of the three authors.

3 Autor:innen kontaktiert wegen fehlender Infos, 2 Rückmeldungen erhalten

2.5 Data extraction table

Outcome data was extracted into another Microsoft Excel spreadsheet for study characteristics, components, and results. This step was performed by the author (HS) and checked by the two scientific supervisors (HY, ZKI).

Datenextraktion in Excel von HS, Kontrolle von HY & ZKI

The following data items were collected and integrated into the data extraction table:

- Study characteristics: This category includes author(s), year, country, study objective, method, including the study design[3], setting, study period, follow-up, provider, developer, funding, and conflict of interest.
- Characteristics of participants are described in the table through sample size, age, perinatal period, and inclusion/ exclusion criteria
- Study components: In this section, the study intervention, features of the digital self-assessment tool and the stage of self-identification are characterised. For this classification, a scale was created, ranging from 1 to 3, to categorise the tools according to their characteristics and functions regarding self-identification (Table 2). Further aspects explored were the availability of information for further help, emergency information, recommended pathways, and involvement of professionals. Further, comparators if the study had any, outcome parameters, type of perinatal mental illness and tools for assessing the risk of the mental illness, additional tools that were used in some of the studies and the positive test rate are also presented in the data extraction table.

Studiencharakteristika: Autor:in, Jahr, Land, Methode, Design, Setting

weitere Charakteristika wie Stichprobe, Alter etc.

Studienkomponenten: Intervention, Tool-Merkmale, Stufe der Selbstidentifikation (Skala 1–3).

weitere Aspekte wie zusätzliche Hilfsangebote, Messinstrumente, etc.

Table 2: Scale for classification of the stage of self-identification

1	The tool represents complete self-identification by one's own motivation independently, without assistance. After the procedure, users get feedback.
2	Self-identification is independently performed without assistance. Explanations or training took place before the self-identification process.
3	The measure took place in an institution (e.g., at a healthcare facility) / somebody was available for assistance/ no feedback was given.

Results according to the review protocol: The results presented in the data extraction table were divided into primary results, focusing on the domains of effectiveness and safety, and secondary non-clinical findings, addressing the social, organisational, and legal domains. The social category was further split into availability and access, acceptance and usability, and ethical issues. The content aligns with the examined aspects defined in the inclusion and exclusion criteria.

Ergebnisse nach Protokoll: primär: Wirksamkeit & Sicherheit

sekundär: sozial, organisatorisch, rechtlich

This table was first pilot tested by using two randomly selected studies that were not included in this review. The spreadsheet was reviewed, discussed, and adapted by HS, HY and ZKI before the start of the thesis.

Pilottest an zwei nicht-inkludierten Studien

Data extraction was conducted as an iterative process where additional data items were added to the data extraction form when considered relevant to answering the research questions after description in the review protocol [108].

iterative Datenextraktion

relevante Ergänzungen

The full table (A3 Data extraction table) is presented in the appendix, and the summarised results are narratively described in Chapter 3.3 Data extraction.

vollständige Tabelle in Appendix

[3] For the classification of the study design the "*Tree of different types of studies*" by CEBM was used as already mentioned [106]

2.6 Synthesis

A narrative synthesis of the findings is provided from all the included studies in the chapter results. The synthesis was intended to be structured around the categories of outcomes (primary: effectiveness and safety, secondary: social, organisational, legal). Since heterogeneity in studies and outcomes was expected, a meta-analytical calculation would have been inappropriate. If homogeneous data on the primary outcomes had been found, a meta-analysis would have been possible later, after the completion of the master's thesis.

Ergebnisse als narrative Synthese

Meta-Analyse wegen Heterogenität nicht durchgeführt

2.7 Quality assessment of studies

As part of the systematic review, the evidence included for the primary outcomes was assessed according to its quality. The quality and risk of bias were evaluated by the author (HS) by using critical appraisal tools, depending on the design of the respective included clinical study. Additionally, this assessment was checked by the second reviewer (HY). The findings were discussed between the two reviewers and are finally presented in the results section in the chapter "Critical evaluation of study quality".

Qualitäts- und RoB-Bewertung der Primärstudien

in eigenem Kapitel präsentiert

As the inclusion criteria for the primary outcomes included nRCTs, prospective cohort studies and systematic reviews in addition to RCTs, the respective instruments were predefined in the review protocol. The Risk of Bias Tool 2 (RoB2) [109] was considered to assess RCTs, and the Risk of Bias in Systematic Reviews (ROBIS) tool [110] for systematic reviews. For other study designs, it was initially planned to select the appropriate tool from the Critical Appraisal Skills Programme (CASP) checklists.

RoB 2 für RCTs, ROBIS für Reviews, CASP-Checklisten für andere Designs verwendet

During the review process, for the evaluation of non-randomised controlled trials and cohort studies, additionally, the use of the ROBINS-I tool (The Risk Of Bias In Non-randomised Studies - of Interventions) [111] and the QUADAS-2 tool (Quality Assessment of Diagnostic Accuracy Studies 2) [112] were considered. These modifications are also mentioned in the adjustments to the review protocol.

zusätzlich für nRCTs und Kohortenstudien ROBINS-I & QUADAS-2 genutzt

The considered instruments are briefly described as follows:

Risk of Bias Tool 2

RoB2 was developed in 2019 from its 1st version called the Risk of Bias Tool (2008). It is designed to assess the quality of individually randomised parallel-group trials, although there is already a test version for cluster-randomised trials and randomised cross-over trials. The RoB2 tool consists of a total of five domains to evaluate trials for risk of bias in relation to the randomisation process, intervention procedure, missing data, outcome measurement and selection of published results. For each domain, there are one or more signalling questions. Finally, the quality of the study can then be assessed as "low risk of bias", "some concerns" or "high risk of bias". The aim is then to finally summarise these categories and, for example, present them in a forest plot, table or figure [99, 109].

RoB2 (2019), prüft RCTs auf Bias in 5 Bereichen:

Randomisierung, Intervention, fehlende Daten, Messung, Ergebnisauswahl

Bewertung: low risk, some concerns, high risk

Risk of Bias in Systematic Reviews

The ROBIS tool was developed to assess the risk of bias in systematic reviews, particularly within healthcare settings.

ROBIS für RoB in SRs

It is structured in three phases, whereby phase 1 is optional: (1) assess relevance, (2) identify concerns with the review process, and (3) judge risk of bias. The latter two phases include signalling questions to help with the assessment. Phase 2 consists of a total of 4 domains, namely the eligibility of included studies, study selection, data collection and appraisal, and synthesis and results to examine systematic reviews for bias. In phase 3, the overall risk is then assessed based on the interpretation of the results and limitations from phase 2. The results are finally to be presented in graphics.

3 Phasen – (1) Relevanz, (2) Bias-Risiken in 4 Domänen (Eignung, Auswahl, Datenerhebung/ Bewertung, Synthese), (3) Gesamtbewertung & grafische Darstellung

The Risk Of Bias In Non-randomised Studies of Interventions

ROBINS-I (2016) is used to assess the risk of bias of non-randomised studies that examined the effect of interventions, which may include observational studies such as cohort or case-control studies. nRCTs often have a higher risk of bias than RCTs in many areas of healthcare, so precise assessment is necessary. The tool considers the bias of each nRCT against the ideal of an RCT and consists of seven domains. The user is again asked signalling questions to help with the assessment. Finally, an overall assessment is made as "low", "moderate", "serious", "critical" risk or "no information" [111].

ROBINS-I für RoB von nicht-randomisierten Interventionsstudien anhand von 7 Bereichen

Ergebnis: low, moderate, serious, critical oder keine Info

Quality Assessment of Diagnostic Accuracy Studies, Version 2

The QUADAS-2 tool is designed to assess the methodological quality of primary diagnostic accuracy studies. It is based on the 1st version, the QUADAS instrument, and consists of a total of four domains. These include the assessment of the risk of bias in patient selection, the index test, the comparison test, and the process, with applicability concerns also being assessed in the first three categories. Each study is finally rated using a descriptive scale indicating "low" or "high", or "unclear" risk of bias [112].

QUADAS-2 bewertet methodische Qualität von Primärstudien zu diagnostischer Genauigkeit in 4 Domänen

Critical Appraisal Skills Program

In addition to training courses and workshops, CASP also provides free checklists for the critical appraisal of various scientific literature. These include, for example, tools for evaluating RCTs, nRCTs, systematic reviews, qualitative studies, but also cross-sectional studies or cohort studies. The checklists basically consist of three main sections: relevance of the study, assessment of the quality of the study, and results and applicability, with around 10 questions.

CASP bietet Checklisten für RCTs, nRCTs, Reviews, etc.
Relevanz, Qualität, Ergebnisse & Anwendbarkeit

2.8 Adjustments made to the review protocol

According to the PRISMA 2020 statement and the Cochrane Handbook for Systematic Reviews of Interventions, it is generally relevant to adhere to the predefined review protocol. If changes are necessary, these must be explained transparently [98, 113]. In this case, minor changes to the review protocol were necessary regarding the description of the methodology.

kleine methodische Anpassungen vorgenommen

A fundamental change to the review protocol was the reformulation of the title and a phrase part of the research question from “Digital health technologies for self-identification of perinatal mental illness: a systematic review on user benefits and implementation aspects” to “Digital health technologies for self-identification of the risk of perinatal mental illness: A systematic review”. This resulted from the research and definition of the individual terms. It became clear that it is more about identifying a risk for the illness. A diagnosis of the disease cannot be made based on self-identification or screening alone.

Titeländerung

Begründung: Selbstidentifikation zeigt Risiko, keine Diagnose

Accordingly, this should already be correctly indicated in the title of the thesis, as well as in the wording of the thesis. Nevertheless, it was not expected that this reformulation could lead to a higher risk of bias. For the assessment of studies that are not randomised controlled trials or systematic reviews, an evaluation using CASP tools was initially defined.

Titel und Formulierungen angepasst, kein Bias erwartet

However, for the assessment of a prospective cohort study, the CASP tool appeared to be insufficient in terms of the quality of the critical evaluation, as other, more precise tools were available. Therefore, the ROBINS-I tool and the QUADAS-2 tool were taken into consideration. The study concerned was analysed in more detail, and finally, the QUADAS-2 tool was used, as it evaluates the risk of bias and applicability of primary diagnostic accuracy studies. This change to the review protocol was discussed in the research team and was not expected to introduce bias.

für Kohortenstudie QUADAS-2 statt CASP verwendet

kein Bias erwartet

Furthermore, during the screening process of the studies, it was noticed that the exclusion criteria regarding the study design were not fully defined in the review protocol. For the domain's effectiveness and safety, only RCTs, nRCTs, prospective cohort studies and systematic reviews were to be considered. According to the exclusion criteria on the primary clinical outcomes, non-systematic reviews, narrative reports, opinions, case studies, and studies presented as abstract only should not be included in this systematic review. However, as some study designs were not mentioned in either the inclusion or exclusion criteria, the exclusion criteria definition derived from the inclusion criteria should be as follows: “all other study designs”. For all other secondary outcomes, the inclusion of all study designs remained without restrictions.

Protokoll ergänzt um Ausschluss aller anderen Designs für Primärendpunkte

kein Bias erwartet

When describing the comparison group in the PICO(S) table, it was noticed that no exclusion criteria were specified in the review protocol. They were finally supplemented for the thesis with the definition “interventions with other digital technology” in accordance with the inclusion criteria as well.

Vergleichsgruppe präzisiert: Ausschluss anderer digitaler Technologien

Those changes were purely made for clarity and did not lead to any change in the conduct of the review. Therefore, no increased risk of bias is expected.

Änderungen nur zur Klarstellung, kein Einfluss

3 Results

3.1 Literature search & selection

A systematic literature search was conducted on July 1st, 2024, using the predefined search strategy in databases, as already described in the methods chapter "Systematic literature search". A total of 2764 hits were initially found using the systematic literature search, although 824 were identified as duplicates by using Deduklick. One article, which eventually turned out to be a conference paper, was additionally excluded because it was not available and did not meet the inclusion criteria. The remaining hits (n = 1937) were imported into Rayyan, where further duplicates were identified by the program and the author (Artificial Intelligence n = 5, human n = 23). After removing these duplicates, a total of 1909 articles were reviewed based on their titles and abstracts, resulting in 40 articles that appeared suitable for this review according to the inclusion and exclusion criteria. A parallel manual hand search yielded a further 20 hits, of which six articles were considered for inclusion. The full-text search was carried out with a total of 46 studies. Five studies could be included from the systematic literature search in databases, and two were identified through the manual hand search. The excluded studies are presented in the appendix (A2: Table of excluded studies after full text screening) with the reason for exclusion.

systematische Suche: 2764 Treffer, 824 Duplikate (Deduklick), 1 Konferenzpaper ausgeschlossen.

in Rayyan weitere Duplikate bereinigt

46 Volltexte nach Handsuche

Ausschlüsse mit Begründung in Appendix A2.

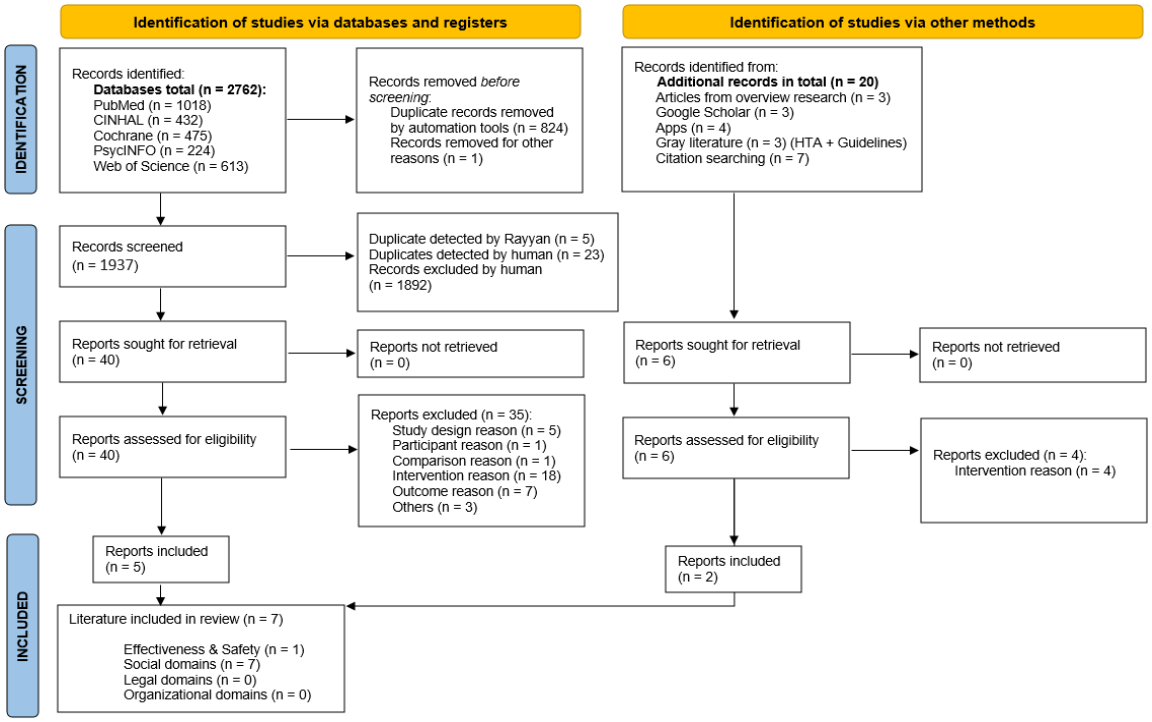

Figure 1: PRISMA Flow Diagram (based on [114])

3.2 Included studies

One clinical study met the criteria for the primary research domains, effectiveness and partly safety, and five descriptive clinical studies focused on the social domains, acceptance and usability. One non-clinical study that was identified through manual hand search focused on the issue of ethics. The following six clinical studies and one review were therefore the subject of this review and are presented in Table 3.

insgesamt 7 Studien:
6 klinische +
1 nicht klinische

Table 3: Included studies for this review.

Authors (Year)	Title	Study design	Researched domain (according to the review)	Aim
Primary Outcomes				
Lawson et al. (2019)	Use of text messaging for postpartum depression screening and information provision	is not specified. Seems to be a prospective cohort study	Effectiveness, safety	Evaluation of the feasibility of an intervention for screening for postnatal depression and providing information through text messages.
Secondary Outcomes				
Daehn et al. (2023)	SmartMoms - a web application to raise awareness and provide information on postpartum depression	Mixed methods study	Social: availability & access, acceptance & usability	Evaluation of the feasibility of the web app SmartMoms, and users' and health professionals' experiences and the user behaviour.
Eisner et al. (2022)	Digital screening for postnatal depression: mixed methods proof-of-concept study	Mixed methods study	Social: availability & access, acceptance & usability	Evaluation of the smartphone app ClinTouch DAWN-P, concerning feasibility, acceptability & usability, usage patterns, safety and the validity of app-based postnatal depression screening compared to paper-based procedure.
Lawson et al. (2019)	Use of text messaging for postpartum depression screening and information provision	is not specified. Seems to be a prospective cohort study.	Social: availability & access, acceptance & usability	Evaluation of the feasibility of an intervention for screening for postnatal depression and providing information through text messages.
Nurbaeti et al. (2021)	Developing an Android-based application for the early detection of postpartum depression symptoms in Indonesia	Cross-sectional design	Social: availability & access, acceptability & usability	Development and implementation of the tes depresi app by using the ADDIE Model (Analysis, Development, Design, Implementation, and Evaluation).
Reilly & Austin (2021)	Attitudes and Engagement of Pregnant and Postnatal Women with a Web-	Cross-sectional design	Social: availability & access, acceptability & usability	Evaluation of the web-based tool Mummatters concerning its acceptability, risk profile of users, credibility, perceived effect, motivational appeal,

	Based Emotional Health Tool (Mummatters): Cross-sectional Study			and help-seeking behaviours and barriers.
Highet et al. (2019)	Perinatal mental health and psychosocial risk screening in a community maternal and child health setting: evaluation of a digital platform	Descriptive cohort design	Social: availability & access, usability	Evaluation of the digital screening platform iCOPE.
Fonseca et al. (2024)	The use of e-mental health tools in the perinatal context	Mixed methods study	Social: ethics	In this article, the authors discuss the current literature on digital health technologies for the prevention and treatment of perinatal mental disorders. Diverse types of digital health technology are described, benefits are highlighted, negative aspects are discussed, and future relevant research topics are mentioned.

Justification

The study by Daehn et al. (2023) [84] was selected for inclusion as it explored both users' and healthcare professionals' experiences with the SmartMoms web-app, alongside analysing user behaviour and experience in the context of self-identifying the risk for postnatal depression. The intervention was fully remote and self-guided, offering valuable insights into autonomous use. The inclusion of psychoeducational videos was discussed in the research team in the context of study criteria for inclusion and exclusion. Considering the study's objectives, this feature was not regarded as directly or primarily influential on the outcomes and was therefore classified as a study for research of the secondary endpoints. This assessment is further supported by the observation that the video page was the least visited section within the app [84].

Daehn et al. 2023: SmartMoms-Web-App, Erfahrungen von Usern und Fachkräften

Fokus auf Selbstidentifikation postnataler Depression

Einstufung als Studie zu sekundären Endpunkten.

The mixed methods study by Eisner et al. (2022) [68] is included in this systematic review as it evaluated the acceptability, usability, and usage patterns of the ClinTouch DAWN-P app. The digital health intervention was exclusively for study participants. As they did not receive their results directly, the inclusion of this study was discussed. The inclusion decision is based on the self-identification intervention and the indirect information about the results through a general practitioner in case of substantial risk for self-harm. It also partly addressed effectiveness, in the form of validity and safety, but did not meet the restricted criteria for study design as it is a mixed methods study, in which the quantitative part consisted of a cross-sectional design [68].

Eisner et al. 2022: ClinTouch DAWN-P App, untersuchte Akzeptanz, Nutzbarkeit und Nutzung.

Design: Mixed Methods mit Querschnittsteil.,

Wirksamkeitsteil deshalb ausgeschlossen

The use of a text messages intervention was evaluated according to its feasibility, including the agreement of an index and comparison gold standard instrument, partly security, as well as user engagement and acceptance in Lawson et al.'s (2019) [96] study. The outcomes for agreement were not clearly defined. However, as the parameters' sensitivity, specificity, the negative predictive value, and the positive predictive value were analysed in this study and used to assess diagnostic accuracy as measures of effectiveness for this review, these were assigned to the endpoint effectiveness. Inclusion was discussed and found to be appropriate, as the measure represents a form of self-identification. When receiving text messages during the study period, each woman could decide for herself whether she wanted to answer the questions or not. Although participants did not receive direct feedback, they were offered a psychiatric appointment if they were at increased risk [96].

Lawson et al. 2019: SMS-Intervention, geprüft auf Machbarkeit, Akzeptanz & Engagement, tw. Sicherheit,Effektivität

Aufnahme wegen Selbstidentifikation; bei Risiko Angebot eines Termins

The study by Nurbaeti et al.(2021) [16] dealt with the development of their app Tes Depresi, but also with the introduction and evaluation of it. The latter aspect was used for this review. Although the app was installed with the help of research staff, the risk assessment was carried out by self-identification and direct feedback was also received [16]. One discussion point was that the authors did not define the postnatal period in weeks, months, or years. Since the most common definitions refer to the postnatal period within one year after birth, this could also be assumed after a discussion in this study [26-28]. Therefore, this paper was identified as suitable according to the inclusion and exclusion criteria.

Nurbaeti et al. 2021: Tes Depresi - App,

Selbstidentifikation mit direktem Feedback.

postnatale Phase nicht definiert, nach Diskussion eingeschlossen

The aim of the study by Reilly & Austin (2021) [115] was to investigate the user experience, including aspects of acceptability and usability of the web-based tool Mummatters. The participants were recruited directly via the tool, completed questionnaires on the risk assessment of perinatal depression and psychosocial risk and received direct feedback. One point of discussion was the inclusion of participants in the study, even after one year postpartum. The range was up to 178 weeks postpartum, but was deemed acceptable as the average was 15.28 weeks postnatal during digital technology use [115]. The study, therefore, could be included in this review.

Reilly & Austin 2021: Webtool „Mummatters", untersucht Nutzung, Akzeptanz & Usability

Einschluss trotz Teilnahme bis zu 178 Wochen postnatal, da Durchschnitt 15 Wochen

Highet et al.'s (2019) [116] study on the digital screening platform iCope was also included in the review as it evaluated the digital health tool and provided findings on usability. Although the intervention took place in a hospital waiting room, it was conducted as a self-identification process. It was noted in the article that assistance from healthcare staff was possible, but no such cases were reported in the results. This aspect was discussed and deemed acceptable [116].

Plattform „iCope", digitale Selbstidentifikation im Wartebereich

keine dokumentierte Hilfe durch Personal

The additional article by Fonseca et al. (2024) [117] was included after a hand search, due to its thematic discussion of the ethical issue of digital health technologies for self-identification of the risk of perinatal mental illness, among others.

Fonseca et al. 2024: Handsuche, Diskussion ethischer Aspekte digitaler Selbstidentifikation

3.3 Data extraction

For a well-structured and detailed breakdown of the data from the six included clinical studies, a Microsoft Excel spreadsheet was created for primary and secondary outcomes (Table A3 in the Appendix). In this step, the results were entered by HS and finally discussed, evaluated, and revised with the two scientific supervisors, HY and ZKI.

Daten der Studien in Tabelle A3 im Appendix

Erhebung durch HS, Diskussion mit HY, ZKI

A separate table (Table A4 in the Appendix) was created for a clear presentation of the additional review, which is not a clinical study. All data extraction tables can be found in the appendix and are described in narrative form below.

zusätzliche Tabelle für nicht-klinischen Review in Tabelle A4 im Appendix

3.3.1 Study characteristics

The included papers were published between 2019 and 2024. The six studies were conducted in various parts of the world, namely in Germany, the United Kingdom, Canada, Indonesia, and Australia [16, 68, 84, 96, 115, 116].

Publikationsjahre 2019–2024,
Orte: D, UK, CA, AUS, ID

The study types were in two cases mixed methods designs [68, 84], two cross-sectional designs [16, 115] and one descriptive cohort design [116], as presented in *Figure 2*. For the two mixed methods studies, interviews were conducted. Daehn et al. (2023) [84] carried out interviews with healthcare professionals at the conclusion. In the study from Eisner et al. (2022) [68], interviews were conducted with both participating women and their partners. In one study [96], the design was not specified, which is why the author HS and the second reviewer HY classified it as a prospective cohort study after a detailed review and according to its appearance. The additional paper is a review [117].

verschiedene Designs:

Mixed Methods, Querschnitt, deskriptive und prospektive Kohorten

Eisner et al. 2022 Zuordnung als prospektive Kohortenstudie

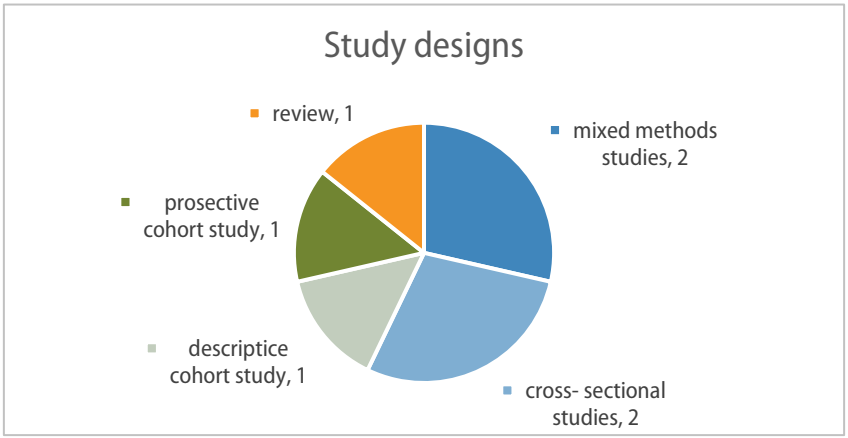

Figure 2: Study designs of the included studies

Setting

The recruitment settings were predominantly healthcare facilities or healthcare providers (such as clinics or midwives) (n = 5) [16, 68, 84, 96, 116], with two studies additionally utilising social media for participant recruitment [68, 84]. Notably, only one study recruited participants directly through its web-based platform [115].

Rekrutierung meist über Gesundheitseinrichtungen oder Social-Media bzw. Webtool

Since the interventions focused on digital health technologies, almost all (n = 5) were conducted remotely, making them independent of location. An exception was one study, which carried out the intervention within the waiting room of a clinic [116].

meist digital
Ausnahme: Wartezimmer-Studie

Study duration

The studies lasted between six and eighteen months, although the duration and timing of one study were not clearly mentioned in the paper [68]. Follow-up surveys were also conducted in two of the studies [96, 115]. This follow-up period ranged from 1 month [115] to 13 weeks [96].

Studiendauer: 6-18 M.

Follow-Up: 1 M.-13 W.

Participants

The number of participants across five of six studies varied significantly, ranging from 109 to 937 women. One mixed methods study included a smaller sample of 15 women and eight partners, making it the only study to involve partners as well [68]. The number of participants of all included studies is depicted in detail in *Figure 3*.

Teilnehmer:innen: n= 23-937; 1 Studie mit Partner:innenbeteiligung

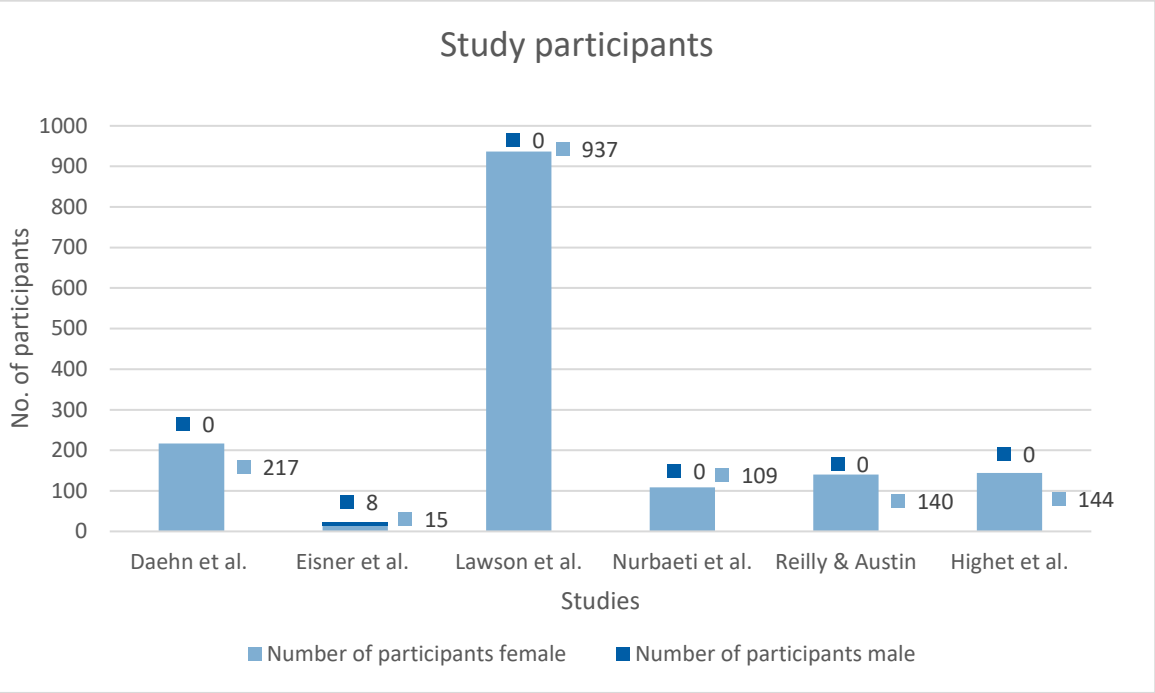

Figure 3: Study participants of the included studies

The average age of participants spanned between 30.68 and 33.8 years. Four studies focused on women in the postnatal period, while two also included the antenatal period [68, 115]. Additionally, one study incorporated health professionals [84].

Durchschnittsalter: 30,7–33,8 J.

Not all studies provided specific details about the weeks of pregnancy or the postpartum period. *Figure 4* visualises the perinatal periods of the included literature as follows: One study defined its population as women in the postnatal phase without further specification [16], while another included participants ranging from 1 week to 178 weeks postnatal [115]. Both studies were ultimately included after consultation with the scientific supervisor: in the first case, participants could be reasonably categorized as postnatal (commonly defined as up to one year after birth) [16], and in the second, the average number of weeks postpartum was 15.28 weeks and seemed therefore acceptable [115]. In the remaining studies, the postnatal period ranged from 0 to a maximum of 12 months after birth (n = 4) [68, 84, 96, 116], with most studies (n = 3 of 4) concluding at around 12 weeks postpartum [68, 96, 116]. Among the antenatal studies, one included pregnant women from the 4th to the 40th week of pregnancy [115], while the other involved participants from the 36th week of pregnancy until birth [68].

4 Studien postnatal, 2 auch antenatal, 1 mit Fachkräften

Zeitpunkt tlw. nicht näher spezifiziert

postnatale Periode in einer Studie von 1 W. – 178 W. nach Geburt

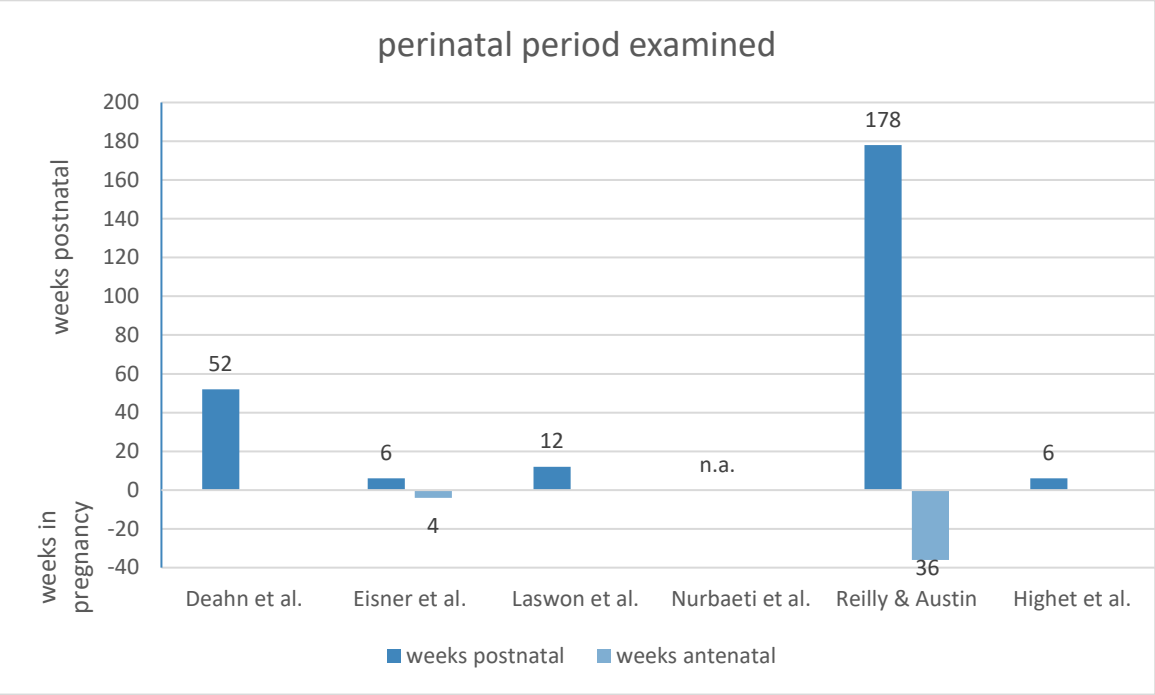

Figure 4: Perinatal period examined in the included studies

Inclusion/exclusion

The common prerequisite for participation in all studies was informed consent. Some studies defined inclusion criteria by a minimum age of 18 or older [68, 96], by planned delivery in a defined clinic [68, 96, 116], by understanding the local language [16, 68, 96, 115] or residence in the respective country [115]. Ownership of a smartphone [16] or access to an internet connection [115] was a technical prerequisite for participation in two studies. In one study, only women with no history of mental illness were included, as well as only women who were married [16]. In another study, women in active psychiatric treatment were excluded after baseline assessment [96].

Ein- und Ausschlusskriterien für Teilnahme mit vielen Gemeinsamkeiten aber auch Unterschieden

3.3.2 Study components

Study intervention

Socio-demographic data was collected in all studies except one [116]. In one study, women were informed about the app and guided through the download process during a home visit by the researchers [16]. For the intervention conducted in a clinic waiting room, clinic staff were trained beforehand and were available to help with any questions [116].

sozialdemografische Daten meist erhoben

tlw. Unterstützung bei App-Installation

Most studies (n = 4) focused on assessing the risk of postnatal depression through self-identification using a standardised instrument[16, 68, 84, 96]. In two studies [115, 116], self-identification extended to include psychosocial risk factors, and in one of them, additionally, the risk of antenatal depression was explored as well [115]. These study characteristics are illustrated in *Figure 5*.

4 Studien zu postnataler Depression per Selbstidentifikation

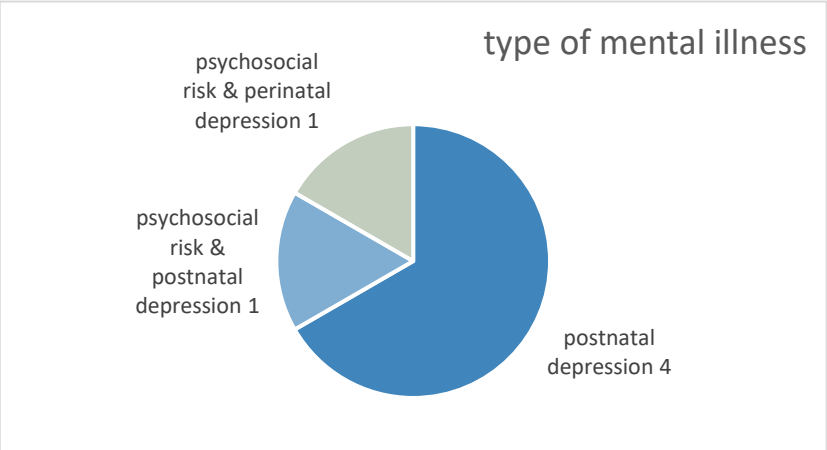

Figure 5: Type of mental illness examined

While two studies provided their digital health technology intervention for a one-time survey [16, 116], two others intended their examined web-app or web-based tool for at least one self-identification assessment, with the option to use it more often [84, 115]. Eisner et al. (2022) [68]included participants in their study if they used the self-identification survey at least once, but the intervention was designed for daily use for six to twelve weeks. Similarly, the text-message intervention in the Lawson et al. (2019) [96]study was intended to respond biweekly for twelve weeks, but the inclusion criteria were to take part once.

Intervention teils einmalig, teils wiederholt nutzbar

Bsp. SMS-Studie: Austausch alle 2-Wochen

Digital health technology

Two studies utilised mobile applications as the medium for their digital health interventions [16, 68], one employed a web-based application[84], one a web-based tool [115], another a web platform [116], and one relied on text messaging [96]. Looking at *Figure 6*, the heterogeneity of the study interventions becomes clearer.

2 Studien zu Apps, je 1 zu Web-App, Web-Tool, Web-Plattform & SMS

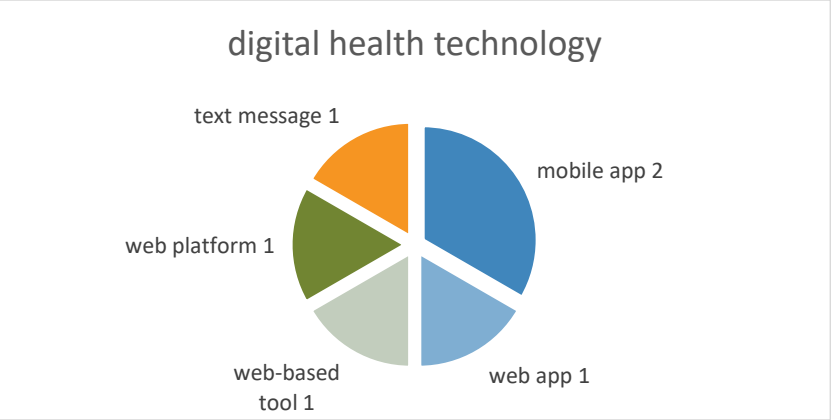

Figure 6: Types of digital health technology used as interventions

These digital health measures were further classified based on the degree of self-identification that they enabled, ranging from 1 (complete self-identification initiated by the user) to 3 (interventions prompted in an institution, with potential assistance available for questions or missing feedback). Two studies could be assigned to category 1 [84, 115], one to classification 2 [16, 68], and three to classification 3 [68, 96, 116]. The respective classification is presented in *Table 4* for a simplified overview.

Selbstidentifikation:

komplett selbstinitiiert vs. Nutzung mit anfänglicher Unterstützung vs. unterstützt

Table 4: Study-classification of the stage of self-identification.

Article	Classification	Type of tool (justification)
Daehn et al., 2023	1	Web-app
Eisner et al., 2022	3	App (no direct feedback)
Lawson et al., 2019	3	Text Messages (no direct feedback)
Nurbaeti et al., 2021	2	App (explanations before usage)
Reilly & Austin, 2021	1	Web-based tool
Highet et al., 2019	3	Web platform (somebody was available for assistance while answering the questions)

Some apps included additional features to enhance user engagement. For instance, one app provided short educational videos, information about perinatal mental illnesses, and details on accessing further support [84]. Another offered a reminder function [68], while a third enabled users to create a personalised wellness action plan [115]. In one study, participants received informal text messages about perinatal mental illness as a supportive feature [96].

Zusatzfunktionen: Video & Infos, Erinnerungen, Wellness-Plan, begleitende SMS

Instruments for assessing mental health state

The valid and reliable EPDS questionnaire was used in four studies to assess the risk of perinatal mental health [16, 68, 84, 116]. In the study by Nurbaeti et al. (2021) [16], the EPDS was used in a different language - Indonesian - and adapted with two additional questions. In one study, the EPDS only served as a reference measurement instrument in paper form compared to the questions of the PHQ-2 instrument in text form [96]. The Whooley questions and ANQR were used in another study instead of EPDS to identify the risk of perinatal depression and psychosocial risk [115]. To additionally examine the psychosocial risk, the participants in the study by Highet et al. (2019) [116] completed self-composed questions. These instruments used in the studies are visualised in *Figure 7*.

4 Studien nutzten EPDS-Fragebogen

1 Studie nutzte Whooley-Fragen stattdessen

Instrumente in Abbildung 7

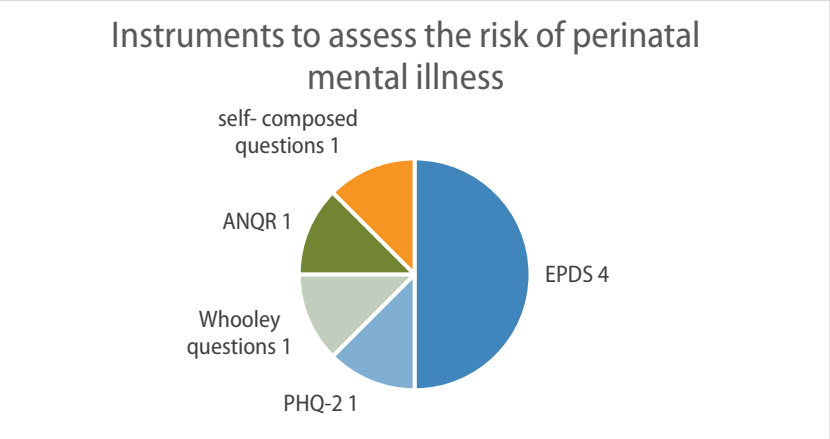

Figure 7: Instruments to assess the risk of perinatal mental illness

The cutoff for EPDS was in most examinations ≥ 12 points. One study used a different cutoff score set at greater than 12 points [116] while another one used a cutoff score of 15 points or higher for pregnant women [96]. PHQ-2 cutoff was defined with ≥ 2 points on one or both questions [96]. The Whooley questions' cutoff for being screened positive was described as answering at least one of the first two questions with “yes”, and ANQR’s cutoff was defined as 23 or more score points [115].

cutoff für EPDS: meist ≥ 12, für Schwangere auch ≥ 15

cutoff für Whooley: ≥ 1× Ja-Antwort

Test results

Feedback on the results was provided in four of the studies [16, 84, 115, 116]. In the study by Highet et al. (2019) [116], participants received a summary of a risk report only upon request, whereas in the other studies, the score and corresponding recommendations were delivered automatically to the participants [16, 84, 115]. In two studies, participants did not receive their results directly. However, researchers in the study by Eisner et al. (2022) [68] had access to the data, and in cases where there was a risk of self-harm, the findings were forwarded to the participant’s general practitioner with their permission. Similarly, in the research of Lawson et al. (2019) [96], participating mothers were not provided with their results, but those who were positive tested were offered an appointment with a perinatal psychiatrist.

Feedback in 4 Studien

in einer Studie nur auf Nachfrage

kein direktes Feedback bei 2 Studien

Terminangebot bei positivem Befund

Further information

Information about further support following self-identification was provided in four studies [16, 84, 115, 116].

weitere Unterstützung in 4 Studien

Emergency contact information was specifically offered in one study [84], while guidance on organisational pathways was included in two digital health tools [16, 116], whereby this information for the one researched by Highet et al. (2019) [116] could only be found on their homepage.

Notfallkontakte, Versorgungswege tlw. angeboten

Healthcare professionals were involved or had the potential to be involved in four studies [68, 96, 115, 116]. Responses to participant results were managed by clinicians or general practitioners in three studies [68, 115, 116].

Fachkräfte in 4 Studien involviert

Comparator

A comparator was included in two of the included papers [68, 96]. In one study [68], the same participants completed the EPDS screening both through the application and using a paper-based form, which they filled out twice during the study. This was only part of this research, not the main purpose. The other study compared women who tested positive with PHQ-2 text messages with women who tested negative in the same form by being interviewed via telephone and asking them the EPDS questions [96].

Vergleichsgruppen in 2 Studien

digital vs. Papier

SMS vs. Anruf

Outcome

The primary outcome of effectiveness was investigated in two studies, while safety was partly addressed in those studies [68, 96]. However, it should be noted here that the study by Eisner et al. (2022) [68] had to be excluded for the primary outcomes due to the inclusion and exclusion criteria regarding the study design. The social domain, focusing on acceptance and usability, was explored across all included studies (n = 6). This encompassed user behaviour [84], usability [16], user experience [68, 84, 96, 115], and user engagement [68, 96, 116]. Additionally, the experience of healthcare professionals involved in the study was examined as an outcome in one study [84]. Social ethical aspects were the subject of review by Fonseca et al. (2024) [117]. Other outcomes included feasibility [68], rates of depression, anxiety, and psychosocial risk [116], as well as issues related to requests for help [115, 116], which, however, were not the subject of this thesis. The further secondary outcomes regarding legislation and organisational aspects were not described in any study.

Wirksamkeit in nur 2 Studien untersucht

soziale Domäne (Akzeptanz, Nutzbarkeit, Nutzung) in allen Studien adressiert

keine Daten zu rechtlichen & organisatorischen Aspekten

3.3.3 Study results

Primary Outcomes

Results effectiveness

One study met the inclusion and exclusion criteria and evaluated the effectiveness of a digital health tool for self-identification [96].

1 Studie zu Wirksamkeit

The aim of this research by Lawson et al. (2019) [96] was to evaluate the feasibility, including measuring the agreement between the intervention of biweekly text message self-identification based on the PHQ-2 questionnaire for the detection of risk for postnatal depression and EPDS questions as a reference instrument. In case of a positive test result in the PHQ-2 text message assessment with a cutoff value of 2 or more points in one or both questions, EPDS screening was carried out via a telephone interview in the following days, which was also conducted with a matched group of negative participants. An analysis was performed using Cohen's Kappa and a 95% confidence interval [96].

Lawson et al. 2019: SMS-Selbstidentifikation (PHQ-2) alle 2 Wochen

bei positivem Ergebnis: EPDS-Telefoninterview

Vergleich mit negativ Getesteten

Fair agreement was found between the PHQ-2 text messages and the EPDS interview with a kappa coefficient of 0.37 [96] according to the Landis & Koch [118] evaluation. Further parameters, such as sensitivity, specificity, positive and negative predictive value, were also calculated. The specificity was 0.93 (95% CI = 0.91-0.94), while the sensitivity was 0.49 (95% CI = 0.38-0.61). This means that the new PHQ-2 text message measure could correctly identify 93% of actual non-cases but could not identify 51% of positive cases (according to the gold standard test). 7% of cases would therefore receive a false-positive result [96]. This comparison resulted in a positive predictive value of 0.38 (95% CI = 0.31-0.46) and a negative predictive value of 0.95 (95% CI = 0.94-0.96). With a positive predictive value of 0.38, 38% of the participants with a positive PHQ-2 text message test result would have been actually ill. In conclusion, 62% of the screened persons could be classified as false positives. With the assumed confidence interval of 95%, the true value was calculated to be between 54% and 69%. Conversely, the negative predictive value was 0.95 (95% CI = 0.94-0.96), which means that 95% of the probands with a negative risk assessment by PHQ-2 would have been healthy. With an assumed confidence interval of 95%, the true value was between 6% and 4% of negative test results, which would be false-negative by inference[96]. Since a minimum of 0.70 for specificity and sensitivity was assumed by the authors, this result would not be acceptable to reflect the accuracy of the screening. However, after adjusting the cutoff score from 2 points or more per question to 2 or more in total, a more balanced specificity of 0.82 (95% CI = 0.79-0.85) and a sensitivity of 0.90 (95% CI = 0.81-0.96) could be calculated. The positive predictive value in this scenario was 0.32 (95% CI = 0.29-0.36), and the negative predictive value was 0.99 (95% CI = 0.98-0.99) [96]. The adjustment resulted in a Kappa Value of 0.45, which according to Landis and Koch [118] indicates a moderate agreement between the PHQ-2 index test and EPDS reference test [96].

Ergebnisse:
PHQ-2 (SMS) vs. EPDS

Kappa 0,37
Spezifität 0,93,
Sensitivität 0,49

viele falsch-negative Ergebnisse, 7% falsch-positive Ergebnisse

positiver Vorhersagewert 0,38 (62% falsch-positiv), negativer Vorhersagewert 0,95

Genauigkeit durch Cutoff-Anpassung auf 2 verbessert
Spezifität 0,82
Sensitivität 0,90

positiver Vorhersagewert 0,32, negativer Vorhersagewert 0,99
Kappa 0,45

Regarding the consistency with a clinical diagnosis, 126 women were tested positive in the PHQ-2 screening, of which ten were already undergoing psychiatric treatment. All women who tested positive were offered an appointment with a psychiatrist, and a total of thirty-one women attended at least once. Postpartum depression was diagnosed in ten women, postpartum psychiatric illness in eleven women and significant psychiatric symptoms in three women. No further data was available for forty-six women, as they were not accessible, did not show up for the appointment or did not receive a diagnosis [96].

126 positiv (PHQ-2) - 10 bereits in Behandlung

31 haben mind. ersten Termin wahrgenommen

46 Teilnehmerinnen ohne weitere Daten

Apart from diagnostic accuracy, neither this study nor any other study found results regarding the effectiveness of digital health technologies for self-identification according to the predefined inclusion and exclusion criteria.

keine weiteren WIrksamkeitsdaten

Results safety

The aspect of safety was only partly researched in one study in the form of false-positive rates [96].

Sicherheit nur zum Teil in einer Studie untersucht

As described above regarding the clinical consistency of diagnosis, 126 of 937 women were tested positive by PHQ-2 Text Messages. While ten women were already in psychiatric treatment and twenty-four other women received a psychiatric diagnosis, a total of forty-six women were later identified as false positives.

Rate an Falsch-Positiven: 46/126

For a further forty-six women, the status could not be followed up, or a diagnosis could not be determined [96]. This data on patient safety is presented in percentages in Figure 8 by depicting the follow-up results of PHQ-2-positive tested women.

weitere 46 Frauen ohne Follow-Up oder Diagnose

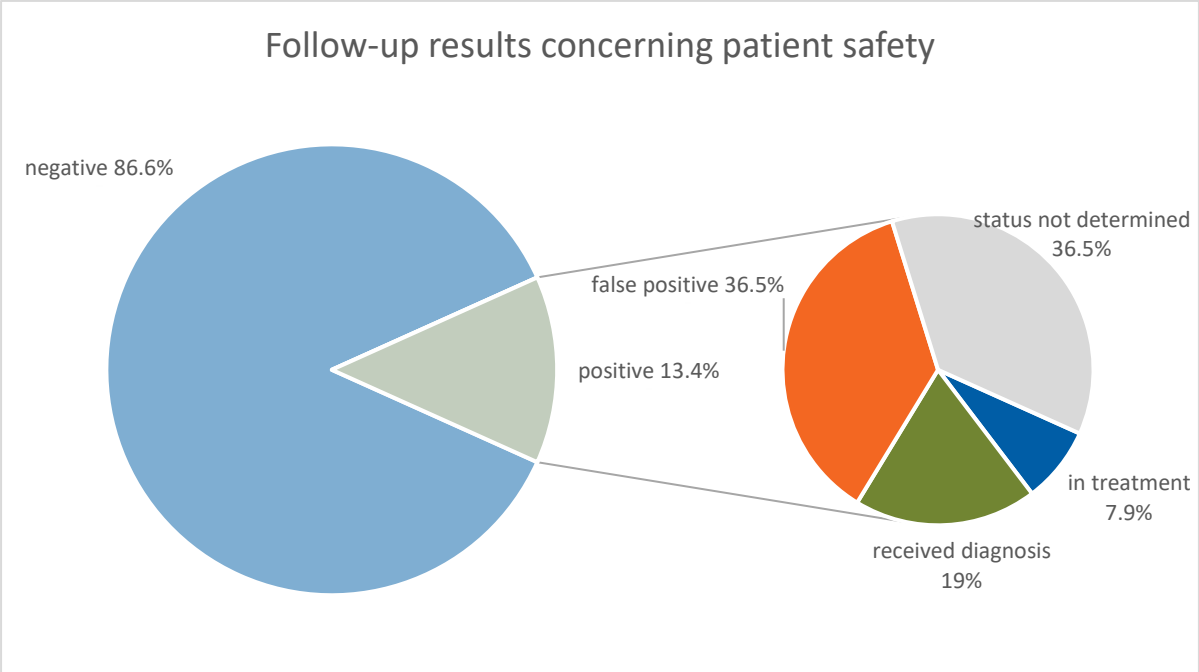

Figure 8: Follow-up results concerning patient safety. Data from Lawson et al. (2019) [95]

No further data on patient safety was available in the studies included, nor could other studies on this topic be identified according to the inclusion and exclusion criteria. But also, limited information on data safety and privacy policy could be found in the included study. This is mainly related to informed consent as a prerequisite for study participation.

keine weiteren Sicherheitsdaten, kaum Infos zu Datenschutz über Einverständnis hinaus

Secondary outcomes

Beyond these considerations, the secondary outcomes explored aspects of social, legal, and organisational subjects related to the digital tools assessed in the included studies.

soziale, rechtliche & organisatorische Aspekte

Results social

Availability and access

All six studies addressed the secondary outcome domain of availability and access. Two studies utilised mobile applications available in app stores [16, 68], though one app was only accessible via the Google Play Store and therefore not available for iPhone users [16].

Verfügbarkeit/Zugang in allen 6 Studien untersucht

The availability of the web-based application SmartMoms was not specified in the research paper, but further details could be found on its official homepage [119]. Similarly, the Mummatters web app was accessible via its website [115].

Informationen auf jeweiligen Webseiten

One digital health tool was developed specifically for clinical settings or healthcare providers, offering worldwide availability in multiple languages [116]. The text message-based intervention was exclusively accessible to study participants during the research period [96].

ein Tool für Klinik-Kontext

SMS-Intervention exklusiv

One app was noted to have global access [84], while another one was restricted to use within a designated birth clinic [68]. Additionally, one app was only accessible via the Google Play Store in the Indonesian language [16]. For another tool, accessibility details were not provided [115]. A brief accessibility check conducted on December 1st, 2024, revealed that only two digital health tools, SmartMoms (web app) and iCope (web-based platform), were still available for use. Although the ClinTouch DAWN-P app appeared in an app store, it was not downloadable due to outdated data protection regulations.

unterschiedliche Nutzbarkeiten (Setting, Sprache, Zugang)

aktuell nur noch 2 digitale Anwendungen verfügbar

All studies targeted at women in the postnatal period, with two also including pregnant women [68, 115] and one study involving their partners as well[68]. Most authors reported that their digital health tools were free to use [68, 96, 115, 116]. Two studies did not specify information about costs[16, 84], though further investigation revealed that one tool was for free, as stated on its homepage [119].

Zielgruppe aller Studien: Frauen postnatal, Schwangere & Partner:in

meist kostenfrei

According to Regulation (EU) 2017/745 of the European Parliament and Council on medical devices, software may be classified as a medical device if it serves specific medical purposes, requiring appropriate authorisations in such cases [120]. There is no concrete information on the authorisation in any of the studies. Eisner et al. (2022) [68] merely mentioned "The app did not meet requirements for registration as a medical device by the Medicines and Healthcare products Regulatory Agency (MHRA)".

keine Studie mit Angaben zu offizieller Zulassung als Medizinprodukt

Acceptance and usability

Acceptance and/or usability, user engagement or user experience of digital health technology tools were assessed in all included studies (n = 6).

Akzeptanz & Nutzbarkeit in allen Studien erfasst

Acceptance

Five studies evaluated parameters that provide information on the acceptance of digital health technologies, consistently demonstrating a high level of approval for their use [16, 68, 84, 96, 115]. Daehn et al. [84] employed an adapted Client Satisfaction Questionnaire (CSQ) with a 1-5 scale, where 133 users rated satisfaction and acceptance as high, scoring between 3.86 and 4.15 points per question. The overall opinion was further reflected in a 4.36 out of 5-star rating (standard deviation (SD) = 0.77) from 200 respondents[84]. Similarly, Eisner et al. (2022) [68] used the Mobile App Rating Scale (MARS), in which 23 participants gave the app a mean score of 4.1 out of 5 (SD = 0.5), describing it as useful and acceptable, although users without symptoms found it less relevant. Reilly & Austin (2021) [115] also reported high acceptance rates, with 94-98.6% of 135 participants feeling comfortable using the tool. In a broader study, Lawson et al. (2019) [96] surveyed 937 participants and found that 87% preferred screening via text messages over other methods.

hohe Zustimmung

Apps durchweg positiv bewertet

Mehrheit fühlte sich bei der Nutzung wohl

geringere Relevanz für Personen ohne Symptome

One study observed higher satisfaction levels among women with a previous postnatal depression diagnosis [84], while another study identified lower usage in women with a history of depression or women who were taking psychiatric medication as well as lower perceived usefulness for users without symptoms, highlighting the nuanced impact of user characteristics on acceptance [68].

höhere Akzeptanz bei früherer Diagnose, geringere Nutzung bei Vorerkrankung oder Symptomfreiheit

Two studies indicate high app reuse potential [84, 115]. Daehn et al. (2023) [84] reported an average reuse CSQ score of 4.07 out of 5, while Reilly & Austin [115] found that 90-91% of participants expressed willingness to use the app again.

90–91 % mit Bereitschaft zur erneuten Nutzung

109 users in Nurbaeti et al.(2021) [16] demonstrated the highest willingness to recommend the application, with 97.25% of participants endorsing it. Similarly, Lawson et al. (2019) [96] highlighted significant support for text-based screening, with 78% of participants in favour.

78–97 % würden Tool weiterempfehlen

Recommendation scores were also observed in other studies, including Daehn et al. (2023) [84] (mean CSQ score 4.15), Reilly & Austin [115] (78-85%), and Eisner et al. (2022) [68] (mean MARS score 4.0), further underscoring the widespread acceptance of these tools.

Akzeptanz in allen Studien hoch

Usability

Usability was analysed in a total of four papers [16, 68, 84, 115]. While Daehn et al. (2023) [84] used the System Usability Score (SUS), with a maximum score of 100, to assess usability, Eisner et al. (2022) [68] used the MARS score, as they had already done to assess acceptance, to evaluate usability. The other studies defined their own questions. In the study of Daehn et al. (2023) [84], the application received a SUS score of 75.20 from 129 participants, indicating good usability overall. This score suggests that users found the application functional and easy to use. In contrast, for the evaluation of the ClinTouch DAWN-P app, Eisner et al. (2022) [68] used the MARS scale, with an overall score of 4.1 out of 5, indicating particularly good usability according to the authors. Notably, the app received a 4.7 / 5 rating for ease of use, suggesting that users found it particularly intuitive and accessible [68]. Similarly, the Tes Depresi app showed good usability in the research of Nurbaeti et al. (2021) [16]. Most of the 109 users found the app “very easy” or “easy” to download (89.9%). Additionally, 94.50% of users reported that the questions were easy to complete, and 96.33% found the language easy to understand, reinforcing the app's user-friendliness. The expectations were also met by the Mummatters web tool for 80-81% of the participants. 88-90% considered it “easy” to find the information they were looking for [115]. The usability of the various applications and tools assessed across the studies indicates consistently positive results, with each using different evaluation scales but all reflecting high user satisfaction. In summary, all the tools assessed in these studies demonstrate good to very good usability. While the ClinTouch DAWN-P app achieved the highest ratings for ease of use [68], the other tools, including the Tes Depresi app and the Mummatters web tool, also showed good performance in terms of user satisfaction, ease of navigation, and clarity of content [16, 115].

Bedienbarkeit in vier Studien untersucht und durchgehend positiv bewertet

alle Tools zeigten insgesamt gute bis sehr gute Gebrauchstauglichkeit.

User engagement

Building on the findings on usability, the studies also investigated user engagement, providing further insights into the extent to which participants interacted with the applications and tools over the course of their respective studies. User engagement was investigated in a total of four of the six included studies, with all results showing a high completion rate[68, 84, 96, 116].

Nutzer:innenbindung in 4 Studien untersucht - ebenfalls hoch

With a completion rate of 99.3%, 144 screenings were carried out in the Highet et al. (2019) [116] study by a single performance self-identification procedure.

iCope: 99,3% einmaliger Screenings abgeschlossen

A similar rate was seen in the results from Lawson et al. (2019) [96], where 99% of participating women completed at least one screening, but 67% completed all six bi-weekly surveys that were planned for the first 12 weeks after birth. For participation in this study, at least one response was mandatory [96].

ähnliche Raten auch in Lawson et. al (2019) berichtet

The ClinTouch DAWN-P app was used by 91% of participants by the end of the study period, while an average of 67% engaged in daily assessment for a period of six to twelve weeks. For this research, a priori "target criterion" was set with 50% of the participants completing at least 50% of the daily self-identification assessments, which could be fulfilled [68]. Daehn et al. (2023) [84] reported that 1874 users completed 2752 sessions on their homepage, and 17.9% were returning users, although at least one usage of the web-app assessment was a study inclusion criterion. A declining participation rate in the weekly and daily screenings with increasing study duration and digital health tool use could be observed in both studies, which lasted over a longer period with multiple planned sessions [68, 96]. As already mentioned, women with a history of depression or who were taking psychiatric medication were less likely to take part in the screenings in the study by Eisner et al. (2022) [68]. The bounce rate (visitors to a website who leave it after accessing a single page) was low, at 27.1%. Participants spent an average of 2 minutes and 32 seconds per session on the webpage [84], compared to an average of 6.7 minutes (SD 3.78) in the Highet et al. (2019) [116] study when answering the iCope questions in the clinic's waiting room. In the web-based SmartMoms app, it was noticeable that the study participants visited the landing page and the survey page most frequently and spent the longest average time on the help page at 01:07 minutes [84]. Highet et al. (2019) [116] also assessed user engagement based on the demand for results, which participants could request on a voluntary basis. 84% wanted to receive the results. In summary, the collected data provided a detailed overview of user engagement metrics, including completion rates, session durations, participation trends, and interaction patterns with the digital health tools across the examined studies.

hohe Abschlussraten in allen Studien

regelmäßige Teilnahme in Langzeitstudie; Rückgang der Teilnahme bei längerer Studiendauer beobachtet

geringere Teilnahme bei Vorerkrankungen

insgesamt hohe Interaktion und Nutzer:innenbindung bei allen Tools

Experience of users

The user experiences were analysed in three studies [16, 68, 115], with one study reporting that these results will be published in a follow-up paper [68]. The results from the studies by Nurbaeti et al. (2021) [16] and Reilly & Austin (2021) [115] reflect positive participant experiences, with some notable similarities and differences in how users perceive the tools' effectiveness and relevance. In Nurbaeti et al. (2021) [16], 96.33% of participants found the Tes Depresi app to be beneficial and useful, while 90.83% felt that it effectively reflected their psychological condition. Similarly, in Reilly & Austin (2021) [115], most participants reported that the tools were seen as credible, with 93.2-97.3% rating them as trustworthy. Additionally, the tools were regarded as appealing by 78.1-91% of participants, and 78.1-92.5% considered them potentially helpful [115]. Both studies highlight positive feedback from participants, with Nurbaeti et al. (2021) [16] emphasising the app's usefulness and psychological relevance, and Reilly & Austin (2021) [115] emphasising the tools' credibility and potential helpfulness.

Tes Depresi App & Mummatters Tool

positive Nutzer:innen-erfahrungen in beiden Studien berichtet

Fokus auf subjektiven Nutzen, Relevanz & Vertrauen in Tools

Experience of health professionals

The experience of health professionals was assessed in one study by Daehn et al. (2023) [84], in which thirteen health experts were interviewed. They rated the app as a good and supportive tool for addressing postnatal depression, with a rate of 4.1 out of five in both categories. Twelve out of the thirteen professionals stated that SmartMums is a useful offer [84].

positive Rückmeldung von Fachpersonal

als hilfreich & unterstützend eingestuft

Ethics

Regarding the ethical aspects, one non-clinical study by Fonseca et al. (2024) [117] summarising this topic could be found during the manual hand search process. The use of e-mental health tools in psychological assessment and intervention, particularly in the perinatal context, raises several important ethical issues that impact both patients and professionals. These concerns touch on benefits and harms, autonomy, privacy, healthcare resource distribution, and equity [117]. Digital tools concerning mental health can offer significant benefits to patients, such as increased accessibility to mental health support and a quick, flexible risk assessment remotely. However, there are also harms, particularly if the tools lack regulatory oversight or evidence of effectiveness. Patients may use tools that are not scientifically proven to be effective, while professionals may struggle to distinguish between trustworthy and unreliable options, leaving both groups vulnerable to suboptimal outcomes [121]. Additionally, issues of anonymity in interventions could compromise the ability of clinicians to accurately assess and continue to provide adequate and safe care [122]. Patient autonomy can be enhanced by digital technology by offering users greater control over their mental health care. However, this autonomy is contingent on patients being fully informed about the potential risks, benefits, and limitations of the tools. Informed consent is crucial, and patients must clearly understand how their data is used, stored, and shared [121]. The ability to make autonomous decisions is not possible if patients are not adequately informed or if tools are poorly regulated [117]. A further significant ethical concern revolves around privacy and data security. Digital health tools on mental health often collect sensitive health information, raising risks related to data breaches, unauthorised access, or the potential sale of personal data. Standards need to be established for data storage, transmission, and user consent [121]. Patients must be informed about who has access to their data and how it will be protected, ensuring their privacy is respected and maintained throughout the process [117]. Another fundamental ethical principle is equity, ensuring that all perinatal women, regardless of socioeconomic status, digital literacy, or geographic location, have equal access to digital mental health tools. There is a risk that digital divides could exacerbate existing social inequalities, with women from disadvantaged backgrounds unable to access these tools due to a lack of resources or technological barriers [123].

ethische Herausforderungen betreffen neben Pts. auch Fachpersonal: Autonomie, Datenschutz, Zugang, Ressourcen

Vorteile: verbesserter Zugang zu psychischer Gesundheitsversorgung, flexible Nutzung, schnelle Risikoeinschätzung

Risiken: fehlende Wirksamkeitsnachweise, mangelnde Regulierung, potenziell falsche Entscheidungen von Pts. und Fachkräften

informierte Einwilligung nur bei Verständnis möglich

Datenschutz: sensible Gesundheitsdaten, Gefahr von Datenlecks oder unbefugtem Zugriff

klare Regelungen zu Speicherung, Zugriff & Einwilligung notwendig

The growing use of digital health tools has the potential to affect the distribution of healthcare resources. On one hand, these tools could relieve pressure on traditional healthcare systems by providing accessible, low-cost options for mental health assessment and support. On the other hand, without proper regulation and evidence of effectiveness, there is a risk of inefficient resource allocation, where limited resources are spent on tools that may not provide adequate care [121].

Gefahr digitaler Ungleichheit

Risiko ineffizienter Mittelverwendung ohne Wirksamkeitsnachweis

In summary, while digital health technology for self-identification offers promising benefits in the perinatal context, careful attention must be paid to ethical concerns surrounding privacy, autonomy, evidence-based effectiveness, and equity. Ensuring that these tools are used responsibly and equitably will be key to maximising their positive impact while minimising potential harms [117].

sorgfältige Berücksichtigung ethischer Aspekte entscheidend für sicheren und fairen Einsatz

Results organizational domain

No studies or articles could be found on the topic of organisational effort, necessary processes, and pathways in the context of the implementation of digital health technology for the self-identification of the risk of perinatal mental illness. Although several national guidelines with pathways for the prevention or early detection of perinatal mental illness are available, they do not refer to the digital component or self-identification, which may pose new challenges.

keine Studien zu organisatorischem Aufwand oder Implementierungspfaden digitaler Selbst-identifikation gefunden

Results legal domain

Like in the case of the organisational aspects, no literature could be found in the systematic literature search as well as through a hand search that deals with the topic of legality and digital health technology for the self-identification of the risk of perinatal mental illness.

keine Literatur zu rechtlichem Kontext

3.4 Critical evaluation of study quality

A critical evaluation of the primary clinical results in terms of effectiveness and safety was performed. As only one study could be included for these endpoints according to the inclusion and exclusion criteria, this paper, researched by Lawson et al. (2019) [96], was critically appraised. Regarding the study design of a prospective cohort study, the tool of first choice according to the Handbook of Cochrane Reviews would be the ROBINS-I tool. After closer examination, however, this instrument was not considered suitable. Since the study by Lawson et al. (2019) [96] was primarily concerned with the accuracy of a new intervention and was compared with the gold standard, the QUADAS-2 assessment tool for primary diagnostic accuracy studies initially seemed appropriate for this study [112].

QADAS-2 als Bewertungsinstrument für diagnostische Genauigkeit gewählt

The study was evaluated as follows:

prospektives Design

The prospective cohort study by Lawson et al. (2019) [96] compared the agreement of the PHQ-2 questions by text messages as an index test with the EPDS questionnaire, which was defined as the gold standard, via telephone interview for (self-) identification of the risk of depressive symptoms in perinatal women. For the patient selection process, women who visited the obstetrics and gynaecology clinic at Mount Sinai Hospital in Toronto between July 2015 and January 2017 were included in this research. Every one of the final 937 participants had to give informed consent [96].

untersuchte Übereinstimmung von PHQ-2 (SMS) mit EPDS (Telefoninterview)

n=937; nach informierter Einwilligung

The risk of bias was rated high in the first domain. A case-control design was performed in which the researchers matched PHQ-2 positive tested women with negative tested women. Further, it was not described whether a consecutive or random sample of patients was enrolled [96]. Concerns regarding applicability that the included patients do not match the review question were rated low. Inclusion and exclusion criteria were not specified, but some aspects were mentioned in the paper, such as being at the age of 18 years or older, delivering at Mount Sinai Hospital, and giving informed consent. In the supplement, the authors also mentioned that there should be no language barrier for a participant. Socioeconomic data was collected [96]. Overall, the participants were estimated to be appropriate to reach the aim of the study for evaluation of the feasibility of using text messages to enhance postpartum depression screening.

RoB bei Auswahl der Pts. als hoch eingestuft

Einschlusskriterien tlw. genannt: ≥18 Jahre, Entbindung am Mount Sinai Hospital, kein Sprachhindernis

sozioökonomische Daten erhoben

For the second domain, the conduct and interpretation of the index test, the risk of bias could be assessed as low. PHQ-2 is a validated test that was sent through automatic text messages. Women could answer those questions if they wanted. They were included in the study if they responded at least once. The results were interpreted through a predefined score and then assessed as negative or positive.

Domäne Index-Test: Risiko für Bias niedrig, PHQ-2 validiert, automatische SMS, standardisierte Auswertung

The reference test was performed afterwards, only for those who tested positive [96]. Concerns regarding a deviation of the index test in its implementation or interpretation from the research question could be classified as low.

Referenztest nur für Positive durchgeführt

The EPDS questionnaire as a reference standard was also observed regarding its risk of bias. It is a validated tool for self-identification of symptoms of depression in the perinatal period [96]. For a comparison with the PHQ-2 intervention, the EPDS questionnaire was surveyed in the Lawson et al. (2019) [96] study a few days after the index test via telephone interview. It was assessed that it is likely to correctly classify the target condition, i. e. to identify the risk for depressive symptoms in the postnatal period. However, it remains unclear whether these results were interpreted without knowledge of the results of the index test. Further, the risk of bias could be increased primarily by the time difference between the two interventions (approx. 3-4 days in between), as well as the implementation of two distinct types, namely text messages on the one hand and a telephone call on the other [96]. Concerns regarding applicability were assessed as low, as this reflects the gold standard for identification of perinatal depression.

Domäne Referenztest: Biasrisiko hoch

EPDS validiert, aber zeitlicher Abstand (3–4 Tage)

unterschiedliche Formate (SMS vs. Telefon)

The fourth domain of the QUADAS-2 critical appraisal tool is patient flow and timing [112]. The time interval between the two tests was about three days. As there might be mood changes and interventions (e.g. visit to the doctor, complications), as well as the participants might receive informal text messages during those days, the interval does not seem to be appropriate. Further, some negative screened participants did not receive the reference test as the positive tested population was matched to the same number of negative tested women. 19% of the positive tested mothers did not receive EPDS screening for no apparent reason as well [96]. As a result, the risk of bias in terms of patient flow and timing is also classified as high.

Domäne Flow: hohes Biasrisiko

nur positives Screening erhielt Referenztest

unvollständige Testdurchführung bei 19 %

It can be finally summarised that an increased risk of bias in three out of four domains could be identified (Table 5). The results of the study by Lawson et al. (2019) [96] should consequently be interpreted in accordance with their limitations and should only be generalised to a limited extent.

3 von 4 Domänen mit erhöhtem RoB; eingeschränkte Aussagekraft

Table 5: Risk of Bias.

Study	RISK OF BIAS				APPLICABILITY CONCERNS		
	PATIENT SELECTION	INDEX TEST	REFERENCE STANDARD	FLOW AND TIMING	PATIENT SELECTION	INDEX TEST	REFERENCE STANDARD
Study 1	☹	☺	☹	☹	☺	☺	☺

☺Low Risk ☹High Risk ? Unclear Risk

according to QUADAS-2 [112]. Evaluation for Lawson et al. (2019) [96]

4 Discussion

The discussion considers the results and implications of this systematic review of digital health technologies for self-identification of the risk of perinatal mental illness. The review referred to one included study for the clinical outcome of effectiveness and safety, and six studies and one review that addressed secondary, non-clinical outcomes in social, organisational, and legal domains.

nur 1 Studie zu Wirksamkeit & Sicherheit

6 weitere zu sozialen Aspekten

4.1 Summary and interpretation of results

This systematic review aimed to evaluate the effectiveness and safety of digital health technologies for self-identification of the risk of perinatal mental illness, and to highlight social, organisational, and legal aspects for implementation of such technologies in the healthcare system.

SR zu verschiedenen Aspekten digitaler Selbstidentifikation

In accordance with the predefined inclusion and exclusion criteria, one study was included for the primary outcomes of effectiveness and, in some cases, safety. The study by Lawson et al. (2019) [96] compared the digital health assessment PHQ-2 for self-identification of the risk of postnatal depression via text messages with telephone interview EPDS screening, depending on the interpretation of the cutoff values, with fair to moderate agreement (Cohen's Kappa 0.37 and 0.45). The balance of sensitivity and specificity improved with the change in the cutoff value for an increased risk assessment. Regarding safety, limited data concerning false-positive cases were reported [96]. Six studies with different digital health technologies, such as (web) apps, web tools and platforms investigated secondary outcomes relating to social effects, such as availability, accessibility and user acceptance, which were consistently high [16, 68, 84, 96, 115, 116]. Usability [16, 68, 84, 115] and user engagement [68, 84, 96, 116] also showed positive results, with high completion rates and good usability of the tools. Ethics-related aspects, such as data protection and equality, were addressed in one review article, mentioning some potential ethical risks and harms [117]. Moreover, there was a lack of concrete research on organisational and legal aspects- no studies could be identified.

Lawson et al. (2019): PHQ-2 vs. EPDS

ethische Aspekte in einem Review diskutiert: Datenschutz, Gleichheit, mögliche Risiken

hohe Akzeptanz, gute Usability und hohe Teilnahme über alle Studien hinweg

keine Studien zu organisatorischen oder rechtlichen Fragen

Study characteristics

In terms of study characteristics, it was found that the target group in almost all studies consisted of women, which is similar to other existing studies and shows that research in the mental health of men in the pre- and postnatal phase is still very underrepresented. Considering that stigmas and barriers prevent fathers from seeking help at this stage of life, research on this specific group would be highly relevant to potentially explore the needs of fathers and to take initial measures to strengthen this group [44].

Zielgruppe kaum Männer

Forschung zu Vätern dringend notwendig

Study components

Furthermore, the study components showed a strong dominance of depression among the mental illnesses in the perinatal phase and an underrepresentation in the research on the diagnosis of other mental illnesses, such as anxiety disorders or post-traumatic stress disorders.

Fokus v.a. auf Depression; kaum andere psychische Erkrankungen berücksichtigt

Above all, postnatal depression was examined in five of six included studies [16, 68, 84, 96, 115], while prenatal depression was observed in only one study [115]. This can be interpreted that mental illness during pregnancy is also less researched than in the postnatal period.

5/6 Studien: postnatale Depression, pränatale Depression nur einmal untersucht

Primary outcomes

As already mentioned, the study by Lawson et al. (2019) [96] showed a fair to moderate agreement between the PHQ-2 text message measure and EPDS telephone interviews according to the assessment by Landis & Koch [118]. It has been noted that with the baseline cutoff score of 2 points or more per question, the agreement was only fair and showed very little sensitivity for the detection of positive cases, as well as a low positive predictive value. After the adjustment of the cutoff score of 2 or more in total, moderate agreement could be calculated, and higher sensitivity and better balance between sensitivity (0.82) and specificity (0.90) were found [96]. If those values are compared with the gold standard of the EPDS questionnaire, a similar picture emerges. For example, with a cutoff of 11 or higher, a recent meta-analysis of 58 studies showed a sensitivity of 0.81 and a specificity of 0.88, whereas with a cutoff value of 13 or higher, a lower sensitivity of 0.66 and higher specificity of 0.95 were analysed [75]. The cutoff value of 12 or higher assumed in the Lawson et al. (2019) [96] study was not included in this meta-analysis. However, an earlier, smaller meta-analysis of 18 studies showed a sensitivity of 0.86 and a specificity of 0.87 for a cutoff value of 12 or higher in a total of 15 studies [124].

Lawson-Studie: PHQ-2 mit angepasstem Cutoff (gesamt ≥ 2) zeigt moderat bessere Sensitivität (0,82) und Spezifität (0,90), jedoch nur mäßige Übereinstimmung mit EPDS

direkter Vergleich schwierig, unterschiedliche Instrumente verwendet

Genauigkeitsforschung vs. Wirksamkeitsnachweis

It can therefore be interpreted that the PHQ-2 text message test appears to be better suited for self-identification of the risk of postnatal depression after adjustment of the cutoff value to a total score of 2 or higher. However, a direct comparison by kappa value still showed only moderate agreement and an even lower positive predictive value [96]. This demonstrates, above all, the limited ability of this test to correctly identify people who are genuinely ill. As the values depend strongly on the prevalence, the calculation could be problematic, especially in a population with a low prevalence of the disease [125]. A high number of false-positive results could therefore lead to uncertainties, unnecessary further tests and consultations and would call the implementation of screening at all in question [126]. This aspect is also consistent with the latest findings of the AIHTA about mental health screening in adults in Austria. According to this paper, there is no direct evidence to date that screening brings more benefit than harm. Implementation should therefore be carefully considered, and numerous factors taken into account [70].

positiver prädiktiver Wert bleibt gering: begrenzte Fähigkeit zur Identifikation tatsächlich Erkrankter

hohe falsch-positive Rate kann zu Unsicherheit, unnötigen Untersuchungen und Belastung führen

AIHTA: kein klarer Nutzen von allgemeinem psychischem Screening belegt

Another critical note to the study by Lawson et al. (2019) [96] is that the agreement was investigated by comparing two different instruments. This primarily pertains to accuracy research, while effectiveness is typically evaluated by comparing the performance of the same instrument across different contexts, as seen in previous studies investigating digital health tools for screening [93]. As a result, this also indicates that the findings should be considered limited regarding effectiveness.

Wirksamkeitsbewertung erfordert Vergleich eines Instruments in unterschiedlichen Anwendungskontexten

During the literature search, a further study was identified that provided results on effectiveness and safety but had to be excluded due to its mixed methods study design for assessing the primary outcomes. This study by Eisner et al. (2022) [68] evaluated the intervention of a mobile app to identify the risk of postnatal depression. To this purpose, the app included the ability to assess this risk by daily using the EPDS questions and sending daily reminders.

Studie von Eisner et al. (2022) musste wegen Mixed-Methods-Design ausgeschlossen werden

These results were then compared with the paper-based EPDS results at two time points (study start and study end) of the same participants.

Resultate mit Papierversion verglichen

An analysis was also performed using Cohen's Kappa and a 95% confidence interval. The results showed almost perfect agreement [118] and statistical significance for the daily app-based and the two paper-based EPDS screenings for self-assessment of risk of postpartum depression, with a kappa coefficient of 0.91 at baseline and 0.97 at the end of the study [68].

große Übereinstimmung

In terms of consistency, the study by Lawson et al. (2019) [96] showed that although research is being conducted in this direction, too little is known about the general basis of screening and its effectiveness. For the investigation of clinical consistency, the study provided data on the numbers of actual diagnoses, treatments, false-positives, and missing cases. However, certain procedural aspects remain unclear and incomplete, such as the methods used for diagnosis and whether those affected received immediate treatment [96]. If the principles of general screening are applied, a clear procedure with pathways for positively screened individuals would have to be defined. After screening, these principles include a conclusive diagnosis and further measures or therapies [71].

Lawson et al. (2019) zeigt mangelnde Klarheit bei Diagnoseverfahren, unvollständige Informationen zu Behandlung nach Screening

Prinzipien eines geordneten Screenings mit klaren Pfaden fehlen

Apart from diagnostic accuracy and some aspects of consistency, neither of the two mentioned studies nor any other study could be identified regarding the effectiveness of digital health technologies for self-identification according to the predefined inclusion and exclusion criteria. Like other earlier reviews, it became apparent that there is still a lack of studies on this topic, especially high-quality studies [69, 92].

keine weiteren Studien zur Wirksamkeit von digitalen Self-ID-Tools

hochwertige Evidenz fehlt

Regarding safety, the study by Eisner et al. (2022) [68], which was excluded for primary endpoints, dealt with patient safety, as did Lawson et al. (2019) [96]. It was to be recorded and described by the number of minor and major adverse events during the study. There was one major adverse event during the study period due to postnatal psychosis with hospitalisation, and four minor adverse events. It was stated that these events were not related to the use of the app [68]. In the course of the systematic literature search, a review protocol (IRAS 320610) of an RCT, which is still running until December 2024, was identified to address safety in addition to other outcomes. As in one of the studies mentioned, the DAWN-P app is used. The safety outcome will also relate to patient safety [127]. The named studies, as well as others, did not deliver any specific results regarding data safety.

Sicherheit: Eisner et al. (2022): ein schweres Ereignis (postpartale Psychose mit Hospitalisierung) sowie 4 leichte Ereignisse

kein Zusammenhang mit App

DAWN-P: Untersuchung zu Sicherheit geplant

A systematic review by Spadaro et al. (2022) [69], which could not be included in the analysis, emphasises significant security deficiencies in the available screening apps. These include unclear information on the duty of care and the frequent lack of references to compliance with data protection laws. In principle, the General Data Protection Regulation (Regulation (EU) 2016/679) should apply to the use of digital technologies in the European Union [128].

keine konkreten Ergebnisse zu Datensicherheit in den eingeschlossenen Studien

Based on the results and the lack of high-quality literature, a relevant research gap has been recognised. Scientific literature could be lacking due to the still very new and constantly developing digital health technologies. However, the blurred boundaries and different or absent definitions of self-identification and screening could also play a role, and not all relevant literature may have been found as a result.

Forschungslücke u. a. wegen neuer Technologie, uneinheitlicher oder fehlender Definitionen

Secondary Outcomes

Verfügbarkeit & Zugänglichkeit variiert

Concerning the secondary non-clinical outcomes, the digital health applications examined were very heterogeneous in their availability and accessibility.

manche Tools weltweit nutzbar, andere durch Plattformen oder Regionen eingeschränkt

While some tools are accessible worldwide and, in several languages, the use of others is restricted by platform limitations (e.g. Google Play Store only) or limited regional availability. Two of the digital health technology interventions of the included studies had limited availability for the purpose of the respective study [68, 96]. An accessibility check revealed that only two tools from the included studies were actually accessible at the time of research. This confirms the findings by Feldman et al. (2021) [91] that some studies are available without publicly accessible digital health technology and vice versa, that most digital health tools are available without basing on any scientific evidence.

je 2 Tools nur im Rahmen der Studie verfügbar bzw. zum Recherchezeitpunkt abrufbar

Akzeptanz in allen Studien unterschiedlich gemessen (CSQ, MARS, eigene Fragen), aber durchwegs hoch

With regard to further social aspects, it should be noted that the social domain acceptance was measured differently in all six studies (CSQ score, MARS score, own questions), but showed quite good values. Similar to other excluded studies [92-95] that focused on digital screening rather than on self-identification, almost all users were very satisfied and accepted the use of the (web) apps, platforms, tools, and digital health measures. As Lawson et al. (2019) [96] stated, the high acceptance rate of digital technologies could be due to overcoming barriers which are reinforced in the postnatal phase. Such tools can, therefore, save time, avoid long journeys, and also save costs [83]. Furthermore, Kingston et al. (2015) [94] cited the evidence of studies on high acceptance as a key criterion for the broader public recommendation of screening measures.

hohe Akzeptanz ist wichtiger Faktor für Empfehlung von Screening-Angeboten

teilweise höhere Zustimmung bei Frauen mit Symptomen oder vorheriger PPD-Diagnose

However, in two studies, there was a tendency for those with previous diagnoses or symptoms of perinatal depression to find the technologies more useful or to be more satisfied than participants without symptoms or previous diagnosis [68, 84], whereas participants in one of those studies completed the app assessment significant less often with a self-reported history of depression [68]. Daehn et al. (2023) [84] interpreted that these findings indicate that women experiencing actual symptoms may have found the content of digital health tools more relevant than those without prior experience with postnatal depression. At the same time, women with a history of depression, as in the aforementioned study [68], may have been less likely to complete the app assessment, as they may have been more burdened with their symptoms, more skeptical of digital solutions, or might have found the app less helpful because they had previous experience with other forms of diagnostic procedure and treatment. To find out the exact reasons for this, further research would have to be carried out accordingly. Nevertheless, it should be mentioned that in another study by Kingston et al. (2014) [64], only four per cent of women refused mental health screening when it was offered to them, which in turn indicates an important level of acceptance. As a result, the offer of digital self-identification could potentially appeal to just as many people.

in einer Studie geringere Teilnahme bei Frauen mit früherer Depression

weitere Forschung nötig, um Gründe zu klären

Kingston et al. (2014): nur 4 % lehnten Screening ab

potenziell auch hohe Akzeptanz für digitale Selbstidentifikation

87 % bevorzugten SMS-Screening

einfache Nutzung & Alltagstauglichkeit

In the study by Lawson et al. (2019) [96], 87% of participants preferred the text message intervention to other methods. This not only indicates a high level of acceptance of exactly this intervention but also suggests that the preference could be due to factors such as ease of use, constant availability, or ease of integration into everyday life [96]. However, to gain a more comprehensive understanding, the exact reasons for this preference would need to be investigated in more detail.

In addition, a study by Kingston et al. (2015) [94] found that women's well-being and acceptance of digital screening methods depend largely on whether they would feel able to talk openly and honestly with their doctor about their mood.

Offenheit im Ärzt:innengespräch hat Einfluss auf Akzeptanz

In terms of usability, one of the included studies [96] showed high participation rates of over 99% in the first screenings, but then participation in the regular screenings decreased over the course of time, especially with longer study duration. This is a frequently observed phenomenon in digital health studies and could indicate decreasing interest, routine fatigue or stress caused by use [129]. It should be noted here that user retention and return could not be interpreted in this review due to the very heterogeneous study measures. For example, Daehn et al. (2023) [84] recorded a return rate of 17.9%, whereby the study only required a single use of the web app and a subsequent evaluation. In contrast, the aim of the study by Eisner et al. (2022) [68] was the daily use of the app with answering the EPDS questions. Although the participants were included after just one assessment, multiple uses of the app were conveyed as the goal, and daily alerts were sent. This might explain the 67% rate of participants who regularly took part in answering the daily questions[68]. In accordance with this, a comparison of the two studies with a longer intervention period showed similar rates [68, 96]. The time spent by users on the included digital technology tools was similar. Nevertheless, users spent a longer time in the Daehn et al. (2023) [84] application than in the Eisner et al. (2022) [68] application with the aim of daily use. As a result, the user might have already known the application as the aim of the study was a daily use of the assessment. However, it should also be added that the web app from Daehn et al. (2023) [84] had additional features, such as educational videos and offers of help, and it can therefore be concluded that the time spent on the app was longer.

hohe Erstnutzung (>99 %), danach Rückgang bei längerer Studiendauer (Routine, Belastung)

heterogene Studiendesigns erschweren Vergleich

Rückkehrrate bei Daehn et al. (2023): 17,9 %, Ziel: Einmalnutzung

67 % Teilnahme bei Eisner et al. (2022) mit täglicher EPDS-Nutzung

ähnliche Rückgänge bei längeren Intervallen in beiden Studien

Finally, major research gaps and the lack of high-quality studies were revealed in the areas of ethics, organisational requirements, and challenges, as well as legal foundations on the topic of self-identification using digital technologies in the field of perinatal mental illnesses. There was no concrete literature on the integration of such tools into existing healthcare systems. National guidelines for the prevention and early detection of perinatal mental illness do not yet address digital technologies and self-identification. This may indicate that additional processes and pathways are needed to effectively integrate digital components into existing care pathways. On this topic, Fonseca et al. (2024) [117] stated, according to Wykes (2019):

deutliche Forschungslücken zu Ethik, Organisation & rechtlichen Grundlagen

keine Literatur zur Integration in bestehende Gesundheitssysteme

noch keine nationalen LL

Clinicians should have clear guidance from regulatory bodies and/or professional associations about the safety, effectiveness and appropriateness of different e-mental health tools targeting perinatal women, and women should be made aware of where and how they can access evidence-based and safe e-mental health tools that can be helpful for their mental health management [117].

Bedarf an klaren Vorgaben für Fachkräfte sowie geprüften, sicheren Tools

However, due to a lack of evidence and current studies, particularly regarding effectiveness and safety, it is not yet possible to make any recommendations, legislation, or organisational pathway.

aktuell keine Empfehlungen möglich wegen fehlender Evidenz

In their systematic review, Clarke et al. (2024) [93] advocated for the allocation of sufficient organisational resources to ensure widespread utilisation, equity, and access to psychosocial support for women globally during the perinatal period. The digital divide can be a barrier as well, especially for socioeconomically disadvantaged women. Unequal access can exacerbate existing inequalities.

Ressourcenverteilung für Zugang & Gleichberechtigung, v.a. für benachteiligte Gruppen

To counteract this, digital solutions could be designed inclusively and made accessible to everyone [83].

inklusive Gestaltung beugt Ungleichheit vor

Concerning legalities, there is a deficit of studies dealing with the legal basis of such technologies. Issues such as regulation, licensing or liability remain unexplored. This could cause uncertainties in the development, implementation, and use of the technologies, especially regarding their classification and authorisation.

keine Studien zu rechtlichen Grundlagen wie Regulierung, Lizenzierung, Haftung

In the legal text on the classification and regulation of medical devices, digital health technologies that contain software and are used for medical purposes are referred to as medical devices and are subject to this legislation in the European Union. According to the regulation, software used for decision-making for diagnostic purposes is classified as class IIa. However, if software is used for "general purposes" and is applied in the subject of lifestyle and well-being, it is not considered a medical device [120]. Accordingly, it is a question of perspective as to whether such tools should be categorised as medical devices or as lifestyle applications for self-identification of mental health risks. Other international classification systems include the WHO's taxonomy Classification of Digital Health Interventions v 1.0 [130] and the Evidence standards framework (ESF) for digital health technologies [131]. According to the latter, digital health technologies for self-identification would be assigned to class C [131]. Such classifications could help to make these applications more comparable and to implement them more standardised in the healthcare system.

Medizinprodukte-Verordnung:

Softwarelösungen mit medizinischem Zweck gelten als Medizinprodukte (Klasse IIa)

gilt nicht für Tools mit Lifestyle-Zweck

Einordnung hängt von Anwendungszweck ab

The lack of consideration of legal and organisational aspects poses a challenge for the sustainable and regulated implementation of digital technologies. At the same time, the lack of research on the effectiveness and safety of such tools could, in turn, have an impact on the lack of recommendations. To fully exploit their potential, further high-quality research is needed to clarify the legal framework and define organisational requirements.

Mangel an rechtlichen, organisatorischen Standards & Evidenz behindert nachhaltige & sichere Implementierung

4.2 Limitations of evidence

Building on the need for further research, it is also crucial to acknowledge the methodological and evidentiary limitations that characterise existing studies in this field.

methodische Limitationen der Studien

Characteristics

The studies included displayed great heterogeneity due to their assorted designs, broad spectrum of participant numbers between 18 and 938 participants, as well as the variety of digital health technology interventions. Another crucial point to mention is that the majority of the people studied were women in the postnatal period, and most of the studies examined the risk of depression. There was only one study that had also investigated the risk of mental illness during pregnancy [115]. Studies on other mental illnesses, such as anxiety disorders or post-traumatic stress disorder, were also underrepresented. Fathers were included in only one study and in a small number of participants, in addition to their partners [68]. No data could be found on co-mothers or adoptive parents in this context.

starke Heterogenität bei Design, Stichprobengröße (n=18–938) & Tools

nur eine Studie zu pränataler Phase

Väter in nur einer Studie, keine Daten zu Co-Müttern/ Adoptiveltern

With regard to the study design, it should be noted that most of the studies were cross-sectional or descriptive studies, which provide a momentary insight into the problem. However, what all studies had in common was that participation was not randomised, but either by downloading an app on their own, accessing a web app or being recruited by hospital staff.

meist Querschnitts- oder deskriptive Studien ohne Randomisierung

Participation could therefore have been favoured by women (or men) who were interested in this topic, which could lead to selection bias. The inclusion criteria for participation in the study also varied greatly - for example, women undergoing active psychiatric treatment were excluded in one study [96], while in another, women with a history of mental illness were excluded [16]. All other studies did not mention any restriction concerning mental health. This affects the comparability of the studies.

erhöhtes Risiko für Auswahlverzerrung

eingeschränkte Vergleichbarkeit der Studien

Primary outcomes

To reduce the risk of bias, inclusion was restricted in terms of study design to RCTs, non-RCTs and prospective cohort studies, as well as systematic reviews for the primary clinical outcomes of effectiveness and safety. Due to this and the other predefined criteria, only one prospective cohort study could be included in this systematic review.

nur geeignete Studien eingeschlossen: RCTs, non RCTs, prospektive Kohortenstudien

This study from Lawson et al. (2019) [96] has some strengths but is limited by significant methodological weaknesses that affect the quality and generalizability of the results. The authors of the study also emphasised several limitations: Firstly, the period between the index test and the reference test was three days on average, which could lead to changes in the mood and symptoms of the participants. In addition, the results can only be generalised to a limited extent, as the sample consisted mainly of Caucasian, married and university-educated women. Furthermore, no systematic diagnostic assessment was carried out on all women who tested positive, which might limit the validity of the results [96]. However, many participants, as well as the two compared tests, PHQ-2 and EPDS, which are valid and reproducible instruments for risk assessment of perinatal mental illness, demonstrate a strength [96]. Regarding the results, only a low level of agreement was found, as well as an exceptionally low positive predictive value, which means that the test is limited due to the consequently increased number of false-positive results.

Lawson et al. (2019) mit validen Instrumenten (PHQ-2, EPDS) & hoher Teilnehmer:innenzahl

methodische Schwächen wie Zeitverzögerung zwischen Tests, eingeschränkte Generalisierbarkeit (homogene Stichprobe)

fehlende systematische Diagnostik

It should further be added that this agreement comparison involved two different instruments (PHQ-2 and EPDS) and two distinct types of interventions (text-message and telephone interview). This is more meaningful in terms of validity and diagnostic accuracy alone. As a result, no concrete statement on effectiveness can be made. In order to assess effectiveness, it seems more appropriate to compare the same instrument to avoid distortions due to other influences, such as the uncertainty of questions.

unterschiedliche Instrumente & Erhebungsmethoden

nur Validität, keine Aussage zu Wirksamkeit

A critical appraisal assessment using the QUADAS-2 tool found that although the study provides useful findings on the feasibility and diagnostic accuracy of PHQ-2 assessment by text message for postnatal depression, it has a high risk of bias in three out of four assessment areas. These methodological limitations, particularly in patient selection and timing, significantly limit the generalizability of the results. Accordingly, the results should be interpreted with caution and should not be used as the sole basis for clinical or organisational decisions. Therefore, it can be concluded that the results of the only included study for the primary clinical outcome areas are of limited significance.

hoher Bias in 3 von 4 Bereichen

Ergebnisse eingeschränkt

nicht als alleinige Entscheidungsgrundlage geeignet

Secondary outcomes

nichtklinische Parameter: nur Nutzung & Akzeptanz

The other studies were not subjected to critical evaluation due to the non-clinical outcomes. The studies provide valuable practical insights into the user engagement and acceptance of digital interventions, but their methodological limitations, such as selective sampling, lack of comparative data and lack of effectiveness evaluation, are significant weaknesses that limit the generalizability and clinical utility of the results as well. Nevertheless, most of the authors also point out the limitations of their studies.

haben deutliche methodischen Schwächen & begrenzte Aussagekraft

Anregungen für Weiterentwicklung (SmartMoms)

The study by Daehn et al. (2023) [84] provided valuable insights into the user experience and behaviour of the SmartMoms app. The authors suggested that future versions of the tool should be available in other languages and as audio to promote greater equity.

Daehn et al. (2023): kleine Stichprobe, keine Teilnahme von Gynäkolog:innen, keine Wirksamkeitsevaluation

Highet et al. (2019): kleine Stichprobe, Einzugsgebiet einer Klinik, keine Vergleichsdaten vor Intervention

Nurbaeti et al. (2021): deskriptives Design, App-Zugang limitiert

Reilly & Austin (2021): kleine, selbstselektierte Stichprobe, keine Wirksamkeitsprüfung

Eisner et al. (2022): keine Limitationen angegeben, ohne kritische Reflexion

However, methodological limitations such as the small sample size, the lack of participation of gynaecologists and the possibility of selection bias among healthcare providers should be mentioned. In addition, there was no effectiveness evaluation, which limits the generalizability of the results. The study should be interpreted with caution and used as a basis for further research. On a positive note, the findings from this study will be used to develop an application specifically for fathers, as well as a mobile cognitive-behavioural therapy intervention for women [84]. In the study by Highet et al. (2019) [116], the generalizability is also limited by a small sample size, the use of convenience sampling, and the fact that only women from a single clinic were recruited. Data was assessed at just 4-6 weeks postnatally, and comparative data prior to the intervention is lacking. The authors suggest that future versions of the tool should be available in other languages and as audio to promote greater equity[116]. There might be limitations as well as the self-identification process took place in the clinic, and not remotely, as in the other studies. Nurbaeti et al. (2021) [16] pointed out in their study that the results may be limited due to the descriptive study design and that equal use may be restricted as the app is only available for Android phones. This study by Reilly & Austin (2021) [115] provided valuable insights into the practical aspects of implementing and using digital health tools to assess mental health. It showed strengths in the comprehensive recording of user experiences and the practicality of the app. However, the generalizability is limited by the small, self-selected sample and the lack of an effectiveness evaluation [115]. Eisner et al. (2022) [68] did not mention any limitations in their paper.

wertvolle Einblicke in Anwendung; viele Limitationen

In summary, the included studies provide valuable insights into the use of digital health solutions, but their results must be interpreted with caution due to limitations such as small samples, a high risk for selection bias and a lack of effectiveness evaluation.

4.3 Limitations of the review

SR durch Publikationsbias & Studienqualität möglicherweise limitiert

Systematic reviews are an important method for synthesising and evaluating evidence, with clear methodological advantages such as transparency, comprehensiveness, and the ability to identify research gaps. However, they may be limited by methodological challenges, publication bias, and the quality of the studies included.

A critical interpretation of the review is necessary to correctly assess its applicability and significance. This review shows strengths to be emphasised by the comprehensive search strategy, consideration of several databases, as well as the finding of initially 2762 studies, which were checked for suitability. Further, the inclusion of grey literature might have reduced the risk of publication bias.

Stärken: breite Suchstrategie, viele Datenbanken, 2762 Treffer geprüft, graue Literatur einbezogen

However, there are also methodological limitations. In general, even though an attempt was made to work very precisely, bias could still have arisen due to the restrictions of all languages other than German and English, as well as due to the temporal limitation of relevant literature. For example, an article in Italian had to be excluded from the process of full-text screening. However, to minimise bias, no language filter was selected in the systematic literature search, and instead a manual selection was carried out.

Limitationen:
nur Deutsch & Englisch

begrenzter Zeitrahmen, heterogene Interventionen

An important aspect was that no appropriate general definition for self-identification in terms of the significance of one's own assessment of the risk of a disease could be found. A definition was defined after extensive research and in the context of the present topic of digital health technologies, and is therefore not applicable.

keine einheitliche Definition von Selbstidentifikation

As the general term screening was often used in studies for self-identification and heterogeneous measures such as apps, platforms or web-based tools were used, the classification and selection of studies based on their interventions was not always clear. This resulted in imprecise boundaries where a screening measure begins and a self-identification process ends. The assessment was partly up to the observers. In this context, it should be added that such issues were discussed between the author HS and the two scientific supervisors, HY and ZKI.

schwierige Abgrenzung zu Screening

Diskussion mit Betreuerinnen bei unklaren Fällen

As guided screening, therapeutic interventions and educational interventions were to be excluded from this review, it was not possible to include systematic reviews that examined such different approaches. Instead, the individual studies included in these reviews were examined and included in the analysis if they met the defined inclusion and exclusion criteria.

geführtes Screening, Therapie- & Bildungsinterventionen ausgeschlossen, relevante Einzelstudien inkludiert

It should also be mentioned that, due to heterogeneous data, the lack of meaningful literature regarding the primary outcomes of effectiveness and safety, as well as the limitations and the low quality of the included study, the significance of the primary results is limited. However, this aspect appears highly relevant for further possible large-scale introduction of such technologies in the healthcare sector and highlights an important need for research.

heterogene Daten, wenig Literatur & niedrige Studienqualität schränken Aussagekraft ein

großer Forschungsbedarf

4.4 Further implications

In view of the study results, there is a highly relevant need for research on the one hand and the further development of evidence-based digital health technologies on the other.

Weiterentwicklung dieser Anwendungen notwendig

To close this research gap, it is essential to conduct high-quality studies such as RCTs on the effectiveness of digital health technologies for self-identification of the risk of perinatal mental illness. This is a key component to initiate further measures for implementation in global health systems.

RCTs erforderlich

Wirksamkeit & Implementierung

For example, an RCT could look like a large study group, excluding individuals that were diagnosed with mental illness, using an app that offers the possibility for self-identification of the risk of perinatal mental illness and further information on this topic, while at the same time another randomized group attends one or more appointments in the clinic for a standard screening using the same instrument by professional medical staff according to guidelines. Finally, a detailed clinical diagnosis should be carried out by specialists in order to determine whether a diagnosis exists for all participants.

Beispiel-RCT: Vergleich App-Selbstscreening vs. klinisches Screening

gleicher Fragebogen, unterschiedliche Settings mit abschließender Fachdiagnose

In the same way, further care through therapy would need to be clarified and made possible for all those affected. Summarising this implication, a clinical study should be performed according to the screening chain by first defining a target population, performing the screening - in this case, self-identification - intervention, establishing a clinical diagnosis of positive screened participants and finally providing treatment for individuals diagnosed with perinatal mental illness [54]. In the future, it seems also important to include other mental illnesses and specific groups, such as co-parents or adoptive parents, in research.

Therapieangebote müssen für alle Betroffenen verfügbar sein
Studien anhand von Screening-Kette

Einbezug weiterer psych. Erkrankungen & Gruppen

High-quality studies would be necessary for safety in terms of data protection, patient, and professional staff safety as well. RCTs on this topic do not appear ethically justifiable as a primary objective, but could be investigated as a secondary outcome or on the basis of other study designs. Findings on this subject are just as necessary as the effectiveness of the intervention to identify harms and risks, ensure the safety of the population and to base laws and guidelines on this.

hohe Studienqualität nötig für Sicherheit

RCTs ethisch bedenklich, eher als sekundäres Ziel oder andere Designs

Further development of digital health technologies, of course, seems equally important as research, making them more efficient and safer. These digital health technologies should be based on a legal and scientific foundation.

rechtliche & wissenschaftliche Fundierung notwendig

Finally, implementation in the healthcare system would also require organizational pathways, compliance with ethical principles such as equality, and comprehensive information and training for healthcare professionals. It should also be noted that the demand for therapy places would probably increase, and additional resources would have to be considered and created accordingly.

Umsetzung braucht Strukturen, Ressourcen, Ethik (Gleichheit), Information & Schulung

For public health, such technologies currently pose major challenges and risks due to the confusing market and low scientific evidence. In the future, there is potential for widespread use to overcome barriers and for more frequent detection of perinatal mental illnesses. As a result, patients could be treated more quickly, and consequences might be minimised. Therefore, high-quality research is indispensable.

unübersichtlicher Markt mit wenig Evidenz, aber großes Potenzial für Barrierenabbau & frühere Behandlung

5 Conclusion

Ergebnisse zeigen Potenzial und Herausforderungen

The findings highlight the potential and challenges of digital health technologies for self-identification of the risk of perinatal mental illnesses, focusing on aspects such as effectiveness and safety, as well as social, legal, and organisational considerations.

nur eine Studie zu Wirksamkeit und Sicherheit, mit begrenzter Aussagekraft & hohem Bias – Forschungsfrage nicht beantwortet

Only one study could be included to analyse the primary outcomes of effectiveness and safety, and showed limited results in terms of diagnostic accuracy in comparison with the gold standard method, as well as of consistency with the clinical diagnosis [96]. The safety aspect could not be sufficiently investigated either, due to a lack of data. Further, these results can only be considered to a limited extent, as they cannot be generalised on the basis of a single study. Due to these facts and an increased risk of bias, the research question could not be adequately answered.

sekundäre Ergebnisse: hohe Akzeptanz und einfache Nutzung, aber unklare & komplexe Verfügbarkeit

The other studies included concerning the secondary outcomes delivered positive results in the social areas of acceptance and usability. Here, for an implementation of digital technologies for self-identification in the healthcare system, a high acceptance across the study population, easy handling of the existing tools, but also a still overly complex and unregulated availability of these technologies were shown [16, 68, 84, 96, 115, 116]. These results should be considered with caution due to limitations and vastly different study interventions [16, 68, 84, 96, 115, 116]. Above all, research gaps could be identified in the areas of legal and organisational aspects.

Forschungslücken: rechtliche & organisatorische Aspekte

weitere hochwertige Studien nötig

als Basis für Entwicklung, Evidenz & Empfehlungen

To achieve the desired objective of this review and to be able to draw well-founded conclusions, it is essential to conduct further research. High-quality studies on effectiveness and safety must provide a deeper and more comprehensive understanding of the topic under investigation to close existing knowledge gaps on the one hand, but also to serve as an evidence base for further development of digital technologies and recommendations in the areas of legality and organisation for implementation in the healthcare system.

Thema relevant für Public Health und sekundäre Prävention

The findings of this review highlight the significant relevance of this topic within public health in the future, especially in the context of secondary prevention

6 Literatur

[1] Howard LM, Molyneaux E, Dennis C-L, Rochat T, Stein A and Milgrom J. Non-psychotic mental disorders in the perinatal period. The Lancet. 2014;384(9956):1775–1788. DOI: 10.1016/S0140-6736(14)61276-9.

[2] Field T, Diego M and Hernandez-Reif M. Prenatal depression effects and interventions: a review. Infant Behav Dev. 2010;33(4):409–418. Epub 20100514. DOI: 10.1016/j.infbeh.2010.04.005.

[3] Paulson JF, Dauber S and Leiferman JA. Individual and combined effects of postpartum depression in mothers and fathers on parenting behavior. Pediatrics. 2006;118(2):659–668. DOI: 10.1542/peds.2005-2948.

[4] Grace SL, Evindar A and Stewart DE. The effect of postpartum depression on child cognitive development and behavior: a review and critical analysis of the literature. Arch Womens Ment Health. 2003;6(4):263–274. DOI: 10.1007/s00737-003-0024-6.

[5] Hussain-Shamsy N, Shah A, Vigod SN, Zaheer J and Seto E. Mobile Health for Perinatal Depression and Anxiety: Scoping Review. J Med Internet Res. 2020;22(4):e17011. Epub 20200413. DOI: 10.2196/17011.

[6] Leddy M, Haaga D, Gray J and Schulkin J. Postpartum mental health screening and diagnosis by obstetrician-gynecologists. J Psychosom Obstet Gynaecol. 2011;32(1):27–34. Epub 20110125. DOI: 10.3109/0167482x.2010.547639.

[7] Chew-Graham CA, Sharp D, Chamberlain E, Folkes L and Turner KM. Disclosure of symptoms of postnatal depression, the perspectives of health professionals and women: a qualitative study. BMC Fam Pract. 2009;10:7. Epub 20090121. DOI: 10.1186/1471-2296-10-7.

[8] Pawils S, Kochen E, Weinbrenner N, Loew V, Döring K, Dähn D, et al. Postpartale Depression – wer kümmert sich? Versorgungszugänge über Hebammen, Gynäkologie, Pädiatrie und AllgemeinmedizinPostpartum depression—who cares? Approaches to care via midwifery, gynaecology, paediatrics and general practice. Bundesgesundheitsblatt - Gesundheitsforschung - Gesundheitsschutz. 2022;65. DOI: 10.1007/s00103-022-03545-8.

[9] Kim JJ, La Porte LM, Adams MG, Gordon TE, Kuendig JM and Silver RK. Obstetric care provider engagement in a perinatal depression screening program. Arch Womens Ment Health. 2009;12(3):167–172. Epub 20090310. DOI: 10.1007/s00737-009-0057-6.

[10] Hadfield H and Wittkowski A. Women's Experiences of Seeking and Receiving Psychological and Psychosocial Interventions for Postpartum Depression: A Systematic Review and Thematic Synthesis of the Qualitative Literature. J Midwifery Womens Health. 2017;62(6):723–736. Epub 20171206. DOI: 10.1111/jmwh.12669.

[11] Edhborg M, Friberg M, Lundh W and Widstrom AM. "Struggling with life": narratives from women with signs of postpartum depression. Scand J Public Health. 2005;33(4):261–267. DOI: 10.1080/14034940510005725.

[12] Scholle SH, Haskett RF, Hanusa BH, Pincus HA and Kupfer DJ. Addressing depression in obstetrics/gynecology practice. Gen Hosp Psychiatry. 2003;25(2):83–90. DOI: 10.1016/s0163-8343(03)00006-9.

[13] Abrams LS, Dornig K and Curran L. Barriers to service use for postpartum depression symptoms among low-income ethnic minority mothers in the United States. Qual Health Res. 2009;19(4):535–551. DOI: 10.1177/1049732309332794.

[14] Pineros-Leano M, Tabb KM, Sears H, Meline B and Huang H. Clinic staff attitudes towards the use of mHealth technology to conduct perinatal depression screenings: a qualitative study. Fam Pract. 2015;32(2):211–215. Epub 20141222. DOI: 10.1093/fampra/cmu083.

[15] Gordon M, Henderson R, Holmes JH, Wolters MK and Bennett IM. Participatory design of ehealth solutions for women from vulnerable populations with perinatal depression. Journal of the American Medical Informatics Association. 2016;23(1):105–109. DOI: 10.1093/jamia/ocv109.

[16] Nurbaeti I, Syafii M and Lestari KB. Developing an android-based application for early detection of postpartum depression symptoms in Indonesia. Belitung Nurs J. 2021;7(2):118–124. Epub 20210429. DOI: 10.33546/bnj.1308.

[17] World Health Organization. *Constitution*. n.d. [cited December 7th, 2024]. Available from: https://www.who.int/about/accountability/governance/constitution.

[18] GBD 2019 Mental Disorders Collaborators. Global, regional, and national burden of 12 mental disorders in 204 countries and territories, 1990–2019: a systematic analysis for the Global Burden of Disease Study 2019. The Lancet Psychiatry. 2022;9(2):137–150. DOI: 10.1016/S2215-0366(21)00395-3.

[19] Skolnik R. Global Health 101. 4th ed. Burlington Massachusetts: Jones&Barlett Learning; 2021.

[20] National Collaborating Centre for Mental Health. The Perinatal Mental Health Care Pathways. Full implementation guidance.: 2018 [cited December 8th]. Available from: https://www.rcpsych.ac.uk/docs/default-source/improving-care/nccmh/perinatal/nccmh-the-perinatal-mental-health-care-pathways-full-implementation-guidance.pdf?sfvrsn=73c19277_2.
[21] Bundesministerium für Arbeit, Soziales, Gesundheit und Konsumentenschutz (BMASGK). Depressionsbericht Österreich. Eine interdisziplinäre und multiperspektivische Bestandsaufnahme. Wien: BMASGK, 2019. Available from: https://www.sozialministerium.gv.at/dam/jcr:e4c2a83e-3116-4296-972e-23cb1510bdfa/depressionsbericht.pdf.
[22] Christl B, Reilly N, Yin C and Austin MP. Clinical profile and outcomes of women admitted to a psychiatric mother-baby unit. Arch Womens Ment Health. 2015;18(6):805–816. Epub 20150116. DOI: 10.1007/s00737-014-0492-x.
[23] Jones I, Chandra PS, Dazzan P and Howard LM. Bipolar disorder, affective psychosis, and schizophrenia in pregnancy and the post-partum period. Lancet. 2014;384(9956):1789–1799. Epub 20141114. DOI: 10.1016/s0140-6736(14)61278-2.
[24] Parsons CE, Young KS, Rochat TJ, Kringelbach ML and Stein A. Postnatal depression and its effects on child development: a review of evidence from low- and middle-income countries. Br Med Bull. 2012;101:57–79. Epub 20111129. DOI: 10.1093/bmb/ldr047.
[25] Heyne CS, Kazmierczak M, Souday R, Horesh D, Lambregtse-van den Berg M, Weigl T, et al. Prevalence and risk factors of birth-related posttraumatic stress among parents: A comparative systematic review and meta-analysis. Clin Psychol Rev. 2022;94:102157. Epub 20220421. DOI: 10.1016/j.cpr.2022.102157.
[26] Perinatal. Duden online: Dudenredaktion; 2024.
[27] World Health Organization. Perinatal conditions. 2024 [cited 22.12.2024]. Available from: https://platform.who.int/mortality/themes/theme-details/topics/topic-details/MDB/perinatal-conditions.
[28] American Psychiatric Association D-TF. Diagnostic and statistical manual of mental disorders: DSM-5™, 5th ed. Arlington, VA, US: American Psychiatric Publishing, Inc.; 2013. xliv, 947–xliv, 947 p.
[29] Dosani A, Arora H and Mazmudar S. mHealth and Perinatal Depression in Low-and Middle-Income Countries: A Scoping Review of the Literature. Int J Environ Res Public Health. 2020;17(20). Epub 20201021. DOI: 10.3390/ijerph17207679.
[30] O'Hara MW and Wisner KL. Perinatal mental illness: definition, description and aetiology. Best Pract Res Clin Obstet Gynaecol. 2014;28(1):3–12. Epub 20131007. DOI: 10.1016/j.bpobgyn.2013.09.002.
[31] Martin-Key NA, Spadaro B, Schei TS and Bahn S. Proof-of-Concept Support for the Development and Implementation of a Digital Assessment for Perinatal Mental Health: Mixed Methods Study. J Med Internet Res. 2021;23(6):e27132. Epub 20210604. DOI: 10.2196/27132.
[32] Antenatal and postnatal mental health: clinical management and service guidance2020.
[33] Clinical descriptions and diagnostic requirements for ICD-11 mental, behavioural and neurodevelopmental disorders. Geneva: World Health Organization; 2024.
[34] Telles-Correia D, Saraiva S and Gonçalves J. Mental Disorder-The Need for an Accurate Definition. Front Psychiatry. 2018;9:64. Epub 20180312. DOI: 10.3389/fpsyt.2018.00064.
[35] Stein DJ, Palk AC and Kendler KS. What is a mental disorder? An exemplar-focused approach. Psychol Med. 2021;51(6):894–901. Epub 20210412. DOI: 10.1017/s0033291721001185.
[36] Hahn-Holbrook J, Cornwell-Hinrichs T and Anaya I. Economic and Health Predictors of National Postpartum Depression Prevalence: A Systematic Review, Meta-analysis, and Meta-Regression of 291 Studies from 56 Countries. Front Psychiatry. 2017;8:248. Epub 20180201. DOI: 10.3389/fpsyt.2017.00248.
[37] Turner R and Honikman S. Maternal mental health and the first 1 000 days. South African medical journal = Suid-Afrikaanse tydskrif vir geneeskunde. 2016;106:1164–1167. DOI: 10.7196/SAMJ.2016.VL06IL2.12129.
[38] Stein A, Pearson RM, Goodman SH, Rapa E, Rahman A, McCallum M, et al. Effects of perinatal mental disorders on the fetus and child. Lancet. 2014;384(9956):1800–1819. Epub 20141114. DOI: 10.1016/s0140-6736(14)61277-0.
[39] King-Hele S, Webb RT, Mortensen PB, Appleby L, Pickles A and Abel KM. Risk of stillbirth and neonatal death linked with maternal mental illness: a national cohort study. Arch Dis Child Fetal Neonatal Ed. 2009;94(2):F105–110. Epub 20081110. DOI: 10.1136/adc.2007.135459.
[40] Webb R, Abel K, Pickles A and Appleby L. Mortality in offspring of parents with psychotic disorders: a critical review and meta-analysis. Am J Psychiatry. 2005;162(6):1045–1056. DOI: 10.1176/appi.ajp.162.6.1045.

[41] Ghio L, Gotelli S, Marcenaro M, Amore M and Natta W. Duration of untreated illness and outcomes in unipolar depression: a systematic review and meta-analysis. J Affect Disord. 2014;152-154:45–51. Epub 20131021. DOI: 10.1016/j.jad.2013.10.002.
[42] Khalifeh H, Hunt IM, Appleby L and Howard LM. Suicide in perinatal and non-perinatal women in contact with psychiatric services: 15 year findings from a UK national inquiry. Lancet Psychiatry. 2016;3(3):233–242. Epub 20160116. DOI: 10.1016/s2215-0366(16)00003-1.
[43] Drew RJ, Morgan PJ, Pollock ER and Young MD. Impact of male-only lifestyle interventions on men's mental health: A systematic review and meta-analysis. Obes Rev. 2020;21(7):e13014. Epub 20200317. DOI: 10.1111/obr.13014.
[44] Affleck W, Carmichael V and Whitley R. Men's Mental Health: Social Determinants and Implications for Services. Can J Psychiatry. 2018;63(9):581–589. Epub 20180419. DOI: 10.1177/0706743718762388.
[45] Bauer A, Parsonage M, Knapp M, Iemmi V and Adelaja B. The costs of perinatal mental health problems2014.
[46] Yang K, Wu J and Chen X. Risk factors of perinatal depression in women: a systematic review and meta-analysis. BMC Psychiatry. 2022;22(1):63. Epub 20220127. DOI: 10.1186/s12888-021-03684-3.
[47] Khsim IEF, Rodríguez MM, Riquelme Gallego B, Caparros-Gonzalez RA and Amezcua-Prieto C. Risk Factors for Post-Traumatic Stress Disorder after Childbirth: A Systematic Review. Diagnostics (Basel). 2022;12(11). Epub 20221026. DOI: 10.3390/diagnostics12112598.
[48] World Health Organization and United Nations Population Fund. Mental health aspects of women's reproductive health : a global review of the literature. Geneva: World Health Organization; 2009.
[49] Davies C, Segre G, Estradé A, Radua J, De Micheli A, Provenzani U, et al. Prenatal and perinatal risk and protective factors for psychosis: a systematic review and meta-analysis. Lancet Psychiatry. 2020;7(5):399–410. Epub 20200324. DOI: 10.1016/s2215-0366(20)30057-2.
[50] Shintani AO, Rabelo-da-Ponte FD, Marchionatti LE, Watts D, Ferreira de Souza F, Machado CDS, et al. Prenatal and perinatal risk factors for bipolar disorder: A systematic review and meta-analysis. Neurosci Biobehav Rev. 2023;144:104960. Epub 20221112. DOI: 10.1016/j.neubiorev.2022.104960.
[51] Furtado M, Chow CHT, Owais S, Frey BN and Van Lieshout RJ. Risk factors of new onset anxiety and anxiety exacerbation in the perinatal period: A systematic review and meta-analysis. J Affect Disord. 2018;238:626–635. Epub 20180618. DOI: 10.1016/j.jad.2018.05.073.
[52] World Health Organization Regional Office for Europe. Screening programmes: a short guide. Increase effectiveness, maximize benefits and minimize harm.: 2020 [cited 08.12.2024]. Available from: https://iris.who.int/bitstream/handle/10665/330829/9789289054782-eng.pdf.
[53] American Psychological Association and American Psychological Association Practice Organization Work Group on Screening and Psychological Assessment. Distinguishing Between Screening and Assessment for Mental and Behavioral Health Problems. 2014. Available from: https://www.apaservices.org/practice/reimbursement/billing/assessment-screening.
[54] Raffle AE, Mackie A and Gray JAM. Screening. Evidence and Practice. 2nd ed. Oxford: Oxford University Press; 2019. 282 p.
[55] Oxford University Press. self-identification. Oxford Languages,n.d.
[56] Schomerus G, Muehlan H, Auer C, Horsfield P, Tomczyk S, Freitag S, et al. Validity and psychometric properties of the Self-Identification as Having a Mental Illness Scale (SELF-I) among currently untreated persons with mental health problems. Psychiatry Res. 2019;273:303–308. Epub 20190115. DOI: 10.1016/j.psychres.2019.01.054.
[57] Moses T. Self-labeling and its effects among adolescents diagnosed with mental disorders. Social Science & Medicine. 2009;68(3):570–578. DOI: https://doi.org/10.1016/j.socscimed.2008.11.003.
[58] Wilson J, Glover M, Jungner G and World Health Organization. Principles and practice of screening for disease. Geneva: World Health Organization; 1968.
[59] Carroll JC, Reid AJ, Biringer A, Midmer D, Glazier RH, Wilson L, et al. Effectiveness of the Antenatal Psychosocial Health Assessment (ALPHA) form in detecting psychosocial concerns: a randomized controlled trial. CMAJ. 2005;173(3):253–259. DOI: 10.1503/cmaj.1040610.
[60] Mitchell AJ and Coyne J. Screening for postnatal depression: barriers to success. BJOG. 2009;116(1):11–14. Epub 20081111. DOI: 10.1111/j.1471-0528.2008.01834.x.
[61] Woolhouse H, Brown S, Krastev A, Perlen S and Gunn J. Seeking help for anxiety and depression after childbirth: results of the Maternal Health Study. Arch Womens Ment Health. 2009;12(2):75–83. Epub 20090213. DOI: 10.1007/s00737-009-0049-6.
[62] Flynn HA, Henshaw E, O'Mahen H and Forman J. Patient perspectives on improving the depression referral processes in obstetrics settings: a qualitative study. Gen Hosp Psychiatry. 2010;32(1):9–16. Epub 20090827. DOI: 10.1016/j.genhosppsych.2009.07.005.

[63] Darwin Z, Domoney J, Iles J, Bristow F, Siew J and Sethna V. Assessing the Mental Health of Fathers, Other Co-parents, and Partners in the Perinatal Period: Mixed Methods Evidence Synthesis. Front Psychiatry. 2020;11:585479. Epub 20210112. DOI: 10.3389/fpsyt.2020.585479.

[64] Kingston D, McDonald S, Biringer A, Austin M-P, Hegadoren K, McDonald S, et al. Comparing the feasibility, acceptability, clinical-, and cost-effectiveness of mental health e-screening to paper-based screening on the detection of depression, anxiety, and psychosocial risk in pregnant women: a study protocol of a randomized, parallel-group, superiority trial. Trials. 2014;15(1):3–3. DOI: 10.1186/1745-6215-15-3.

[65] Marcus SM, Flynn HA, Blow FC and Barry KL. Depressive symptoms among pregnant women screened in obstetrics settings. J Womens Health (Larchmt). 2003;12(4):373–380. DOI: 10.1089/154099903765448880.

[66] Stuart-Parrigon K and Stuart S. Perinatal Depression: An Update and Overview. Current Psychiatry Reports. 2014;16(9):468. DOI: 10.1007/s11920-014-0468-6.

[67] Garcia ME, Hinton L, Neuhaus J, Feldman M, Livaudais-Toman J and Karliner LS. Equitability of Depression Screening After Implementation of General Adult Screening in Primary Care. JAMA Netw Open. 2022;5(8):e2227658. Epub 20220801. DOI: 10.1001/jamanetworkopen.2022.27658.

[68] Eisner E, Lewis S, Stockton-Powdrell C, Agass R, Whelan P and Tower C. Digital screening for postnatal depression: mixed methods proof-of-concept study. BMC Pregnancy Childbirth. 2022;22(1):429. Epub 20220523. DOI: 10.1186/s12884-022-04756-2.

[69] Spadaro B, Martin-Key NA, Funnell E and Bahn S. mHealth Solutions for Perinatal Mental Health: Scoping Review and Appraisal Following the mHealth Index and Navigation Database Framework. JMIR Mhealth Uhealth. 2022;10(1):e30724. Epub 20220117. DOI: 10.2196/30724.

[70] Kern J, Reinsperger I and Hofer V. Mental health screening of adults in primary care. AIHTA Project Report No.: 159. Journal. 2024. Epub Epub Date. Original Publication.

[71] Dobrow MJ, Hagens V, Chafe R, Sullivan T and Rabeneck L. Consolidated principles for screening based on a systematic review and consensus process. Cmaj. 2018;190(14):E422–e429. DOI: 10.1503/cmaj.171154.

[72] McBride H, Wiens R, McDonald M, Cox D and Chan E. The Edinburgh Postnatal Depression Scale (EPDS): A review of the reported validity evidence. 2014. p. 157–174.

[73] Töreki A, Andó B, Keresztúri A, Sikovanyecz J, Dudas RB, Janka Z, et al. The Edinburgh Postnatal Depression Scale: translation and antepartum validation for a Hungarian sample. Midwifery. 2013;29(4):308–315. Epub 20120313. DOI: 10.1016/j.midw.2012.01.011.

[74] Cox JL, Holden JM and Sagovsky R. Detection of postnatal depression. Development of the 10-item Edinburgh Postnatal Depression Scale. Br J Psychiatry. 1987;150:782–786. DOI: 10.1192/bjp.150.6.782.

[75] Levis B, Negeri Z, Sun Y, Benedetti A and Thombs BD. Accuracy of the Edinburgh Postnatal Depression Scale (EPDS) for screening to detect major depression among pregnant and postpartum women: Systematic review and meta-analysis of individual participant data. BMJ: British Medical Journal. 2020;371. DOI: 10.1136/bmj.m4022.

[76] Kroenke K, Spitzer RL and Williams JB. The Patient Health Questionnaire-2: validity of a two-item depression screener. Med Care. 2003;41(11):1284–1292. DOI: 10.1097/01.mlr.0000093487.78664.3c.

[77] Whooley MA, Avins AL, Miranda J and Browner WS. Case-finding instruments for depression. Two questions are as good as many. J Gen Intern Med. 1997;12(7):439–445. DOI: 10.1046/j.1525-1497.1997.00076.x.

[78] Bosanquet K, Bailey D, Gilbody S, Harden M, Manea L, Nutbrown S, et al. Diagnostic accuracy of the Whooley questions for the identification of depression: a diagnostic meta-analysis. BMJ Open. 2015;5(12):e008913. Epub 20151209. DOI: 10.1136/bmjopen-2015-008913.

[79] Austin MP, Colton J, Priest S, Reilly N and Hadzi-Pavlovic D. The antenatal risk questionnaire (ANRQ): acceptability and use for psychosocial risk assessment in the maternity setting. Women Birth. 2013;26(1):17–25. Epub 20110720. DOI: 10.1016/j.wombi.2011.06.002.

[80] Austin MP, Highet N and the Expert Working Group. Mental Health Care in the Perinatal Period: Australian Clinical Practice Guideline. Melbourne: 2017 [cited December 12th]. Available from: https://cope.org.au/wp-content/uploads/2017/10/Final-COPE-Perinatal-Mental-Health-Guideline.pdf.

[81] National Institute for Health and Care Excellence. Evidence Standards Framework for Digital Health Technologies. 2019 [cited December 8th]. Available from: https://www.nice.org.uk/Media/Default/About/what-we-do/our-programmes/evidence-standards-framework/digital-evidence-standards-framework.pdf.

[82] World Health Organization. Global strategy on digital health 2020- 2025.: 2021 [cited December 8th]. Available from: https://iris.who.int/bitstream/handle/10665/344249/9789240020924-eng.pdf.

[83] World Health Organization. World mental health report: transforming mental health for all. 2022 [cited Decmeber 8th]. Available from: https://iris.who.int/bitstream/handle/10665/356119/9789240049338-eng.pdf?sequence=1.
[84] Daehn D, Martens C, Loew V, Kemmler L, Rudolf S, Kochen E, et al. SmartMoms - a web application to raise awareness and provide information on postpartum depression. BMC Pregnancy Childbirth. 2023;23(1):402. Epub 20230531. DOI: 10.1186/s12884-023-05680-9.
[85] Choo EK, Ranney ML, Aggarwal N and Boudreaux ED. A systematic review of emergency department technology-based behavioral health interventions. Acad Emerg Med. 2012;19(3):318–328. DOI: 10.1111/j.1553-2712.2012.01299.x.
[86] Renker PR. Breaking the barriers: the promise of computer-assisted screening for intimate partner violence. J Midwifery Womens Health. 2008;53(6):496–503. DOI: 10.1016/j.jmwh.2008.07.017.
[87] Gordon M, Henderson R, Holmes JH, Wolters MK and Bennett IM. Participatory design of ehealth solutions for women from vulnerable populations with perinatal depression. J Am Med Inform Assoc. 2016;23(1):105–109. Epub 20150905. DOI: 10.1093/jamia/ocv109.
[88] Vanderkruik R, Raffi E, Freeman MP, Wales R and Cohen L. Perinatal depression screening using smartphone technology: Exploring uptake, engagement and future directions for the MGH Perinatal Depression Scale (MGHPDS). PLoS One. 2021;16(9):e0257065. Epub 20210929. DOI: 10.1371/journal.pone.0257065.
[89] MacMillan HL, Wathen CN, Jamieson E, Boyle M, McNutt LA, Worster A, et al. Approaches to screening for intimate partner violence in health care settings: a randomized trial. JAMA. 2006;296(5):530–536. DOI: 10.1001/jama.296.5.530.
[90] Le HN, Perry DF and Sheng X. Using the internet to screen for postpartum depression. Matern Child Health J. 2009;13(2):213–221. Epub 20080216. DOI: 10.1007/s10995-008-0322-8.
[91] Feldman N, Back D, Boland R and Torous J. A systematic review of mHealth application interventions for peripartum mood disorders: trends and evidence in academia and industry. Archives of Women's Mental Health. 2021;24(6):881–892. DOI: 10.1007/s00737-021-01138-z.
[92] Naslund JA, Aschbrenner KA, Araya R, Marsch LA, Unützer J, Patel V, et al. Digital technology for treating and preventing mental disorders in low-income and middle-income countries: a narrative review of the literature. Lancet Psychiatry. 2017;4(6):486–500. Epub 20170419. DOI: 10.1016/s2215-0366(17)30096-2.
[93] Clarke JR, Gibson M, Savaglio M, Navani R, Mousa M and Boyle JA. Digital screening for mental health in pregnancy and postpartum: A systematic review. Arch Womens Ment Health. 2024. Epub 20240401. DOI: 10.1007/s00737-024-01427-3.
[94] Kingston DE, Biringer A, McDonald SW, Heaman MI, Lasiuk GC, Hegadoren KM, et al. Preferences for Mental Health Screening Among Pregnant Women A Cross-Sectional Study. American Journal of Preventive Medicine. 2015;49(4):E35–E43. DOI: 10.1016/j.amepre.2015.03.026.
[95] Kingston D, Austin M-P, Highet N, van Zanten SV, Harvalik P, Giallo R, et al. Pregnant women's views on the feasibility and acceptability of web-based mental health e-screening versus paper-based screening: A randomized controlled trial. Journal of Medical Internet Research. 2017;19(4):316–333. DOI: 10.2196/jmir.6866.
[96] Lawson A, Dalfen A, Murphy KE, Milligan N and Lancee W. Use of Text Messaging for Postpartum Depression Screening and Information Provision. Psychiatr Serv. 2019;70(5):389–395. Epub 20190205. DOI: 10.1176/appi.ps.201800269.
[97] Drake E, Howard E and Kinsey E. Online screening and referral for postpartum depression: an exploratory study. Community Ment Health J. 2014;50(3):305–311. Epub 20130103. DOI: 10.1007/s10597-012-9573-3.
[98] Page MJ, Moher D, Bossuyt PM, Boutron I, Hoffmann TC, Mulrow CD, et al. PRISMA 2020 explanation and elaboration: updated guidance and exemplars for reporting systematic reviews. BMJ. 2021;372:n160. DOI: 10.1136/bmj.n160.
[99] Cochrane Handbook for Systematic Reviews of Interventions: Cochrane; 2024.
[100] Munn Z, Peters MDJ, Stern C, Tufanaru C, McArthur A and Aromataris E. Systematic review or scoping review? Guidance for authors when choosing between a systematic or scoping review approach. BMC Medical Research Methodology. 2018;18(1):143. DOI: 10.1186/s12874-018-0611-x.
[101] Lasserson T, Thomas J and Higgins J. Chapter 1: Starting a review. In: Higgins J, Thomas J, Chandler J, Cumpston M, Li T, Page M and Welch V, editors. Cochrane Handbook for Systematic Reviews of Interventions. version 6.5 ed: Cochrane; 2024.
[102] Khan KS, Kunz R, Kleijnen J and Antes G. Five steps to conducting a systematic review. J R Soc Med. 2003;96(3):118–121. DOI: 10.1177/014107680309600304.

[103] Shamseer L, Moher D, Clarke M, Ghersi D, Liberati A, Petticrew M, et al. Preferred reporting items for systematic review and meta-analysis protocols (PRISMA-P) 2015: elaboration and explanation. BMJ : British Medical Journal. 2015;349:g7647. DOI: 10.1136/bmj.g7647.
[104] Stone PW. Popping the (PICO) question in research and evidence-based practice. Appl Nurs Res. 2002;15(3):197–198. DOI: 10.1053/apnr.2002.34181.
[105] EUnetHTA. HTA Core Model ® version 3.0. Joint Action 2, Work Package 8. 2016.
[106] Centre for Evidence-Based Medicine. Study Designs. n.d. Available from: https://www.cebm.ox.ac.uk/resources/ebm-tools/study-designs.
[107] Ouzzani M, Hammady H, Fedorowicz Z and Elmagarmid A. Rayyan—a web and mobile app for systematic reviews. Systematic Reviews. 2016;5(1):210. DOI: 10.1186/s13643-016-0384-4.
[108] Büchter RB, Weise A and Pieper D. Development, testing and use of data extraction forms in systematic reviews: a review of methodological guidance. BMC Medical Research Methodology. 2020;20(1):259. DOI: 10.1186/s12874-020-01143-3.
[109] Sterne JAC, Savović J, Page MJ, Elbers RG, Blencowe NS, Boutron I, et al. RoB 2: a revised tool for assessing risk of bias in randomised trials. Bmj. 2019;366:l4898. Epub 20190828. DOI: 10.1136/bmj.l4898.
[110] Whiting P, Savović J, Higgins JP, Caldwell DM, Reeves BC, Shea B, et al. ROBIS: A new tool to assess risk of bias in systematic reviews was developed. J Clin Epidemiol. 2016;69:225–234. Epub 20150616. DOI: 10.1016/j.jclinepi.2015.06.005.
[111] Sterne JA, Hernán MA, Reeves BC, Savović J, Berkman ND, Viswanathan M, et al. ROBINS-I: a tool for assessing risk of bias in non-randomised studies of interventions. Bmj. 2016;355:i4919. Epub 20161012. DOI: 10.1136/bmj.i4919.
[112] Whiting PF, Rutjes AW, Westwood ME, Mallett S, Deeks JJ, Reitsma JB, et al. QUADAS-2: a revised tool for the quality assessment of diagnostic accuracy studies. Ann Intern Med. 2011;155(8):529–536. DOI: 10.7326/0003-4819-155-8-201110180-00009.
[113] Cumpston M and Flemyng E. Chapter II: Planning a Cochrane Review. In: Higgins J, Thomas J, Chandler J, Cumpston M, Li T, Page M and Welch V, editors. Cochrane Handbook for Systematic Reviews of Interventions. version 6.5, last updated Aug, 23 ed2024.
[114] Page MJ, McKenzie JE, Bossuyt PM, Boutron I, Hoffmann TC, Mulrow CD, et al. The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. Bmj. 2021;372:n71. DOI: 10.1136/bmj.n71.
[115] Reilly N and Austin MP. Attitudes and Engagement of Pregnant and Postnatal Women With a Web-Based Emotional Health Tool (Mummatters): Cross-sectional Study. J Med Internet Res. 2021;23(3):e18517. Epub 20210326. DOI: 10.2196/18517.
[116] Highet N, Gamble J and Creedy D. Perinatal mental health and psychosocial risk screening in a community maternal and child health setting: evaluation of a digital platform. Primary Health Care Research & Development. 2019;20:1–7. DOI: 10.1017/S1463423618000336.
[117] Fonseca A, Mancinelli E and Branquinho M. The use of e-mental health tools in the perinatal context. BJPsych Advances. 2024:1–9. Epub 2024/08/27. DOI: 10.1192/bja.2024.23.
[118] Landis JR and Koch GG. The measurement of observer agreement for categorical data. Biometrics. 1977;33(1):159–174.
[119] Pawils S. SmartMoms. 2024. Available from: https://smart-moms.de/.
[120] das Europäische Parlament and der Rat der Europäischen Union. Verordnung (EU) 2017/745 des europäischen Parlaments und des Rates. 2017.
[121] Wykes T, Lipshitz J and Schueller S. Towards the Design of Ethical Standards Related to Digital Mental Health and all Its Applications. Current Treatment Options in Psychiatry. 2019;6. DOI: 10.1007/s40501-019-00180-0.
[122] Montalto M. The Ethical Implications of Using Technology in Psychological Testing and Treatment. Ethical Human Psychology and Psychiatry. 2014;16. DOI: 10.1891/1559-4343.16.2.127.
[123] Jokinen A, Stolt M and Suhonen R. Ethical issues related to eHealth: An integrative review. Nurs Ethics. 2021;28(2):253–271. Epub 20200915. DOI: 10.1177/0969733020945765.
[124] Hewitt C, Gilbody S, Brealey S, Paulden M, Palmer S, Mann R, et al. Methods to identify postnatal depression in primary care: an integrated evidence synthesis and value of information analysis. Health technology assessment (Winchester, England). 2009;13(36):1–145, 147–230. DOI: 10.3310/hta13360.
[125] Safari S, Baratloo A, Elfil M and Negida A. Evidence Based Emergency Medicine Part 2: Positive and negative predictive values of diagnostic tests. Emerg (Tehran). 2015;3(3):87–88.
[126] Molinaro AM. Diagnostic tests: how to estimate the positive predictive value. Neuro-Oncology Practice. 2015;2(4):162–166. DOI: 10.1093/nop/npv030.
[127] Digital assessment of wellbeing in new parents. Digital Assessment of Wellbeing in New Parents (DAWN-P): a feasibility study of digital screening for postnatal depression. 2023.

[128] Europäisches Parlament and Rat der Europäischen Union. Verordnung (EU) 2016/679 des Europäischen Parlaments und des Rates vom 27. April 2016 zum Schutz natürlicher Personen bei der Verarbeitung personenbezogener Daten, zum freien Datenverkehr und zur Aufhebung der Richtlinie 95/46/EG (Datenschutz-Grundverordnung). In: Directorate-General for Justice and Consumers E, editor. 2016.

[129] Schroé H, Crombez G, De Bourdeaudhuij I and Van Dyck D. Investigating When, Which, and Why Users Stop Using a Digital Health Intervention to Promote an Active Lifestyle: Secondary Analysis With A Focus on Health Action Process Approach-Based Psychological Determinants. JMIR Mhealth Uhealth. 2022;10(1):e30583. Epub 20220131. DOI: 10.2196/30583.

[130] World Health Organization. Classification of digital health interventions. Geneva.: World Health Organization; 2018. p. 19.

[131] National Institute for Health and Care Excellence. Evidence standards framework for digital health technologies. 2018. p. 47.

[132] The SUPPORT Study: effectiveness and Usability of a Web-Enabled Resource for Postpartum Mental Health. The SUPPORT Study: survey and Development of a Universally Accessible Postpartum Online Resource for the Treatment of Postpartum Depression. 2022.

[133] Camoni L, Mirabella F, Palumbo G, Del Re D, Gigantesco A, Calamandrei G, et al. A screening and treatment programme to deal with perinatal anxiety and depression during the COVID-19 pandemic. Epidemiol Prev. 2020;44(5-6 Suppl 2):369–373. Indicazioni di un programma di screening e trattamento per la gestione dell'ansia e della depressione perinatale nell'emergenza e post-emergenza COVID-19. DOI: 10.19191/EP20.5-6.S2.139.

[134] Chrzan-Detkos M and Walczak-Kozlowska T. Postpartum depression crisis since the second lockdown and 'screening paradox': many women identified, very few treated. BMC Public Health. 2022;22(1). DOI: 10.1186/s12889-022-14705-5.

[135] Doherty K, Barry M, Marcano-Belisario J, Arnaud B, Morrison C, Car J, et al. A Mobile App for the Self-Report of Psychological Well-Being During Pregnancy (BrightSelf): Qualitative Design Study. JMIR Ment Health. 2018;5(4):e10007. Epub 20181127. DOI: 10.2196/10007.

[136] Doherty K, Marcano-Belisario J, Cohn M, Mastellos N, Morrison C, Car J, et al. Engagement with Mental Health Screening on Mobile Devices: Results from an Antenatal Feasibility Study. CHI 2019: PROCEEDINGS OF THE 2019 CHI CONFERENCE ON HUMAN FACTORS IN COMPUTING SYSTEMS2019.

[137] Fijean AL, Marçais M, Banasiak C, Morel O, Dahlhoff S, Olieric MF, et al. Universal screening of postpartum depression with Edinburgh Postpartum Depression Scale: A prospective observational study. Int J Gynaecol Obstet. 2024. Epub 20240604. DOI: 10.1002/ijgo.15722.

[138] Guille C, Henrich N, Brinson AK and Jahnke HR. Improving the Management of Maternal Mental Health with Digital Health Care. Psychiatr Res Clin Pract. 2024;6(1):23–32. Epub 20231129. DOI: 10.1176/appi.prcp.20230035.

[139] Guille C, King C, King K, Kruis R, Ford D, Maldonado L, et al. Text And Telephone Screening And Referral Improved Detection And Treatment Of Maternal Mental Health Conditions. Health Affairs. 2024;43(4):548–556. DOI: 10.1377/hlthaff.2023.01432.

[140] Inkster B, Kadaba M and Subramanian V. Understanding the impact of an AI-enabled conversational agent mobile app on users' mental health and wellbeing with a self-reported maternal event: a mixed method real-world data mHealth study. FRONTIERS IN GLOBAL WOMENS HEALTH. 2023;4. DOI: 10.3389/fgwh.2023.1084302.

[141] Jhawar S, Gupta SD and Das A. Maternal depression: Technology enabled self screening in real time. Health Care for Women International. 2022;43(12):1449–1463. DOI: 10.1080/07399332.2022.2037603.

[142] Kingston D, Biringer A, Veldhuyzen van Zanten S, Giallo R, McDonald S, MacQueen G, et al. Pregnant Women's Perceptions of the Risks and Benefits of Disclosure During Web-Based Mental Health E-Screening Versus Paper-Based Screening: Randomized Controlled Trial. JMIR Ment Health. 2017;4(4):e42. Epub 20171020. DOI: 10.2196/mental.6888.

[143] Learman LA. Screening for Depression in Pregnancy and the Postpartum Period. Clinical Obstetrics & Gynecology. 2018;61(3):525–532. DOI: 10.1097/GRF.0000000000000359.

[144] Li Y, Zhao Q, Cross WM, Chen J, Qin C and Sun M. Assessing the quality of mobile applications targeting postpartum depression in China. Int J Ment Health Nurs. 2020;29(5):772–785. Epub 20200328. DOI: 10.1111/inm.12713.

[145] Lucas K, Hoeppner C, Marko K, Sebastian A, Sheth S and Tung B. Mobile Assessments to Improve Screening and Novel Patient Engagement to Diagnose and Manage Maternal Mental Health (MIND) Study Midpoint Analysis: compliance Rate of Antenatal Screening. Obstetrics and gynecology. 2023;141(5):28S. DOI: https://doi.org/10.1097/01.AOG.0000930072.37985.05.

[146] Marcano-Belisario JS, Gupta AK, O'Donoghue J, Ramchandani P, Morrison C and Car J. Implementation of depression screening in antenatal clinics through tablet computers: results of a feasibility study. BMC MEDICAL INFORMATICS AND DECISION MAKING. 2017;17. DOI: 10.1186/s12911-017-0459-8.

[147] Martínez-Borba V, Suso-Ribera C and Osma J. The Use of Information and Communication Technologies in Perinatal Depression Screening: A Systematic Review. CYBERPSYCHOLOGY BEHAVIOR AND SOCIAL NETWORKING. 2018;21(12):741–752. DOI: 10.1089/cyber.2018.0416.

[148] Nguyen PY, Caddy C, Wilson AN, Blackburn K, Page MJ, Gülmezoglu AM, et al. Self-care interventions for preconception, antenatal, intrapartum and postpartum care: a scoping review. BMJ Open. 2023;13(5):e068713. Epub 20230510. DOI: 10.1136/bmjopen-2022-068713.

[149] Oğur YS, Yazıcı E, Yuvacı HU, Oğur NB, Köse E and Yazıcı AB. Development of a mobile monitoring program for anxiety and depression in pregnancy and evaluation of 3-month results. Ann Clin Psychiatry. 2023;35(4):260–271. DOI: 10.12788/acp.0127.

[150] Osma J, Plaza I, Crespo E, Medrano C, Serrano R and Ieee. Proposal of use of smartphones to evaluate and diagnose depression and anxiety symptoms during pregnancy and after birth. 2014 IEEE-EMBS INTERNATIONAL CONFERENCE ON BIOMEDICAL AND HEALTH INFORMATICS (BHI)2014. p. 547–550.

[151] Reilly N, Kingston D, Loxton D, Talcevska K and Austin MP. A narrative review of studies addressing the clinical effectiveness of perinatal depression screening programs. WOMEN AND BIRTH. 2020;33(1):51–59. DOI: 10.1016/j.wombi.2019.03.004.

[152] Reilly N, Talcevska K, Black E, Matthey S and Austin MP. A comparison of the interviewer-administered phone and self-complete online versions of the computerized eMINI 6.0 in a sample of pregnant women. J Affect Disord. 2019;242:265–269. Epub 20180818. DOI: 10.1016/j.jad.2018.08.055.

[153] Stone JS and Hirshberg A. Telemedicine and Digital Health Solutions in Intrapartum and Postpartum Care. CURRENT OBSTETRICS AND GYNECOLOGY REPORTS. 2024. DOI: 10.1007/s13669-024-00394-x.

[154] Vani K, Katehis I, Bernstein PS, Lebron-Reyes C, Chung HY, Bruney T, et al. Piloting a prenatal care smartphone application and care navigation intervention at a federally qualified health center. AMERICAN JOURNAL OF OBSTETRICS & GYNECOLOGY MFM. 2023;5(10). DOI: 10.1016/j.ajogmf.2023.101135.

[155] Varma DS, Mualem M, Goodin A, Gurka KK, Wen TS, Gurka MJ, et al. Acceptability of an mHealth App for Monitoring Perinatal and Postpartum Mental Health: Qualitative Study With Women and Providers. JMIR Form Res. 2023;7:e44500. Epub 20230607. DOI: 10.2196/44500.

[156] Zingg A, Rogith D, Refuerzo JS and Myneni S. Digilego for Peripartum Depression: A Novel Patient-Facing Digital Health Instantiation. AMIA Annu Symp Proc. 2020;2020:1421–1430. Epub 20210125.

[157] RANZCOG Women's Health Committee. Category: Best Practice Statement. Mental Health Care in the Perinatal Period. Version 4.1 ed2021.

[158] World Health Organization. Guide for integration of perinatal mental health in maternal and child health services. Geneva: World Health Organization; 2022 2022.

[159] Diginostic Pty Ltd. About iCOPE.: 2024 [cited December 21st]. Available from: https://diginostic.com.au/icope/.

[160] Excellence. CoP. iCOPE Digital Screening. Journal. 2024. Epub Epub Date. Original Publication.

[161] Diginostic Pty Ltd. About iCOPE. Journal. 2024. Epub Epub Date. Original Publication.

[162] SmartMoms. Datenschutz. 2021 [cited December 21]. Available from: https://smart-moms.de/datenschutz/.

7 Appendix

A1 Search strategy: Systematic literature search

PUBMED

#1	Population	parent* OR mother* OR mom OR mum OR father* OR dad OR co-parent* OR (adoptive parent*) OR parent*-to-be OR (expect* parent*) OR "mother*-to-be" OR "father*-to-be" OR pregnant OR pregnancy
#2	Digital health technology	"digital technolog*" OR "digital health technolog*" OR digital OR online OR mobile OR (mobile AND (phone OR application OR technolog*)) OR "smartphone technolog*" OR platform OR website OR mHealth OR eHealth OR telemedicine OR telehealth OR (internet-delivered program*) OR telepsychiatry OR "remote sensing" OR computer OR software OR ((web OR computer OR internet OR online) AND (based OR assisted OR guided OR aided OR delivered OR supported))
#3	Self-identification	screening OR "early detection" OR "self-assessment" OR (self-identification)
#4	Perinatal mental illness	(perinatal OR peripartum OR peripartal OR prenatal OR antenatal OR postnatal OR postpartum) AND (((mental OR psychological) AND (health OR illness OR disease OR disorder OR condition)) OR "mood disorder*" OR (depress* OR psychosis OR anxiety OR (post traumatic stress disorder)))

01.07.2024

total hits 1,018

09:56:47/ Austrian Time 15:56, 01.07.2024

Search: #1 AND #2 AND #3 AND #4 Filters: from 2014 - 2024

#1 (("parent*"[All Fields] OR "mother*"[All Fields] OR "mom"[All Fields] OR ("mum int conf mob ubiquitous multimed"[Journal] OR "mum"[All Fields]) OR "father*"[All Fields] OR "dad"[All Fields] OR "co parent*"[All Fields] OR (("adoptive"[All Fields] OR "adoptively"[All Fields]) AND "parent*"[All Fields]) OR "parent* to be"[All Fields] OR ("expect*"[All Fields] AND "parent*"[All Fields]) OR "mother* to be"[All Fields] OR "father* to be"[All Fields] OR ("pregnant"[All Fields] OR "pregnants"[All Fields]) OR ("pregnancy"[MeSH Terms] OR "pregnancy"[All Fields] OR "pregnancies"[All Fields] OR "pregnancy s"[All Fields]))

#2 AND ("digital technolog*"[All Fields] OR "digital health technolog*"[All Fields] OR ("digitalisation"[All Fields] OR "digitalised"[All Fields] OR "digitalization"[All Fields] OR "digitalize"[All Fields] OR "digitalized"[All Fields] OR "digitalizer"[All Fields] OR "digitalizing"[All Fields] OR "digitally"[All Fields] OR "digitals"[All Fields] OR "digitization"[All Fields] OR "digitizations"[All Fields] OR "digitize"[All Fields] OR "digitized"[All Fields] OR "digitizer"[All Fields] OR "digitizers"[All Fields] OR "digitizes"[All Fields] OR "digitizing"[All Fields] OR "radiographic image enhancement"[MeSH Terms] OR ("radiographic"[All Fields] AND "image"[All Fields] AND "enhancement"[All Fields]) OR "radiographic image enhancement"[All Fields] OR "digital"[All Fields]) OR "online"[All Fields] OR ("mobile"[All Fields] OR "mobiles"[All Fields]) OR (("mobile"[All Fields] OR "mobiles"[All Fields]) AND ("phone s"[All Fields] OR "phoned"[All Fields] OR "phones"[All Fields] OR "phoning"[All Fields] OR "telephone"[MeSH Terms] OR "telephone"[All Fields] OR "phone"[All Fields] OR ("applicabilities"[All Fields] OR "applicability"[All Fields] OR "application"[All Fields] OR "applications"[All Fields] OR "applicative"[All Fields]) OR "technolog*"[All Fields])) OR "smartphone technolog*"[All Fields] OR ("platform"[All Fields] OR "platform s"[All Fields] OR "platforms"[All Fields]) OR ("website"[All Fields] OR "website s"[All Fields]

OR "websites"[All Fields]) OR ("mhealth s"[All Fields] OR "telemedicine"[MeSH Terms] OR "telemedicine"[All Fields] OR "mhealth"[All Fields]) OR ("telemedicine"[MeSH Terms] OR "telemedicine"[All Fields] OR "ehealth"[All Fields]) OR ("telemedicine"[MeSH Terms] OR "telemedicine"[All Fields] OR "telemedicine s"[All Fields]) OR ("telehealth s"[All Fields] OR "telemedicine"[MeSH Terms] OR "telemedicine"[All Fields] OR "telehealth"[All Fields]) OR ("internet-delivered"[All Fields] AND "program*"[All Fields]) OR "telepsychiatry"[All Fields] OR "remote sensing"[All Fields] OR ("computability"[All Fields] OR "computable"[All Fields] OR "computating"[All Fields] OR "computation"[All Fields] OR "computational"[All Fields] OR "computations"[All Fields] OR "compute"[All Fields] OR "computed"[All Fields] OR "computer s"[All Fields] OR "computers"[MeSH Terms] OR "computers"[All Fields] OR "computer"[All Fields] OR "computes"[All Fields] OR "computing"[All Fields] OR "computional"[All Fields]) OR ("software"[MeSH Terms] OR "software"[All Fields] OR "software s"[All Fields] OR "softwares"[All Fields]) OR (("web"[All Fields] OR ("computability"[All Fields] OR "computable"[All Fields] OR "computating"[All Fields] OR "computation"[All Fields] OR "computational"[All Fields] OR "computations"[All Fields] OR "compute"[All Fields] OR "computed"[All Fields] OR "computer s"[All Fields] OR "computers"[MeSH Terms] OR "computers"[All Fields] OR "computer"[All Fields] OR "computes"[All Fields] OR "computing"[All Fields] OR "computional"[All Fields]) OR ("internet"[MeSH Terms] OR "internet"[All Fields] OR "internet s"[All Fields] OR "internets"[All Fields]) OR "online"[All Fields]) AND ("based"[All Fields] OR "basing"[All Fields] OR ("assistances"[All Fields] OR "assistant s"[All Fields] OR "assistants"[All Fields] OR "assisted"[All Fields] OR "assisting"[All Fields] OR "assistive"[All Fields] OR "dental assistants"[MeSH Terms] OR ("dental"[All Fields] AND "assistants"[All Fields]) OR "dental assistants"[All Fields] OR "assistant"[All Fields] OR "helping behavior"[MeSH Terms] OR ("helping"[All Fields] AND "behavior"[All Fields]) OR "helping behavior"[All Fields] OR "assist"[All Fields] OR "assistance"[All Fields] OR "assists"[All Fields]) OR ("guide"[All Fields] OR "guided"[All Fields] OR "guides"[All Fields] OR "guiding"[All Fields]) OR ("aided"[All Fields] OR "aiding"[All Fields]) OR ("deliver"[All Fields] OR "delivered"[All Fields] OR "delivering"[All Fields] OR "delivers"[All Fields]) OR ("support"[All Fields] OR "support s"[All Fields] OR "supported"[All Fields] OR "supporter"[All Fields] OR "supporter s"[All Fields] OR "supporters"[All Fields] OR "supporting"[All Fields] OR "supportive"[All Fields] OR "supportiveness"[All Fields] OR "supports"[All Fields])))))

#3 AND ("diagnosis"[MeSH Subheading] OR "diagnosis"[All Fields] OR "screening"[All Fields] OR "mass screening"[MeSH Terms] OR ("mass"[All Fields] AND "screening"[All Fields]) OR "mass screening"[All Fields] OR "early detection of cancer"[MeSH Terms] OR ("early"[All Fields] AND "detection"[All Fields] AND "cancer"[All Fields]) OR "early detection of cancer"[All Fields] OR "screen"[All Fields] OR "screenings"[All Fields] OR "screened"[All Fields] OR "screens"[All Fields] OR "early detection"[All Fields] OR "self-assessment"[All Fields] OR "self-identification"[All Fields]) AND (("perinatal"[All Fields] OR "perinatally"[All Fields] OR "perinatals"[All Fields] OR ("peripartum period"[MeSH Terms] OR ("peripartum"[All Fields] AND "period"[All Fields]) OR "peripartum period"[All Fields] OR "peripartum"[All Fields]) OR "peripartal"[All Fields] OR ("prenatal"[All Fields] OR "prenatally"[All Fields] OR "prenatals"[All Fields]) OR ("antenatal"[All Fields] OR "antenatally"[All Fields]) OR ("postnatal"[All Fields] OR "postnatally"[All Fields]) OR ("postpartum period"[MeSH Terms] OR ("postpartum"[All Fields] AND "period"[All Fields]) OR "postpartum period"[All Fields] OR "postpartum"[All Fields]))

#4 AND ((("mental"[All Fields] OR "mentalities"[All Fields] OR "mentality"[All Fields] OR "mentalization"[MeSH Terms] OR "mentalization"[All Fields] OR "mentalizing"[All Fields] OR "mentalize"[All Fields] OR "mentalized"[All Fields] OR "mentally"[All Fields] OR ("psychologic"[All Fields] OR "psychological"[All Fields] OR "psychologically"[All Fields] OR "psychologization"[All Fields] OR "psychologized"[All Fields] OR "psychologizing"[All Fields])) AND ("health"[MeSH Terms] OR "health"[All Fields] OR "health s"[All Fields] OR "healthful"[All Fields] OR "healthfulness"[All Fields] OR "healths"[All Fields] OR ("illness"[All Fields] OR "illness s"[All Fields] OR "illnesses"[All Fields]) OR ("disease"[MeSH Terms] OR "disease"[All Fields] OR "diseases"[All Fields] OR "disease s"[All Fields] OR "diseased"[All Fields]) OR ("disease"[MeSH Terms] OR "disease"[All Fields] OR "disorder"[All Fields] OR "disorders"[All Fields] OR "disorder s"[All Fields] OR "disordes"[All Fields]) OR ("condition"[All Fields] OR "condition s"[All Fields] OR "conditions"[All Fields]))) OR "mood disorder*"[All Fields] OR ("depress*"[All Fields] OR ("psychotic disorders"[MeSH Terms] OR ("psychotic"[All Fields] AND "disorders"[All Fields]) OR "psychotic disorders"[All Fields] OR "psychosis"[All Fields]) OR ("anxiety"[MeSH

Terms] OR "anxiety"[All Fields] OR "anxieties"[All Fields] OR "anxiety s"[All Fields]) OR ("stress disorders, post traumatic"[MeSH Terms] OR ("stress"[All Fields] AND "disorders"[All Fields] AND "post traumatic"[All Fields]) OR "post-traumatic stress disorders"[All Fields] OR ("post"[All Fields] AND "traumatic"[All Fields] AND "stress"[All Fields] AND "disorder"[All Fields]) OR "post traumatic stress disorder"[All Fields])))))

#Filter AND (2014:2024[pdat])

CINHAL Ultimate

#1	Population	parent* OR mother* OR mom OR mum OR father* OR dad OR co-parent* OR (adoptive parent*) OR parent*-to-be OR (expect* parent*) OR "mother*-to-be" OR "father*-to-be" OR pregnant OR pregnancy
#2	Digital health technology	"digital technolog*" OR "digital health technolog*" OR digital OR online OR mobile OR (mobile AND (phone OR application OR technolog*)) OR "smartphone technolog*" OR platform OR website OR mHealth OR eHealth OR telemedicine OR telehealth OR (internet-delivered program*) OR telepsychiatry OR "remote sensing" OR computer OR software OR ((web OR computer OR internet OR online) AND (based OR assisted OR guided OR aided OR delivered OR supported))
#3	Self-identification	screening OR "early detection" OR "self-assessment" OR (self-identification)
#4	Perinatal mental illness	(perinatal OR peripartum OR peripartal OR prenatal OR antenatal OR postnatal OR postpartum) AND (((mental OR psychological) AND (health OR illness OR disease OR disorder OR condition)) OR "mood disorder*" OR (depress* OR psychosis OR anxiety OR (post traumatic stress disorder)))

01.07.2024, 16:45

432 total hits

S1 AND S2 AND S3 AND S4

Limiters - Publication Date: 20140101-20241231
Expanders - Apply related words
Search modes - Proximity

Mon, Juli 1, 2024 05:52:58 PM

QueryLimiters/Expanders Last Run Via Results

S5 S1 AND S2 AND S3 AND S4 Limiters - Publication Date: 20140101-20241231

Expanders - Apply related words

Search modes - Proximity Interface - EBSCOhost Research Databases

Search Screen - Advanced Search

Database - CINAHL Ultimate 432

S4 (perinatal OR peripartum OR peripartal OR prenatal OR antenatal OR postnatal OR postpartum) AND (((mental OR psychological) AND (health OR illness OR disease OR disorder OR condition)) OR "mood disorder*" OR (depress* OR psychosis OR anxiety OR (post traumatic stress disorder))) Expanders - Apply related words

Search modes - Proximity Interface - EBSCOhost Research Databases

Search Screen - Advanced Search

Database - CINAHL Ultimate 23,691

S3 screening OR "early detection" OR "self-assessment" OR (self-identification) Expanders - Apply related words

Search modes - Proximity Interface - EBSCOhost Research Databases

Search Screen - Advanced Search

Database - CINAHL Ultimate 251,685

S2 “digital technolog*” OR “digital health technolog*” OR digital OR online OR mobile OR (mobile AND (phone OR application OR technolog*)) OR “smartphone technolog*” OR platform OR website OR mHealth OR eHealth OR telemedicine OR telehealth OR (internet-delivered program*) OR telepsychiatry OR “remote sensing” OR computer OR software OR ((web OR computer OR internet OR online) AND (based OR assisted OR guided OR aided OR delivered OR supported)) Expanders - Apply related words

Search modes - Proximity Interface - EBSCOhost Research Databases

Search Screen - Advanced Search

Database - CINAHL Ultimate 902,230

S1 parent* OR mother* OR mom OR mum OR father* OR dad OR co-parent* OR (adoptive parent*) OR parent*-to-be OR (expect* parent*) OR "mother*-to-be" OR "father*-to-be" OR pregnant OR pregnancy Expanders - Apply related words

Search modes - Proximity Interface - EBSCOhost Research Databases

Search Screen - Advanced Search

Database - CINAHL Ultimate 570,126

Web of Science

#1	Population	parent* OR mother* OR mom OR mum OR father* OR dad OR co-parent* OR (adoptive parent*) OR parent*-to-be OR (expect* parent*) OR "mother*-to-be" OR "father*-to-be" OR pregnant OR pregnancy
#2	Digital health technology	“digital technolog*” OR “digital health technolog*” OR digital OR online OR mobile OR (mobile AND (phone OR application OR technolog*)) OR “smartphone technolog*” OR platform OR website OR mHealth OR eHealth OR telemedicine OR telehealth OR (internet-delivered program*) OR telepsychiatry OR “remote sensing” OR computer OR software OR ((web OR computer OR internet OR online) AND (based OR assisted OR guided OR aided OR delivered OR supported))
#3	Self-identification	screening OR “early detection” OR “self-assessment” OR (self-identification)
#4	Perinatal mental illness	(perinatal OR peripartum OR peripartal OR prenatal OR antenatal OR postnatal OR postpartum) AND (((mental OR psychological) AND (health OR illness OR disease OR disorder OR condition)) OR “mood disorder*” OR (depress* OR psychosis OR anxiety OR (post traumatic stress disorder)))

#Web of Science Search Strategy (v0.1)
Database: Web of Science Core Collection
Entitlements:
- WOS.SCI: 1900 to 2024
- WOS.AHCI: 2000 to 2024
- WOS.ESCI: 2005 to 2024
- WOS.ISTP: 1990 to 2024
- WOS.SSCI: 2000 to 2024
- WOS.ISSHP: 1990 to 2024

Searched:
All fields
Limit 2014- 2024
Total hits 613

Searches:
1: ALL=(parent* OR mother* OR mom OR mum OR father* OR dad OR co-parent* OR

(adoptive parent*) OR parent*-to-be OR (expect* parent*) OR "mother*-to-be" OR "father*-to-be" OR pregnant OR pregnancy) Date Run: Mon Jul 01 2024 18:03:35 GMT+0200 (Mitteleuropäische Sommerzeit) Results: 1972802
2: ALL=("digital technolog*" OR "digital health technolog*" OR digital OR online OR mobile OR (mobile AND (phone OR application OR technolog*)) OR "smartphone technolog*" OR platform OR website OR mHealth OR eHealth OR telemedicine OR telehealth OR (internet-delivered program*) OR telepsychiatry OR "remote sensing" OR computer OR software OR ((web OR computer OR internet OR online) AND (based OR assisted OR guided OR aided OR delivered OR supported))) Date Run: Mon Jul 01 2024 18:04:06 GMT+0200 (Mitteleuropäische Sommerzeit) Results: 8476836
3: ALL=(screening OR "early detection" OR "self-assessment" OR (self-identification)) Date Run: Mon Jul 01 2024 18:04:31 GMT+0200 (Mitteleuropäische Sommerzeit) Results: 1499169
4: ALL=((perinatal OR peripartum OR peripartal OR prenatal OR antenatal OR postnatal OR postpartum) AND (((mental OR psychological) AND (health OR illness OR disease OR disorder OR condition)) OR "mood disorder*" OR (depress* OR psychosis OR anxiety OR (post traumatic stress disorder)))) Date Run: Mon Jul 01 2024 18:04:49 GMT+0200 (Mitteleuropäische Sommerzeit) Results: 59073
5: #1 AND #2 AND #3 AND #4 Date Run: Mon Jul 01 2024 18:05:06 GMT+0200 (Mitteleuropäische Sommerzeit) Results: 668
6: #1 AND #2 AND #3 AND #4 and 2014 or 2015 or 2024 or 2023 or 2022 or 2021 or 2020 or 2019 or 2018 or 2017 or 2016 (Publication Years) Date Run: Mon Jul 01 2024 18:06:13 GMT+0200 (Mitteleuropäische Sommerzeit) Results: 613

PsychINFO

#1	Population	parent* OR mother* OR mom OR mum OR father* OR dad OR co-parent* OR (adoptive parent*) OR parent*-to-be OR (expect* parent*) OR "mother*-to-be" OR "father*-to-be" OR pregnant OR pregnancy
#2	Digital health technology	"digital technolog*" OR "digital health technolog*" OR digital OR online OR mobile OR (mobile AND (phone OR application OR technolog*)) OR "smartphone technolog*" OR platform OR website OR mHealth OR eHealth OR telemedicine OR telehealth OR (internet-delivered program*) OR telepsychiatry OR "remote sensing" OR computer OR software OR ((web OR computer OR internet OR online) AND (based OR assisted OR guided OR aided OR delivered OR supported))
#3	Self-identification	screening OR "early detection" OR "self-assessment" OR (self-identification)
#4	Perinatal mental illness	(perinatal OR peripartum OR peripartal OR prenatal OR antenatal OR postnatal OR postpartum) AND (((mental OR psychological) AND (health OR illness OR disease OR disorder OR condition)) OR "mood disorder*" OR (depress* OR psychosis OR anxiety OR (post traumatic stress disorder)))

Mon, Juli 1, 2024 09:54:27 PM

224 total hits

S1 AND S2 AND S3 AND S4

Limiters - Publication Date: 20140101-20241231
Expanders - Apply related words
Search modes - Proximity

QueryLimiters/Expanders Last Run Via Results

S6 S1 AND S2 AND S3 AND S4 Limiters - Publication Year: 2014-2024

Expanders - Apply related words

Search modes - Proximity Interface - EBSCOhost Research Databases

Search Screen - Advanced Search

Database - APA PsycInfo 224

S5 S1 AND S2 AND S3 AND S4 Expanders - Apply related words

Search modes - Proximity Interface - EBSCOhost Research Databases

Search Screen - Advanced Search

Database - APA PsycInfo 272

S4 (perinatal OR peripartum OR peripartal OR prenatal OR antenatal OR postnatal OR postpartum) AND (((mental OR psychological) AND (health OR illness OR disease OR disorder OR condition)) OR "mood disorder*" OR (depress* OR psychosis OR anxiety OR (post traumatic stress disorder))) Expanders - Apply related words

Search modes - Proximity Interface - EBSCOhost Research Databases

Search Screen - Advanced Search

Database - APA PsycInfo 35,595

S3 screening OR "early detection" OR "self-assessment" OR (self-identification) Expanders - Apply related words

Search modes - Proximity Interface - EBSCOhost Research Databases

Search Screen - Advanced Search

Database - APA PsycInfo 129,998

S2 "digital technolog*" OR "digital health technolog*" OR digital OR online OR mobile OR (mobile AND (phone OR application OR technolog*)) OR "smartphone technolog*" OR platform OR website OR mHealth OR eHealth OR telemedicine OR telehealth OR (internet-delivered program*) OR telepsychiatry OR "remote sensing" OR computer OR software OR ((web OR computer OR internet OR online) AND (based OR assisted OR guided OR aided OR delivered OR supported)) Expanders - Apply related words

Search modes - Proximity Interface - EBSCOhost Research Databases

Search Screen - Advanced Search

Database - APA PsycInfo 466,861

S1 parent* OR mother* OR mom OR mum OR father* OR dad OR co-parent* OR (adoptive parent*) OR parent*-to-be OR (expect* parent*) OR "mother*-to-be" OR "father*-to-be" OR pregnant OR pregnancy Expanders - Apply related words

Search modes - Proximity Interface - EBSCOhost Research Databases

Search Screen - Advanced Search

Database - APA PsycInfo 506,305

Cochrane Library

#1	Population	parent* OR mother* OR mom OR mum OR father* OR dad OR co-parent* OR (adoptive parent*) OR parent*-to-be OR (expect* parent*) OR "mother-to-be" OR "mothers-to-be" OR "father-to-be" OR "fathers-to-be" OR pregnant OR pregnancy
#2	Digital health technology	"digital technology" OR "digital technologies" OR "digital health technology" OR "digital health technologies" OR digital OR online OR mobile OR (mobile AND (phone OR application OR technolog*)) OR "smartphone technology" OR "smartphone technologies" OR platform OR website OR mHealth OR eHealth OR telemedicine OR telehealth OR (internet-delivered program*) OR telepsychiatry OR "remote sensing" OR computer OR software OR ((web OR computer OR internet OR online) AND (based OR assisted OR guided OR aided OR delivered OR supported))
#3	Self-identification	screening OR "early detection" OR "self-assessment" OR (self-identification)

#4	Perinatal mental illness	(perinatal OR peripartum OR peripartal OR prenatal OR antenatal OR postnatal OR post-partum) AND (((mental OR psychological) AND (health OR illness OR disease OR disorder OR condition)) OR "mood disorder" OR "mood disorders" OR (depress* OR psychosis OR anxiety OR (post traumatic stress disorder)))

01.07.2024, 22:30

Search 1 AND 2 AND 3 AND 4

Limit 2014- current

Total hits: 475

Multi Field Search

EBM Reviews - Cochrane Database of Systematic Reviews <2005 to June 26, 2024>

EBM Reviews - ACP Journal Club <1991 to June 2024>

EBM Reviews - Database of Abstracts of Reviews of Effects <1st Quarter 2016>

EBM Reviews - Cochrane Clinical Answers <June 2024>

EBM Reviews - Cochrane Central Register of Controlled Trials <May 2024>

EBM Reviews - Cochrane Methodology Register <3rd Quarter 2012>

EBM Reviews - Health Technology Assessment <4th Quarter 2016>

EBM Reviews - NHS Economic Evaluation Database <1st Quarter 2016>

1 (parent* or mother* or mom or mum or father* or dad or co-parent* or adoptive parent* or parent*-to-be or expect* parent* or "mother-to-be" or "mothers-to-be" or "father-to-be" or "fathers-to-be" or pregnant or pregnancy).af. 169478

2 ("digital technology" or "digital technologies" or "digital health technology" or "digital health technologies" or digital or online or mobile or (mobile and (phone or application or technolog*)) or "smartphone technology" or "smartphone technologies" or platform or website or mHealth or eHealth or telemedicine or telehealth or internet-delivered program* or telepsychiatry or "remote sensing" or computer or software or ((web or computer or internet or online) and (based or assisted or guided or aided or delivered or supported))).af. 195746

3 (screening or "early detection" or "self-assessment" or self-identification).af. 96737

4 ((perinatal or peripartum or peripartal or prenatal or antenatal or postnatal or postpartum) and (((mental or psychological) and (health or illness or disease or disorder or condition)) or "mood disorder" or "mood disorders" or (depress* or psychosis or anxiety or post traumatic stress disorder))).af. 7674

5 1 and 2 and 3 and 4 904

6 ((parent* or mother* or mom or mum or father* or dad or co-parent* or adoptive parent* or parent*-to-be or expect* parent* or "mother-to-be" or "mothers-to-be" or "father-to-be" or "fathers-to-be" or pregnant or pregnancy) and ("digital technology" or "digital technologies" or "digital health technology" or "digital health technologies" or digital or online or mobile or (mobile and (phone or application or technolog*)) or "smartphone technology" or "smartphone technologies" or platform or website or mHealth or eHealth or telemedicine or telehealth or internet-delivered program* or telepsychiatry or "remote sensing" or computer or software or ((web or computer or internet or online) and (based or assisted or guided or aided or delivered or supported))) and (screening or "early detection" or "self-assessment" or self-identification) and ((perinatal or peripartum or peripartal or prenatal or antenatal or postnatal or postpartum) and (((mental or psychological) and (health or illness or disease or disorder or condition)) or "mood disorder" or "mood disorders" or (depress* or psychosis or anxiety or post traumatic stress disorder)))).af. 904

7 limit 5 to yr="2014 -Current" 475

A2 Table of excluded studies after full text screening

No.	*Author*	Title	Exclusion reason
1	*University of British Columbia (2022) [132]*	The SUPPORT Study: effectiveness and Usability of a Web-Enabled Resource for Postpartum Mental Health	Study design reason: study protocol
2	*ISRCTN10781027 (2023) [127]*	Digital assessment of wellbeing in new parents	Study design reason: study protocol
3	*Camoni, Mirabella, et al. [133]*	A screening and treatment programme to deal with perinatal anxiety and depression during the COVID-19 pandemic	Others: only available in Italian language
4	*Chrzan-Detkos and Walczak-Kozlowska [134]*	Postpartum depression crisis since the second lockdown and 'screening paradox': many women identified, very few treated	Outcome reason: Incidence of depression during COVID-19 pandemic
5	*Clarke, Gibson, et al. [93]*	Digital screening for mental health in pregnancy and postpartum: A systematic review	Intervention reason: different types of interventions compared
6	*Doherty, Barry, et al. [135]*	A Mobile App for the Self-Report of Psychological Well-Being During Pregnancy (BrightSelf): Qualitative Design Study	Outcome reason: design of mobile technologies
7	*Doherty, Marcano-Belisario, et al. [136]*	Engagement with Mental Health Screening on Mobile Devices: Results from an Antenatal Feasibility Study	Comparison reason: comparing EPDS with EPDS + Ecological Momentary Assessment (EMA) group
8	*Dosani, Arora, et al. [29]*	mHealth and Perinatal Depression in Low-and Middle-Income Countries: A Scoping Review of the Literature	Outcome reason: different interventions
9	*Fijean, Marçais, et al. [137]*	Universal screening of postpartum depression with Edinburgh Postpartum Depression Scale: A prospective observational study	Intervention reason: not self-identification
10	*Guille, Henrich, et al. [138]*	Improving the Management of Maternal Mental Health with Digital Health Care	Intervention reason: not screening/ self-identification
11	*Guille (2024) [139]*	Text And Telephone Screening And Referral Improved Detection And Treatment Of Maternal Mental Health Conditions	Intervention reason: not self-identification
12	*Hussain-Shamsy, Shah, et al. [5]*	Mobile health for perinatal depression and anxiety: Scoping review	Intervention reason: different interventions
13	*Inkster, Kadaba, et al. [140]*	Understanding the impact of an AI-enabled conversational agent mobile app on users' mental health and wellbeing with a self-reported maternal event: a mixed methods real-world data mHealth study	Intervention reason: includes education and therapy intervention
14	*Jhawar, Gupta, et al. [141]*	Maternal depression: Technology enabled self screening in real time	Intervention reason: validation and development
15	*Kingston, Austin, et al. [95]*	Pregnant women's views on the feasibility and acceptability of web-based mental health e-screening versus paper-based screening: A randomized controlled trial	Intervention reason: not self-identification (tablet vs. paper)

16	*Kingston, Biringer, et al. [142]*	Pregnant Women's Perceptions of the Risks and Benefits of Disclosure During Web-Based Mental Health E-Screening Versus Paper-Based Screening: Randomized Controlled Trial	Intervention reason: not self-identification (tablet vs. paper)
17	*Kingston, Biringer, et al. [94]*	Preferences for mental health screening among pregnant women: A cross-sectional study	Intervention reason: not self-identification (tablet vs. paper)
18	*Learman [143]*	Screening for Depression in Pregnancy and the Postpartum Period	Study design reason: no scientific study
19	*Li, Zhao, et al. [144]*	Assessing the quality of mobile applications targeting postpartum depression in China	Intervention reason: different interventions
20	*Lucas, Hoeppner, et al. [145]*	Mobile Assessments to Improve Screening and Novel Patient Engagement to Diagnose and Manage Maternal Mental Health (MIND) Study Midpoint Analysis: compliance Rate of Antenatal Screening	Study design reason: abstract only
21	*Marcano-Belisario, Gupta, et al. [146]*	Implementation of depression screening in antenatal clinics through tablet computers: results of a feasibility study	Outcome reason: survey layout
22	*Martínez-Borba, Suso-Ribera, et al. [147]*	The Use of Information and Communication Technologies in Perinatal Depression Screening: A Systematic Review	Intervention reason: different intervention, not self-identification
23	*Martin-Key, Spadaro, et al. [31]*	Proof-of-Concept Support for the Development and Implementation of a Digital Assessment for Perinatal Mental Health: Mixed Methods Study	Participant reason: pregnancy planned, gave birth in last two years + intervention reason: not self-identification
24	*Nguyen, Caddy, et al. [148]*	Self-care interventions for preconception, antenatal, intrapartum and postpartum care: a scoping review	Intervention reason: not self-identification (self- care intervention)
25	*Oğur, Yazıcı, et al. [149]*	Development of a mobile monitoring program for anxiety and depression in pregnancy and evaluation of 3-month results	Intervention reason: not self-identification (online vs. paper)
26	*Osma, Plaza, et al. [150]*	Proposal of use of smartphones to evaluate and diagnose depression and anxiety symptoms during pregnancy and after birth	Intervention reason: different interventions (including therapy)
27	*Pineros-Leano, Tabb, et al. [14]*	Clinic staff attitudes towards the use of mHealth technology to conduct perinatal depression screenings: A qualitative study	Outcome reason: app development + participant reason: health care professionals
28	*Reilly, Kingston, et al. [151]*	A narrative review of studies addressing the clinical effectiveness of perinatal depression screening programs	Intervention reason: no digital health technology
29	*Reilly, Talcevska, et al. [152]*	A comparison of the interviewer-administered phone and self-complete online versions of the computerized eMINI 6.0 in a sample of pregnant women	Intervention reason: interview questions vs. telephone
30	*Spadaro, Martin-Key, et al. [69]*	mHealth solutions for perinatal mental health: Scoping review and appraisal following the mHealth index and navigation database framework	Intervention reason: different interventions
31	*Stone and Hirshberg [153]*	Telemedicine and Digital Health Solutions in Intrapartum and Postpartum Care	Study design reason: no scientific study + intervention reason: apps not for mental health
32	*Vanderkruik, Raffi, et al. [88]*	Perinatal depression screening using smartphone technology: Exploring uptake, engagement and future directions for the MGH Perinatal Depression Scale (MGHPDS)	Outcome reason: prevalence

33	*Vani, Katehis, et al. [154]*	Piloting a prenatal care smartphone application and care navigation intervention at a federally qualified health center	Outcome reason: implementation, prevalence and sociodemographic data
34	*Varma, Mualem, et al. [155]*	Acceptability of an mHealth App for Monitoring Perinatal and Postpartum Mental Health: Qualitative Study With Women and Providers	Intervention reason: not screening/ self-identification
35	*Zingg, Rogith, et al. [156]*	Digilego for Peripartum Depression: A Novel Patient-Facing Digital Health Instantiation	Intervention reason: app development
	Handsearch		
36	*Feldman, Back, et al. [91]*	A systematic review of mHealth application interventions for peripartum mood disorders: trends and evidence in academia and industry.	Intervention reason: different interventions
37	*Naslund, Aschbrenner, et al. [92]*	Digital technology for treating and preventing mental disorders in low-income and middle-income countries: a narrative review of the literature.	Intervention reason: different interventions (prevention and therapy included)
38	*RANZCOG Women's Health Committee [157]*	Category: Best Practice Statement. Mental Health Care in the Perinatal Period	Intervention reason: not digital technologies
39	*WHO (2022) [158]*	Guide for integration of perinatal mental health in maternal and child health services	Intervention reason: not digital technologies

A3 Data extraction table

Characteristics of the study included for primary outcomes

Legend for all tables: n.r. = data was not researched

n.a. = data was not available

Authors, Year (citation)	Lawson et al. (2019)
Study characteristics	
Country	Canada
Study objective	Evaluation of feasibility of an intervention for screening for PND and providing information through text messages.
Method	
Study design	Not specified. Seems to be prospective cohort design
Setting of recruitment	Hospital
Setting for intervention	Remotely: telephone and text-messages
Setting for results follow-up	Remotely: online
Study period / duration	July 2015 - January 2017 (18 months)
Follow-up period	12 to 13 weeks postpartum
Providers: (involved health care professionals or researcher)	Researchers
Developer of tool	Not specified - authors of the study
Funding	Funding by the Academic Health Science Centre (AHSC) Alternative Funding Program
Conflict of interest	No financial relationships with commercial interests
No of participants	937 women postnatal
Age / mean in years (SD/ range)	33.7 (SD 4.17 / range n.a.)
Weeks of pregnancy / postnatal	12 weeks postnatal
Inclusion / exclusion criteria	Not specified – inclusion mentioned: ≥ 18 years, delivery at Mount Sinai Hospital in Toronto, No language barrier (supplement) + informed consent. Exclusion after baseline process: women in active psychiatric care.

Components of the study included for primary outcomes

Authors, Year (citation)	Lawson et al. (2019)
Study Intervention	1) baseline assessment (sociodemographic questions + EPDS) 2) screening by text messages (PHQ-2) biweekly until 12 weeks postpartum + informal texts 3 times / week 3) positiv PHQ-2 (+ matched negative PHQ-2 screened women) complete EPDS via telephone 4) 12-13 weeks postnatal follow-up via e-mail: satisfaction online survey (anonymous)
Features of the digital self-assessment tool	package of different interventions, not a tool.
Stage of self-identification / feedback	self-identification (3): receiving external text messages.no feedback to user.
Information about further help after self-assessment	partly: positive tested women (EPDS or PHQ-2) were offered an appointment with a perinatal psychiatrist.
Emergency information	n.a.
Recommended pathway	n.a.
Involvement of professionals	Appointment with a perinatal psychiatrist was offered when tested positive.
Comparator	as a part of the study: Women, who were screened negative in phase 2 (PHQ-2).
Outcome parameters analyzed	evaluate the feasibility of using text messages by: • agreement PHQ-2 text message and EPDS (sensitivity & specificity) • user engagement • user satisfaction
perinatal mental illness type	postnatal depression
Tools for assessing mental health state	EPDS (with cutoff ge 15 in pregnancy /baseline and ge 12 postpartum), PHQ-2
Additional tools used for the study	none

Results of the study included for primary outcomes

Authors, Year (citation)	Lawson et al. (2019)
Results effectiveness	
Diagnostic accuracy (sensitivity, specificity, positive/negative predictive value)	Fair agreement between text message screening and EPDS (kappa value = 0.37) / cut-off adaptation: 0.45 sensitivity: 0.49 (95% CI = 0.38-0.61) / adaptation: 0.90 (95% CI = 0.81-0.96) specificity: 0.93 (95% CI = 0.91-0.94) / adaptation: 0.82 (95% CI = 0.79-0.85) positive predictive value: 0.38 (95% CI = 0.31-0.46) / adaptation: 0.32 (95% CI = 0.29-0.36) negative predictive value: 0.95 (95% CI = 0.94-0.96) / adaptation 0.99 (95% CI = 0.98-0.99)
Consistency with the clinical diagnosis	Of 126 women positive screened women: 10 were already in psychological care, 10 received the diagnosis of postnatal depression, 11 postnatal psychiatric disorder diagnosis and 3 had significant psychiatric symptoms, no further data: 46.
Mental health symptoms	n.r.
Time to accurate diagnosis	n.r.
Symptom severity	n.r.
Time to treatment	n.r.
Other Benefits	n.r.

Results safety	
Safety for patients	n.r.
False-negative or false-positive results	Of 126 positive screened 34: mental illness diagnosis, 46: false-positive. 46: not diagnosed, could not be contacted or did not turn up for their appointment.
Missing or overdetection of urgent or emergency cases	n.r.
Inappropriate care pathways	n.r.
Complication rate	n.r.
Harms (e.g. psychological)	n.r.
Data protection	
Safety of data	Inclusion criteria was to give informed consent.
Privacy policies	n.a.
Safety for professionals	n.r.

Characteristics of the studies included for secondary outcomes

Authors, Year (citation)	Daehn et al. (2023)	Elsner et al. (2022)	Nurbaeti et al. (2021)
Study Characteristics			
Country	Germany	United Kingdom	Indonesia
Study objective	Evaluation of feasibility of web app SmartMoms, and user's and health professional's experiences and the user behavior.	Evaluation of the smartphone app ClinTouch (DAWN): P, screening feasibility, acceptability & safety, many concerns, safety & the validity of app based PND screening compared to paper-based procedure.	Development and implementation of an app by using the ADDIE Model and evaluation of effectiveness.
Method			
Study design	mixed-methods study	mixed- methods proof-of-concept study	descriptive cross-sectional design
Setting of recruitment	healthcare facilities and providers, online (social media)	1) women: hospital + online (social media). 2) partners: via pregnant participants.	hospital
Setting for intervention	remotely: application (online), telephone.	remotely: combination of telephone calls, SMS messages, email and post.	remotely, during a homevisit through a researcher
Setting for results follow-up	no follow-up	no follow-up	no follow-up
Study period / duration	May 2021 - November 2021 (6 months)	n.a.	second week of August - the second week of October 2019 (2 months)

Follow-up period	no follow-up period	no follow-up period	no follow-up
Providers involved (health care professionals or researcher)	self-initiated	self-initiated	n.a.
Developer of tool	scientists and psychologists of University clinic Hamburg Eppendorf and Freie Universität Berlin in cooperation with external web app developers (including the authors).	not specified - authors of the study.	research team under the name of Nurbaeti Irma.
Funding	Funding is supported by a grant from the Damp Stiftung, Hamburg.	Funding by the UK Medical Research Council and Health Innovation Challenge Director (Social Health) and Women and Children's Growth domains).	Funding by Universitas Islam Negeri Syarif Hidayatullah Jakarta.
Conflict of interest	No conflict of interest.	Two of the authors are directors of Affigo CIC, a not for profit community interest. This is a company designed to make digital health products available in the NHS and public sector.	No conflict of interest.
Participants			
No of participants	total: 217 women perinatal usability evaluation: 129 women user satisfaction and acceptability: 133 women user behavior: 1874 women self-screening with EPDS: 222 women health care provider interviews: 13 providers	15 women, 8 partners antenatal + postnatal	109 women postnatal
Age / mean in years (SD/range)	EPDS maternal: 32.7 (SD 4.0 / range 22-49)health care provider: 43.6 (SD 9.4 / range 27-58)	33.8 (SD 5.2 / range n.a.)	30.98 (SD n.a. / range 16-50)
Weeks of pregnancy/ postnatal	12 months postnatal: average child age (in EPDS self-identification participants): 3.56 months (SD 2.57 / range 0.12-months)	ge 6 weeks pregnancy - 6 weeks postnatal	n.a.
Inclusion/exclusion criteria	not specified, inclusion mentioned: informed consent. Exclusion mentioned concerning self-screening participants: women with children over 12 months of age, pregnant women	inclusion for women:ge 36 weeks' gestation, over 18 years age, fluent in English, under the care of Manchester University NHS Foundation Trust + informed consent.exclusion: current stillbirth, fetal abnormality, or multiple pregnancypartners inclusion: male/female partner of a pregnant participant, over 18 years age, fluent in English + informed consent.	inclusion:birth of a living child, married, no history of mental illness, able to implement for complications, can read Bahasa Indonesian language, smartphone+ agreement

Authors, Year (citation)	Reilly & Austin (2021)	Highet et al. (2019)
Study Characteristics		
Country	Australia	Australia
Study objective	Evaluation of the web-based tool *Mummamaters* concerning its acceptability, risk for life of cases, usability, perceived effect and motivational appeal, and help seeking behaviors and barriers.	Evaluation of the digital screening platform iCOPE.
Method		
Study design	cross-sectional design	descriptive cohort design
Setting of recruitment	via web-based tool *Mummamaters*	hospital
Setting for intervention	remotely: application (online), telephone.	remotely: hospital
Setting for results follow-up	remotely: web-based Key Survey (TM) platform.	no follow-up
Study period / duration	November 13, 2016 - May 22, 2018 (18 months)	September 2015 - September 2016 (12 months)
Follow-up period	1 month follow-up period	no follow-up
Providers involved (health care professionals or researcher)	self-initiated	health professional in hospital
Developer of tool	Bupa Australia	Centre of Perinatal Excellence (COPE) and Dignostic (Dignostic Pty Ltd, 2024)
Funding	By the University of Newcastle (2018-2020), and the University of Wollongong (2020-2023)	n.a.
Conflict of interest	No conflict of interest.	n.a.
Participants		
No of participants	140 women: 73 antenatal and 67 postnatal	144 women postnatal
Age / mean in years (SD / range)	antenatal: 32.97 (SD 4.60 / range 24-43)postnatal: 32.78 (SD 4.20 / range 25-45)	30.68 (SD 4.69 / range n.a.)
Weeks of pregnancy / postnatal	antenatal: mean 20.96 (SD 11.19), range 4-40 weekspostnatal: mean 15.28 (SD 24.11), range 1-178 weeks	4-6 weeks postnatal
Inclusion / exclusion criteria	inclusion:living in Australia, internet access, be able to complete the assessment in English + agreement in participation	inclusion:women attending the clinic for their four to six weeks postnatal check-up + consent in usage of data

Source mentioned: [159]

Components of the studies included for secondary outcomes

Authors, Year (citation)	Daehn et al. (2023)	Elsner et al. (2022)	Nurbaeti et al. (2021)
Study Intervention	1) women: quantitative 27 item app survey (sociodemographic characteristics, app usability (SUS) and satisfaction (CSQ)) + additional questions about intention → user receive recommendations based on score 2) midwives and social workers: structured telephone interviews 3) researcher: Analyzing user behaviour (Google Analytics and app access)	1) baseline assessment (sociodemographic questions) 2) app download and training 3) app use with daily EPDS questions and 2 times (beginning and end) paper based EPDS questions. 4) 6 weeks postnatal final interviews 6 quantitative assessment with MARS score	1) Home visit through researcher team 2) Instructions and download application 3) App usage: EPDS + sociodemographic data collection 4) Evaluation of the application 5) follow-up recommendation based on their score (normal / mild / moderate / severe depression)
Features of the digital self-assessment tool	• psychoeducational informal video • EPDS self-identification • subpage: information about postnatal depression • help subpage with information about further support and treatment options	• daily EPDS Screening via app (accessible for clinic staff) • additional functions: randomly daily alert between 9am and 7pm - 2 hours window to answer the questions. • "snooze" function to postpone the alert for half an hour.	• EPDS 12 item Indonesian version • results and recommendation
Stage of self-identification / feedback	self-identification (1) feedback: based on risk status: users receive result and recommendations.	self-identification (3): alert reminds to daily answer the questions.no feedback to user.	self-identification (2), explanations before process.feedback and recommendation based on score (normal / mild / moderate / severe depression)
Information about further help after self-assessment.	Yes, according the score + help subpage	no information is provided.	Yes, recommendations according the score.
Emergency Information	Yes, emergency recommendation when high risk for suicide.	no direct information. Risk of self-harm response sent to general practitioner within one working day.	n.a.
Recommended pathway	n.a.	n.a.	Yes, recommendation pathway based on EPDS score.
Involvement of professionals	health professionals for recruiting process	the responses could be seen by clinicians / research team via a password-protected web interface.	not involved.
Comparator	none	as a part of the study about validity: paper-based version of EPDS	none
Outcome parameters analyzed	• user experience • user behaviour • healthcare providers' experience	• feasibility • patterns of app use • validity • safety • acceptability & usability • user experiences (presented in a follow-up paper)	"effectiveness":acceptability and usability
perinatal mental illness type	postnatal depression	postnatal depression	postnatal depression
Tools for assessing mental health state	EPDS (cutoff ≥12)	EPDS (cutoff ≥12)	EPDS Indonesian version (12 item, cutoff ≥12)

Additional tools used for the study	CSQ-3, SUS, Google Analytics	MARS	man questions- without origin

Authors, Year (citation)	Reilly & Austin (2021)	Highet et al. (2019)
Study Intervention	1) download of *mummatters app* 2) answer demographic questions + baseline assessment (Whooley questions, ANRQ + postnatal equivalent) -> users receive recommendations 3) additional web-based Key Survey: questions relating to the acceptability, credibility, likeability, perceived effect, and motivational appeal of the tool, questions about help-seeking behaviors in the previous month and barriers to help seeking.	1) brief training session with Maternal Child Health nurses 2) While waiting for their postnatal check up, women completed the questions on the *iCope* platform on a digital screen in the waiting room.If a woman needed help, it could be connected directly by consultation. 3) results (promoted by specialists) -> report was sent to the clinician, as well as a short report to the participant via mail or text message.
Features of the digital self-assessment tool	• *Whooley questions* & ANQR self-identification • monthly prompts • key feature: computer-based decision aid that combines responses to the Whooley questions and ANRQ -> recommendations and help-seeking information. • possibility to create an individualized wellness action plan and option to receive inspirational messages	• EPDS • questions to detect the presence if psychosocial risk • additional questions if mental health and/or drug and alcohol risk factors exist.
Stage of self-identification / feedback	self-identification (1). feedback and recommendation based on scores.	self-identification (3): answering questions in the clinic waiting room.possibility to receive a result report.
Information about further help after self-assessment.	Yes, help seeking information. With permission the health care provider can be informed about results.	Yes, links for further information and referral pathways to local specialists / perinatal mental health support services available [160].
Emergency Information	n.a.	n.a.
Recommended pathway	n.a.	Yes, pathways are available [161]).
Involvement of professionals	A letter can be addressed to the health care provider, if women give their permission, directly from the tool with the results.	iCOPE: is available to all medical professionals in Australia [161]. Clinicians got the results report.
Comparator	none	none
Outcome parameters analyzed	• sociodemographic and psycho social data (Whooley questions + ANQR) • user experience (acceptability, credibility, perceived effect, motivational appeal, likeability) • help-seeking behaviors and barriers	• performance of iCOPE: user engagement• rates of depression and anxiety (EPDS) • psychosocial risk: 13 risk factors were asked. • request for help
perinatal mental illness type	perinatal depression and psychosocial risk	postnatal depression and psychosocial risk
Tools for assessing mental health state.	*Whooley questions* and ANQR	EPDS (9-12 moderate, > 12 very high score)
Additional tools used for the study	modified questions from previous studies	own questions

Sources mentioned: [160] [161]

Authors, Year (citation)	Daehn et al. (2023)	Elsner et al. (2022)	Lawson et al. (2019)
SOCIETAL DOMAIN			

Acceptance and usability			
Acceptance for technology	CSQ score: 4 questions with a average point of 4.58-4.70, (max 5 points).1-5 stars rating: mean 4.36 (SD 0.77) range 3-5. asked app reuse: 4.07 (SD 0.75) range 2-5Recommendation to friends: 4.15 (SD 0.8) range 3-5. There was significant more satisfaction in women, who already had a history of postnatal depression.	The results indicate a high overall acceptability / usability (MAIS mean score 3.1, SD 0.51), some parts of the app was not that interesting (MAIS score 2.3). The app had high acceptability.qualitative: useful and acceptable, users without symptoms found it less useful.	Recommendation to women after delivery: 78 %. 87% preferred screening by text message to other methods.
Usability of the tool	total SUS score (n = 129) was 75.20 and showed good usability.	The app was easy to use for most.participants rated the test window of 2 hours was too short.	n.r.
User engagement	n = 1874 usage cases had 3752 sessions, with 17.9 % returning users bounce rate was low: 27.1 %average session duration 0.20 minutesmost visited: landing page (29.3 %) and survey page (15.1 %) most time spend in content (01:07 minutes) in contrast to mean time (00:42 minutes)	An average of 67 % completed the daily assessment in the app.91% of participants continued to use it for the full study period. Women with symptoms of depression used it less often. The app engagement with daily EPDS was gradually less over the study duration from beginning to the end.	930 (99 %) women responded at least one of the six screenings, 67 % completed all six screenings, 100 % responded quickly.50 % with screening with approximately 2 %. Most positive results were detected two weeks after birth while the text screening (49 %)
Experience of mothers / fathers (to-be)	n.a.	n.a. -> user experiences (later published in a follow up paper).	n.r.
Experience of health experts	13 health experts rated the app as a good and supportive tool for advancing perinatal depression, both rating with 4.1 (1-5), 12 of 13 professionals stated that SmartMoms is a full offer.	n.r.	n.r.
Availability and access			
Types of technologies available	not specified in paper. homepage: SmartMoms.ch and via webpage SmartMoms, 2024	*Clin Touch DAWN-P*: app stores for iPhone and Android during the study period.	only for study period: text messages, e-mail, telephone calls
Accessibility	access global	only for patients of Manchester University NHS Foundation Trust and their partners.	only for women, who deliver Mount Sinai Hospital in Toronto and were part of the study
Target groups	mothers in the postnatal period within 12 months.	pregnant women ≥ 36 weeks pregnant and their partners.	mothers in postnatal period within 12 weeks after birth
Authorization stage	n.a.	"The app did not meet requirements for registration by the Medicines and Healthcare products Regulatory Agency (MHRA)" (Elsner et al, 2022).	n.a.
Costs	no costs (SmartMoms, 2024) compensation for expenses (drugstore voucher 25-75 €)	No costs. Participants were paid up to 60£. Smartphones were also available to rent for free.	No costs. Women got a $10 CAD gift card.
Ethical Issues			
Benefits and harms for	n.r.	n.r.	n.r.

patients and professionals			
Affects on autonomy for the patient	n.r.	n.r.	n.r.
Spheres of privacy	n.r.	n.r.	n.r.
Affect on distribution of health care resources	n.r.	n.r.	n.r.
Equity for usage	n.r.	n.r.	n.r.
ORGANIZATIONAL DOMAIN			
Organizational involvement	n.r.	n.r.	n.r.
Affect on current work process	n.r.	n.r.	n.r.
Implementation in health system	n.r.	n.r.	n.r.
Management problems	n.r.	n.r.	n.r.
Further pathways	n.r.	n.r.	n.r.
LEGAL DOMAIN			
Regulation for permission of digital technologies	n.r.	n.r.	n.r.
Laws/ funding rules concerning safety, marketing, training, usability or usage	n.r.	n.r.	n.r.

Source mentioned: [162]

Authors, Year (citation)	Nurbaeti et al. (2021)	Reilly & Austin (2021)	Highet et al. (2019)
SOCIETAL DOMAIN			
Acceptance and usability			
Acceptance for technology	previously used a similar app: 9.17 % recommendation rate: 97.25 %	acceptance: 94-98.6 % felt comfortable in answering questions. 90-91 % would use the app again. 78-85 % would tell friends about it.	n.r.
Usability of the tool	download: 55.96 % very easy, 33.94 % easy. fill out procedure: easy for 94.50 % easy to understand language: very understandable: 61.47 %, understandable 34.86 %	expectations met: 80-81 % easy to find information: 88-90 %	n.r.
User engagement	n.r.	n.a.	overall completion screening rate: 99.3%. 144 screens were performed. average time to answer the question was 6.7minutes (SD 3.78). Two women discussed issues related to the screening tools. 84 % wanted to receive the results.
Experience of mothers / fathers (to-be)	beneficial/useful output: 96.33 % reflected the psychological condition: 90.83 %	Most participants regarded the tools as credible (85.2-97.3 %), appealing (78.1-91.3 %) and potentially helpful (78.1-92.5 %)	n.a.
Experience of health experts	n.r.	n.r.	n.r.
Availability and access			
Types of technologies available	app *tes depresi* available in Google PlayStore	The web-based tool *Mummatters* is available for free at *Bupa Website*.	web-based *iCOPE* platform is available in health care facilities in Australia.
Accessibility	only available for android users and in Indonesian language.	not specified, study inclusion: living in Australia.	global access and availability in multiple languages.
Target groups	Indonesian women in postnatal period.	pregnant women or women in postnatal period	women postnatal (4-6 weeks after birth)
Authorization stage	n.a.	n.a.	not specified, *iCOPE* data security meets all legislative regulatory frameworks for health-related data in Australia.
Costs	n.a.	no costs.	no costs/ health care facilities: implementation of *iCOPE* in the public sector will offset costs by government until 2025 [161].
Ethical Issues			
Benefits and harms for patients and professionals	n.r.	n.r.	n.r.

Affects on autonomy for the patient	n.r.	n.r.	n.r.
Spheres of privacy	n.r.	n.r.	n.r.
Affect on distribution of health care resources	n.r.	n.r.	n.r.
Equity for usage	n.r.	n.r.	n.r.
ORGANIZATIONAL DOMAIN			
Organizational involvement	n.r.	n.r.	n.r.
Affect on current work process	n.r.	n.r.	n.r.
Implementation in health system	n.r.	n.r.	currently ongoing
Management problems	n.r.	n.r.	n.r.
Public trust	n.r.	n.r.	n.r.
LEGAL DOMAIN			
Regulation for permission of digital technologies	n.r.	n.r.	n.r.
Laws/ funding rules concerning safety, marketing, training, usability or usage	n.r.	n.r.	n.r.

Source mentioned: [161]

A4 Data extraction table- additional literature

Review included according to secondary outcome ethical domain

Authors, Year (citation)	Fonseca et al. (2024)
objective of the paper	In this article, the authors discuss the current literature on digital health technologies for the prevention and treatment of perinatal mental disorders. Different types of DHT are described, benefits are highlighted, negative aspects were discussed, and future relevant research topics are mentioned.
Paper design	Scientific review article
Funding:	no specific grant. One author was supported by a doctoral grant.
Conflict of interest:	None.
Target population	Women in perinatal context.
Contents	• Different types of e-mental health tools • Benefits • considering aspects • Ethical aspects • Future research issues
Issues researched regarding the review	Ethical aspects.
organizational impact	n.r.
legal issues	n.r.
ethical issues	Ethical standards and regulations are necessary. • Privacy, confidentiality, and data security. • Data storage and transmission (type and how) • informed consent Lots of digital health tools are already available, but they are lacking evidence for efficacy and safety. Anonymity might be an ethical concern. Information, benefits, and risks need to be communicated clearly. Maintaining equality and equal rights

Conflict of interest

The author, Sophie Hafner, declares no conflicts of interest related to this systematic review.

Eidesstattliche Erklärung

Hiermit erkläre ich, Sophie Hafner, an Eides statt, dass ich die vorliegende Masterarbeit, mit dem Titel „Digital health technologies for self-identification of the risk of perinatal mental illness: A systematic review“ selbstständig und ohne fremde Hilfe angefertigt sowie die verwendeten Quellen und Hilfsmittel in vollständigem Umfang - siehe Anlage „Erklärung zur Verwendung generativer KI-Systeme“ - angegeben habe.

Diese Masterarbeit wurde in gleicher oder ähnlicher Form noch bei keiner anderen Prüfungsinstanz als Prüfungsleistung eingereicht. Mir ist bekannt, dass Zuwiderhandeln geahndet wird und weitere rechtliche Schritte nach sich ziehen kann.

Die Masterarbeit wurde neben der gedruckten Version auch in Word- und PDF-Format zur Prüfung der eidesstattlichen Erklärung abgegeben.

Podersdorf, am 12.01.2025 Unterschrift: 

Anlage „Erklärung zur Verwendung generativer KI-Systeme”

Bei der Erstellung der vorliegenden Masterarbeit habe ich die folgenden auf Künstlicher Intelligenz (KI) basierten Systeme benutzt:

1. Deduklick
2. Rayyan
3. DeepL
4. ChatGPT

Ich erkläre,

- dass ich mich intensiv mit den Fähigkeiten und Einschränkungen der zuvor genannten KI-Systeme auseinandergesetzt habe,
- dass ich Text-Passagen zzgl. Graphiken, Tabellen und weitere Materialien, die aus diesen KI-Systemen stammen, entsprechend gekennzeichnet habe,
- dass ich überprüft habe, dass die Inhalte, die mithilfe dieser KI-Systeme erstellt und von mir übernommen wurden, faktisch korrekt sind,
- dass mir bewusst ist, dass ich als Autor*in der Masterarbeit die Verantwortung für alle darin enthaltenen Informationen und Aussagen trage.

Die o.g. KI- Systeme habe ich, wie im Folgenden dargestellt in der Masterarbeit eingesetzt:

Arbeitsschritt	KI-Systeme	Verwendungsweise
Generieren von Ideen/Konzeptionen		
Literatursuche/-analyse/-bewertung	Deduklick, Rayyan	Identifikation von Duplikaten
Literaturverwaltung/Zitationsmanagement		
Datenerhebung/-analyse/-interpretationen		
Erstellung von Visualisierungen		
Interpretationen/Diskussion/Implikationen		
Formulierung des Textes	DeepL, ChatGPT	Unterstützung bei der Formulierung von Argumenten, Übersetzung von Phrasen/ Sätzen, Ideen für Übergänge zwischen Kapiteln
Redigieren des Textes	DeepL, ChatGPT	Verbesserung der Ausdrucksform, Grammatik und Stilistik von Sätzen
Übersetzung von Texten	DeepL	Übersetzung von schwierigen Passagen/ fachlichen Ausdrücken/ Phrasen, eigenständige Kontrolle auf Richtigkeit
Vorbereitung der Textpräsentation		
Sonstiges		

Podersdorf, am 12.01.2025 Unterschrift: 

HTA Austria
Austrian Institute for
Health Technology Assessment
GmbH