

# Development of a Framework for the Implementation of Synchronous Digital Mental Health: A Realist Synthesis of Systematic Reviews

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## Research

**Keywords:** Telemedicine, digital health, Internet-Based Intervention, Mental Health, Mental Disorders, Systematic Reviews, Qualitative Research, realist review.

**Posted Date:** November 9th, 2021

**DOI:** <https://doi.org/10.21203/rs.3.rs-1029302/v1>

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## Abstract

**Background:** The use of technologies has served to reduce gaps in access to treatment and digital health interventions show promise in the care of mental health problems. However, to understand what and how these interventions work, it's imperative to document the aspects related to their challenging implementation.

**Methods:** The SPIDER framework was used to develop the following review question: What makes digital mental health interventions with a synchronous component work on people with mental health problems, including depression, anxiety, or stress, based on implementation, economic, quantitative, qualitative, and mixed methods studies? MEDLINE, EBM Reviews, PsycINFO, EMBASE, SCOPUS, CINAHL Complete, and Web of Science databases from 1st January 2015 to September 2020 were searched with no language restriction. AMSTAR-2 was used to assess the risk of bias, and CERQual was used to assess the confidence in cumulative evidence. Realist synthesis analysis allowed for developing a framework on the implementation of synchronous digital mental health using a grounded theory approach with an emergent approach.

**Results:** 21 systematic reviews were included in the study. Ninety percent of the studies presented a critically low confidence level assessed with the AMSTAR-2. The realist synthesis allowed the development of three hypotheses to identify the context and mechanisms in which these interventions achieve these outcomes: Hypothesis 1: These interventions reach populations otherwise unable to have access because they do not require the physical presence of the therapist nor the patient, thereby tackling geographic barriers posed by in-person therapy. Hypothesis 2: These interventions reach populations otherwise unable to have access because they can be successfully delivered by non-specialists, which makes them more cost-effective to implement in health services. Hypothesis 3: These interventions are acceptable and show good results in satisfaction, because they require less need of disclosure and provide more privacy, comfortability, and participation, enabling the establishment of rapport with the therapist.

**Conclusion:** We developed a framework with three hypotheses that explain what makes digital mental health interventions with a synchronous component work on people with mental health problems. Each hypothesis represented essential outcomes in the implementation process.

**Registration:** PROSPERO (CRD420203811).

## Contributions To The Literature

- Research has shown that synchronous digital mental health interventions reach populations otherwise unable to have access through face-to-face interventions, thereby tackling geographic barriers posed by in-person therapy.
- These mental health interventions reach populations otherwise unable to have access via face-to-face interventions because they can be successfully delivered by non-specialists, which makes them more cost-effective to implement in health services.
- These finding shows that digital mental health is acceptable by patients and show good results in satisfaction, because they require less need of disclosure and provide more privacy, comfortability, and participation, enabling the establishment of rapport with the therapist.

## Background

Mental health is in crisis globally and the COVID-19 pandemic has suddenly revealed the magnitude of this problem [1, 2]. To minimize health care gaps, the use of digital technologies has been proposed to be able to providing specialized treatment to a greater number of people in places with limited resources and those with difficult access [3–7]. These technologies were very well received and served to complement or improve the effectiveness of treatments for various chronic diseases [6]. In addition, these digital interventions show great promise in the care of mental health problems [8–10].

With the undeniable contribution of technologies in mental healthcare, it is important to document the aspects related to their challenging implementation [11], such as adaptability, cost, complexity, external policies and incentives, compatibility, or general fit between the digital health intervention and the organization, etc. [12] These features provide understanding about how and what works in these interventions and consider its complexity as challenges in the implementation of telemedicine reveals the deficiencies and inequalities of healthcare systems worldwide [13].

Although several systematic reviews have focused on the effectiveness of digital interventions in mental health [14, 15], this evidence alone is not sufficient to ensure the implementation of these interventions or their adoption by health systems [4]. More qualitative and flexible approaches are needed to understand the complexity of these interventions and what key elements could help their implementation [4]. Thus, this study aimed to determine what evidence is available for synchronous digital mental health implementation and develop a framework, informed by a realist review, to explain what makes digital mental health interventions work for people with mental health problems.

## Methods

### Research question

This systematic review adhered to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines [16], a completed PRISMA checklist can be found in the Supplementary Material 1. The study protocol has been published previously where the methodology is explained in full [17], and was registered in PROSPERO (CRD420203811). The SPIDER framework was used to develop the review question, which is based on describing the Sample (S), Phenomenon of Interest (PI), Design (D), Evaluation (E), and Research type (R) [18]:

- *Sample:* Adults with depression (or major depressive disorder), anxiety (or generalized anxiety disorder), stress (or trauma-related disorders), and/or general mental health problems (unspecified). Participants may be diagnosed through clinical interviews or categorized based on screening assessments (self-reported scales).
- *Phenomenon of interest:* Any digital mental health intervention that includes a synchronous component, namely communication with a mental health professional (psychiatrist, psychologist, etc.) or a health professional trained in mental health. These interventions included, among others, remote consultation, interactive application, video chats, calls, etc.
- *Design:* Systematic review.
- *Evaluation:* We included all types of outcomes of interest assessed by implementation studies, economic, qualitative, quantitative, and others. For example, a) Health effectiveness outcomes: Depression, anxiety and/or stress symptoms, adherence to treatment, etc.; b) Patient outcomes: Quality of life, satisfaction, etc.; c) Economic outcomes; d) Damage or adverse effects.
- *Research type:* Quantitative, qualitative, and mixed methods.

## Eligibility criteria

*Inclusion criteria:* Systematic reviews that: a) reported on inclusion/exclusion criteria for their included studies, conducted an adequate systematic literature search using at least two databases, and synthesized, assessed the quality of, and presented sufficient detail on their individual primary included studies [19]. b) Included primary studies as a unit of analysis focused on a research question. c) Were published in the last five years (since January 1, 2015) without language restrictions. We include this time frame to include only the latest systematic reviews since in the field of digital health, the launch of new technologies makes scientific development dynamic. d) Included in their primary studies adults with common mental health problems defined as i) Adults with depression (or major depressive disorder), anxiety (or generalized anxiety disorder), stress (or trauma-related disorders) and/or general mental health problems (unspecified); or ii) Adults attending an outpatient mental health consultation. e) Included at least 90% of their primary studies assessing synchronous digital mental health or presenting its results independently only for synchronous digital mental health.

*Exclusion criteria:* Narrative reviews, scoping reviews, primary studies, opinion/editorial manuscripts, letters to the editor, and reviews of mobile health interventions repositories (i.e., apps stores). Reviews that included primary studies with some of these subjects' characteristics: a) Adult's participants with some other specific mental health condition; b) Healthy adult participants (without mental health conditions); c) Adult's participants receiving emergency/crisis psychiatric care; d) Interventions that lack a synchronic component (real-time information exchange between the user and mental health professional using technologies) or were not sufficiently clear of having a synchronic component; e) Women with depressive symptoms among postpartum.

## Information sources

We searched MEDLINE (Ovid), EBM Reviews (Ovid), PsycINFO (Ovid), EMBASE (Elsevier), SCOPUS, CINAHL Complete (EBSCOhost), and Web of Science databases, including Science Citation Index Expanded, Social Sciences Citation Index and Conference Proceedings Citation Index (Clarivate Analytics). Articles published in the last five years (January 1st, 2015 to April 31, 2020) were included with no language restrictions. Database's search was performed at April 31, 2020.

## Search strategy

The search formula was created using thesaurus and entry terms for the following syntax: "telemedicine" AND "mental health, anxiety, depression or stress" AND "systematic reviews". The full search strategy for each database is available in the Supplementary Material 2.

## Study records

### Data management

The records retrieved after the search were managed using the Rayyan QCRI free online application (eliminate duplicates, and review titles and abstracts) [20]. Full-text review and data extraction were performed in an Excel template.

### Selection process

The records were screened by title and abstract and then by full-text assessment. Records were divided into three groups. Two independent authors previously calibrated (discrepancy less than 5%) assessed each record for each group. Each pair of authors discussed discrepancies, and a third reviewer was included if needed.

### Data collection process

For each eligible study, data were extracted independently and duplicated on pre-designed extraction forms. Reviewers solved discrepancies, and a third reviewer evaluated any unresolved disagreement.

## Data items

An extraction form was created for the included systematic reviews. We collected the following information: first author and publication date of the study, characteristics of the participants, main objective, research questions, inclusion criteria for the systematic review, search date, study selection process, quality assessment (if any), main findings, and limitations. Also, the full-text of the included articles, the tables, and supplementary material were gathered to perform the qualitative analysis of the text.

## Outcomes and prioritization

Our study aimed to conduct a realist review of systematic reviews, using a qualitative strategy to synthesize the information and answer our research question. Therefore, we did not look for a specific result such as effectiveness, cost-effectiveness, or similar. Instead, we were interested in identifying the full-text of all studies that answered our research question to perform a grounded theory analysis with an emergent approach [21]. Priority was given in the analysis of those studies with the lowest risk of bias assessed.

### Risk of bias in individual studies

To assess the quality of the included systematic reviews, we used the "A Measurement Tool to Assess Systematic Reviews-2" (AMSTAR-2), which has sixteen domains. Seven of these domains are considered critical: 1) protocol registered before the start of the review, 2) adequacy of the literature search, 3) justification for the exclusion of individual studies, 4) risk of bias of individual studies included in the review, 5) adequacy of meta-analytic methods, 6) consideration of the risk of bias in interpreting the results of the review, and 7) assessment of the presence and likely impact of publication bias [22].

AMSTAR-2 classifies the quality of systematic reviews into four categories: high (none or one non-critical weakness), moderate (more than one non-critical weakness), low (one critical weakness with or without non-critical weaknesses), and very low (more than one critical weakness with or without non-critical weaknesses). The quality assessment was rated by two trained researchers independently. In case of difference in the overall quality of the systematic reviews, the AMSTAR-2 criteria were discussed among both researchers to reach a consensus.

### Data synthesis

We developed a framework informed by a realist analysis of synchronous digital mental health interventions using a grounded theory approach with an emergent approach [23]. The realist synthesis was based on interpreting, integrating, and inferring the evaluation elements to better understanding the implementation of synchronous digital mental health interventions from all the included studies [24]. To answer the question "what makes the implementation of these interventions work?", hypotheses supported by included studies' results were developed and generated through discussion and consensus among the researchers [24]. Our study seeks to perform a realist synthesis of the evidence, so we focused on different outcomes to use them as input to assess the implementation of synchronous digital mental health interventions. Therefore, we did not perform a quantitative synthesis in any case (i.e., a meta-analysis of effectiveness).

Three researchers followed the three steps established by Thomas and Harden for qualitative syntheses [25]. First, the extracted data was freely coded. The researchers read the full texts of the included articles and coded each text fragment that provided information to answer the research question. Second, the codified data was organized, and then grouped based on descriptive aspects using a context-linked causality approach represented as "context + mechanism = outcome" [21]. Finally, the analytical concepts generated in the previous step were grouped in a way in which they were related to each other. The elements that were related to each other were assumed to be part of a hypothesis that would help to answer the research aim.

The selection of the studies for the realist review was based on the AMSTAR-2 score, with the highest quality studies being assessed first. We assessed all included studies, down to the criterion of theoretical saturation [26]. All qualitative analyses were performed with the NVivo software (version 12, QSR International).

### Confidence in cumulative evidence

The Confidence in Evidence from Reviews of Qualitative Research (CERQual) approach, which has four components (Methodological Limitations, Relevance, Coherence, and Appropriateness Data), was assessed by a researcher, and then reviewed by another independent researcher. The CERQual was evaluated to contribute to an overall assessment of each hypothesis resulting from the realist synthesis to determine the level of confidence (high, moderate, low, or very low) and present the overall assessment in a Summary of Qualitative Findings (SoQF) table [27, 28].

## Results

### Study selection

The search strategy retrieved 30,228 records, and after duplicated cleaning, we obtained 14,536 unique records. The evaluation by title and abstract identified 374 results that were evaluated at full-text. From those, 353 were excluded. The reasons for exclusion are listed in **Supplementary Material 3**. Finally, 21 systematic reviews were included in this study (see Figure 1).

### Study characteristics

The included systematic reviews included an average of 26.8 studies (range 9-155). Eleven studies reported some form of synchronous digital mental health intervention based on Internet, telephone, or online cognitive-behavioral therapy as the primary intervention [29–39]. The remaining studies reported a mix of digital mental health interventions based on synchronous components (i.e., telephone, videoconferencing) and asynchronous components (i.e., text messages, email, chats, instructional videos, podcasts). Most of the systematic reviews included exclusively randomized-controlled trials (RCTs) as primary studies, two included only non-RCTs, and five studies included both. Only six studies didn't include a meta-analysis. About the type of therapy, nine reviews stated as target therapy Cognitive Behavioral Therapy (CBT), one review used the transdiagnosis method and one included Mindfulness-based interventions. The individual characteristics of the included studies are presented in Table 1. It is important to mention that despite having no language restrictions, all the included articles were published in English and the systematic reviews did not include qualitative studies.

Table 1  
Characteristics of the included studies.

First author and year	Total o subgroup	Main characteristics of participants included in studies	Study design of primary studies	Number of studies included	Main objective	Quality assessment (Tool)	Electronic health interventions	Main findings
Ahern, E. et al. (2018) [29]	Subgroup	The oCBT group (intervention) have females (54.92%) and males (22.31%), and mean age was 42.73 years.	RCTs	30	To assess the clinical and economic evidence for the use of oCBT for major depressive disorder.	Checklist items from Drummond and Jefferson Quality Assessment Scale	oCBT	Support (guided shows a promise for effective treatment of adult patients with major depressive disorder) the show oCBT cost the access effective afford a treatment therefore much pain alleviated psychosocial economic depression. Although was often to be more the QALY improved following tended greater, the favor treatment. Willingness threshold £20,000 (a UK setting likelihood effective treatment usual), QALY in setting likelihood effective waiting control) Willingness threshold \$95,000 (an Australian setting likelihood WLC).
Carlbring, P. et al. (2018) [30]	Subgroup	Adults	RCTs	20	To reinvestigate the efficacy of ICBT compared to face-to-face CBT for psychiatric and somatic disorders, considering studies published in the past four years.	Cochrane risk-of-bias tool	ICBT	The ICE face-to-face are equivalent effective treating anxiety panic disorder depressive symptoms dissatisfaction insomnia male sexual dysfunction spider phobia snake phobia fibromyalgia

Note: CBT: Cognitive behavioral therapy; DSM: Diagnostic and Statistical Manual of Mental Disorders; ICBT: Internet-based cognitive behavioral therapy; ICD: International Statistical Classification of Diseases and Related Health Problems; oCBT: Online cognitive behavioral therapy; RCTs: Randomized-controlled trials; Post-traumatic stress disorders. QALY: Quality adjusted life years

First author and year	Total o subgroup	Main characteristics of participants included in studies	Study design of primary studies	Number of studies included	Main objective	Quality assessment (Tool)	Electronic health interventions	Main fi
Castro, A. et al. (2020) [31]	Total	Adult participants (aged 18 and over) with major depression diagnosed using a structured clinical interview conducted according to internationally recognized standards (e.g., ICD-10, DSM-V) or significant (moderate to severe) depressive symptoms established using a validated screening measure (e.g., Patient Health Questionnaire -9), Beck Depression Inventory)	RCTs	10	To evaluate the effectiveness of telephone-administered psychotherapy for depression in adults when compared to control conditions or other active treatments and to determine adherence to telephone-administered psychotherapy.	Cochrane risk-of-bias tool	Telephone based CBT	Availab sugges telepho delivere psycho may be effectiv to redu depress sympto compar control and sho adequa treatme adherer
Coughtrey, A. et al. (2016) [48]	Subgroup	Adults (18 years and older) who had received an intervention to reduce symptoms of depression and/or anxiety.	RCTs, non-RCTs, and uncontrolled studies (cohort studies, open trials, or one-group pretest-posttest designs) if they obtained quantitative outcome data at a minimum of two time points (pre- and post-intervention) and the outcome data were statistically analyzed	14	To find the effectiveness evidence-based psychological therapies for adults with depression and/or anxiety in reducing psychological symptoms when delivered over the telephone.	Effective Public Health Practice Project Quality Assessment Tool	Therapies delivered by telephone	Of the 1 include review, statisti signific reductio sympto depress anxiety an evid treatme delivere telepho finding; review ; that evi based interver delivere telepho promis; reducin sympto depress anxiety.

Note: CBT: Cognitive behavioral therapy; DSM: Diagnostic and Statistical Manual of Mental Disorders; ICBT: Internet-based cognitive behavioral therapy; ICD- International Statistical Classification of Diseases and Related Health Problems; oCBT: Online cognitive behavioral therapy; RCTs: Randomized-controlled trial; Post-traumatic stress disorders. QALY: Quality adjusted life years

First author and year	Total o subgroup	Main characteristics of participants included in studies	Study design of primary studies	Number of studies included	Main objective	Quality assessment (Tool)	Electronic health interventions	Main fi
Cuijpers, P. et al. (2019) [32]	Subgroup	No details	RCTs	155	To examine the most effective delivery format for CBT via a network meta-analysis.	Using 4 criteria of the Cochrane risk-of-bias tool: adequate generation of allocation sequence; concealment of allocation to conditions; prevention of knowledge of the allocated intervention; and dealing with incomplete outcome data.	Telephone-based CBT	The ind group, t admini guided treatme have cc effectiv the trea depress that tele admini effectiv not diff statistic signific across . The eff these tr formats with the usual c conditic modera when co with the list con conditic Althoug self-hel as effe individu and tele CBT, it v accepta the othe The un help wa statistic signific effectiv of indiv group, t and gui help CB
Domhardt, M. et al (2018) [40]	Subgroup	Adults aged 18 years or above, who meet diagnostic criteria according to a relevant classification system (e.g. DSM-IV, DSM-5 or ICD-10) at least for one of the following anxiety disorders diagnosed at baseline: specific phobia, social anxiety disorder, panic disorder, agoraphobia, or generalized anxiety disorder	RCTs	34	Summarize, evaluate, and meta-analyze integrating research on intervention components of Internet- and mobile-based interventions for adult anxiety disorders.	Cochrane risk-of-bias tool	Therapy by e-mail, videoconference, text messages, via telephone	Guided interver signific efficac improve adherer compar comple unguide interver
Drago, A. et al. (2016) [47]	Subgroup	No details	RCTs	14	Non-inferiority meta-analysis of distance psychiatric counseling compared to the face-to-face setting.	Downs and Black check-list	Videoconferencing	The nor of remc psychia counse reporter assessr treatme

Note: CBT: Cognitive behavioral therapy; DSM: Diagnostic and Statistical Manual of Mental Disorders; ICBT: Internet-based cognitive behavioral therapy; ICD- International Statistical Classification of Diseases and Related Health Problems; oCBT: Online cognitive behavioral therapy; RCTs: Randomized-controlled trial; Post-traumatic stress disorders. QALY: Quality adjusted life years

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Finley, B. et al. (2020) [49]	Total	No details	case studies retrospective quasi experimental match-control study	9	Do a systematic exploration of Telepsychiatry use among (psychiatric mental health advanced practice registered nurses) psychiatric mental health advanced practice nurse practitioners.	The Grading of Recommendations Assessment, Development and Evaluation	Telepsychiatry, defined as delivering mental health care at a distance using electronic audio and visual teleconferencing technology	The lim existent demon psychia health & practice practic feasibly succes practice telepsy Most p telepsy literatur predom focuse service pediatri populat the rura urban unders Acaden ships w care, hc shelters federal implem dissem succes telepsy consult schedu service unclear prograr sustain term de term fe There w random experim yielded search, demon lack of and hig researc psychia health & practice practic

Note: CBT: Cognitive behavioral therapy; DSM: Diagnostic and Statistical Manual of Mental Disorders; ICBT: Internet-based cognitive behavioral therapy; ICD- International Statistical Classification of Diseases and Related Health Problems; oCBT: Online cognitive behavioral therapy; RCTs: Randomized-controlled trial; Post-traumatic stress disorders. QALY: Quality adjusted life years

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Irvine, A. et al. (2020) [33]	Total	Outpatients with insurance coverage mostly students of workers, one study of patients with mild TBI and one of HIV-living patients	Experimental studies and observational studies	15	To establish what research evidence exists to support such claims about the interactional differences between telephone and face-to-face therapy.	Ad-hoc designed bias evaluation design based on: (1) Bias in the comparison of face-to-face and telephone therapy. (2) Outcome measurement. (3) Sample representativeness.	Counselling, CBT, brief CBT, Recovery-focused CBT, and trained in Solution Focused Therapy	The tele conven reliable virtually commu channe despite of com clinical adoptio service; challen- practic ambiva embedd and sys favors f face. Th availab does su lack of argume the tele a detrin effect c interact aspects psycho therapy
Josephine, K. et al (2017) [41]	Total	Adult samples with a reliably diagnosed depressive disorder (i.e. major depression and/or persistent depressive disorder/dysthymia)	RCTs	19	To summarize and critically evaluate the effectiveness of internet- and mobile-based interventions for depression in adults with a diagnosed depression.	Cochrane risk-of-bias tool	No details	All Inter mobile-depress interver investic this rev effectiv reducin depress sympto patient; depress disorde diagno; Internet mobile-depress interver showec benefic on depr severity of treat compar waitlist

Note: CBT: Cognitive behavioral therapy; DSM: Diagnostic and Statistical Manual of Mental Disorders; ICBT: Internet-based cognitive behavioral therapy; ICD- International Statistical Classification of Diseases and Related Health Problems; oCBT: Online cognitive behavioral therapy; RCTs: Randomized-controlled trial; Post-traumatic stress disorders. QALY: Quality adjusted life years

First author and year	Total o subgroup	Main characteristics of participants included in studies	Study design of primary studies	Number of studies included	Main objective	Quality assessment (Tool)	Electronic health interventions	Main fi
Kampmann, I. et al (2016) [34]	Subgroup	Adults with minimum age of 18 years who met the criteria for diagnosis of social anxiety disorder.	RCTs	37	to evaluate the efficacy of technology assisted interventions for individuals with a diagnosis of social anxiety disorder	Cochrane risk-of-bias tool	Guided internet delivered CBT	Guided effective reducing anxiety compared passive conditions assessed effect d sustain after th however implica this find limited that onl studies include medium guided relative control indicate guided have ar advantage the acti

Note: CBT: Cognitive behavioral therapy; DSM: Diagnostic and Statistical Manual of Mental Disorders; ICBT: Internet-based cognitive behavioral therapy; ICD- International Statistical Classification of Diseases and Related Health Problems; oCBT: Online cognitive behavioral therapy; RCTs: Randomized-controlled trial; Post-traumatic stress disorders. QALY: Quality adjusted life years

First author and year	Total o subgroup	Main characteristics of participants included in studies	Study design of primary studies	Number of studies included	Main objective	Quality assessment (Tool)	Electronic health interventions	Main fi
Lewis, C. et al (2017) [35]	Total	Adults aged 16 years or older required to meet full diagnostic criteria for PTSD according to DSM or ICD criteria, assessed by clinical interview or a validated questionnaire.	RCTs	10	To determine whether ICBT is an effective treatment for those who meet diagnostic criteria for PTSD.	Cochrane risk-of-bias tool	ICBT	ICBT w; effective reductio than no interver treatme post-tre Howeve three st reporter data an was no that tre; gains h maintai follow-t than si) There w evidenc greater sub-gro analysi therapi; ICBT. TI evidenc signific differer dropou; the ICB' compar wait list; care gro was evi ICBT w; effectiv waitlist, as usu; attentio reductio sympto depress anxiety treatme follow-t than si) There w evidenc was mc effectiv waitlist, as usu; attentio treatme of impr quality

Note: CBT: Cognitive behavioral therapy; DSM: Diagnostic and Statistical Manual of Mental Disorders; ICBT: Internet-based cognitive behavioral therapy; ICD- International Statistical Classification of Diseases and Related Health Problems; oCBT: Online cognitive behavioral therapy; RCTs: Randomized-controlled trial; PTSD: Post-traumatic stress disorders. QALY: Quality adjusted life years

First author and year	Total o subgroup	Main characteristics of participants included in studies	Study design of primary studies	Number of studies included	Main objective	Quality assessment (Tool)	Electronic health interventions	Main fi
Linde, K. et al (2015) [42]	Subgroup	Adults (18 years or older). Patients must have been recruited from a primary care setting (primary care clinics, private practices of general practitioners, internists or other non-psychiatrists providing primary care in the respective country). Included patients had to suffer from prevalent or incident unipolar depressive disorder.	RCTs	30	To systematically review and compare the available evidence for the effectiveness of pharmacological, psychological, and combined treatments for patients with depressive disorders in primary care	Cochrane risk-of-bias tool	Remote therapy provided online, by telephone	The dif between types o psycho treatme minor, a therapi: guided and mi contact approa yield ef similar person: to-face There a hints th psycho therapi less eff patient: minor d and dys than fo with ma depress
Moulton-Perkins, A. et al (2020) [36]	Total	Adults (>=18 years)	RCTs, non-controlled interventions, qualitative	12	To describe current evidence about the feasibility, acceptability, safety, and efficacy of delivering Mindfulness Based Cognitive therapy /Mindfulness-Based Stress Reduction for group videoconferencing	The Effective Public Health Practice Project Quality Assessment Tool for Quantitative studies	Mindfulness Based CBT /Mindfulness-Based Stress Reduction for group videoconferencing	Mindfu Based ( Mindfu Based ( Reducti Group Videocon appears for redu psycho distress with inc control: mediun sizes ev Effectiv compar active c was les howeve any eff potenti: mechar action. were su powere conduc inferiori analyse compar interver person

Note: CBT: Cognitive behavioral therapy; DSM: Diagnostic and Statistical Manual of Mental Disorders; ICBT: Internet-based cognitive behavioral therapy; ICD- International Statistical Classification of Diseases and Related Health Problems; oCBT: Online cognitive behavioral therapy; RCTs: Randomized-controlled trial; Post-traumatic stress disorders. QALY: Quality adjusted life years

First author and year	Total o subgroup	Main characteristics of participants included in studies	Study design of primary studies	Number of studies included	Main objective	Quality assessment (Tool)	Electronic health interventions	Main fi
Olthuis, J. et al (2015) [43]	Subgroup	Adults of over 18 years of age; no upper limit with a primary diagnosis of an anxiety disorders.	RCTs	30	To assess the effects of therapist-supported Internet cognitive-behavioral therapy on remission of anxiety disorder diagnosis and reduction of anxiety symptoms in adults as compared to waiting list control, unguided CBT, or face-to-face CBT.	Cochrane risk-of-bias tool	Online treatment modules with email support from therapists, therapist support by telephone, online discussion forum	The inter cognitive behavior is more efficaci waiting attentio informo online c group c in leadi clinicall importo improv anxiety, anxiety (both di specific general improvi of life. I also ge showec differer outcom followin therapie support versus i CBT at treatme results : by low c evidenc limited studies imprec Moreov sugges therapie support may no signific differer face-to- and ind CBT in anxiety Meta-an reveale signific differer clinicall importo improv anxiety reductio anxiety (both di specific general posttre follow-t two inte

Note: CBT: Cognitive behavioral therapy; DSM: Diagnostic and Statistical Manual of Mental Disorders; ICBT: Internet-based cognitive behavioral therapy; ICD- International Statistical Classification of Diseases and Related Health Problems; oCBT: Online cognitive behavioral therapy; RCTs: Randomized-controlled trial; Post-traumatic stress disorders. QALY: Quality adjusted life years

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Olthuis, J. V. et al (2016) [44]	Subgroup	Military samples general population or clinical samples, including parents of children on cancer treatment, stem cell transplant patients, and women following childbirth. Thirteen of the included studies required participants meet PTSD criteria. The remaining six studies included some or all participants who met criteria for subclinical PTSD.	RCTs	19	To comprehensively review the outcomes from therapist-guided, distance-delivered interventions for PTSD	Cochrane risk-of-bias tool	Intervention delivered via videoconferencing, Internet-delivered interventions with telephone or email support, intervention supplemented with telephone support.	The videoocc seems 1 compar face-to-treatme at least outcom researc compar these tv interver depress outcom long-ter up is ne the curr sugges inferiori videoocc in these
Pasarelu, CR. et al (2016) [37]	Total	Adult participants (aged 18 years or older) that had either symptoms of anxiety and/or unipolar depression or a primary diagnosis of anxiety and/or unipolar depression with comorbid anxiety and/or unipolar depression.	RCTs	19	To provide a meta-analysis of the published studies on transdiagnostic and tailored ICBT for adult patients with symptoms of anxiety and/or depression or with a primary diagnosis of anxiety and/or unipolar depression with comorbid anxiety and/ or unipolar depression.	Cochrane risk-of-bias tool	Internet-delivered transdiagnostic and tailored CBT	Internet transdi and tail are pro interver have a to-large on sym anxiety depress the effe interver quality-assessi modera adherer comple entire p varied f 89%. Tr length (modera and qu outcom Howeve case of depress outcom treatme than si were as with lar size. Th of time spent w patient associa better o even th index v: 19 min min.

Note: CBT: Cognitive behavioral therapy; DSM: Diagnostic and Statistical Manual of Mental Disorders; ICBT: Internet-based cognitive behavioral therapy; ICD- International Statistical Classification of Diseases and Related Health Problems; oCBT: Online cognitive behavioral therapy; RCTs: Randomized-controlled trial; Post-traumatic stress disorders. QALY: Quality adjusted life years

First author and year	Total o subgroup	Main characteristics of participants included in studies	Study design of primary studies	Number of studies included	Main objective	Quality assessment (Tool)	Electronic health interventions	Main fi
Proctor, B. J. et al (2018) [45]	Subgroup	People with Multiple Sclerosis in which a telephone-delivered psychological therapy was compared to a control.	RCTs	11	To review the evidence for the effectiveness of telephone-psychotherapy on psychological outcomes in people with Multiple Sclerosis compared to those receiving no treatment, standard care or other control, on psychological and physical outcomes.	Cochrane risk-of-bias tool	Telephone-psychotherapy	A small significant treatment was found favoring telephone-psychotherapy compared to control. There is mixed quality evidence that suggests providing telephone-psychotherapy to people with Multiple Sclerosis has a small to moderate effect on depression. The authors found a small effect on depression in interventional designs. RCTs with heterogeneous studies at least a small bias.
Rees, C. S. et al (2015) [38]	Subgroup	No details	Controlled, Case study, Uncontrolled case series, Uncontrolled	20	To synthesize the current literature on the effectiveness of videoconference delivered therapy for anxiety disorders.	No details	Exposure therapy for PTSD, cognitive processing therapy for PTSD, prolonged exposure for PTSD, group cognitive processing therapy–cognitive, group CBT, CBT for PTSD, prolonged exposure, behavioral activation and therapeutic exposure, cognitive processing therapy–cognitive, CBT.	Not reported

Note: CBT: Cognitive behavioral therapy; DSM: Diagnostic and Statistical Manual of Mental Disorders; ICBT: Internet-based cognitive behavioral therapy; ICD-10: International Statistical Classification of Diseases and Related Health Problems; oCBT: Online cognitive behavioral therapy; RCTs: Randomized-controlled trials; PTSD: Post-traumatic stress disorders. QALY: Quality adjusted life years

First author and year	Total o subgroup	Main characteristics of participants included in studies	Study design of primary studies	Number of studies included	Main objective	Quality assessment (Tool)	Electronic health interventions	Main fi
Sunjaya, A. et al (2020) [39]	Total	No details	RCTs, case-control and cohort study design	15	To evaluate the potential of telemedicine as an alternative solution to bridge the barriers towards better PTSD care in Indonesia and other countries.	No details	Teleconference, online CBT	Various have sh telepsy; an effe; efficien; manag; The qu; given b; telepsy; both th; video; confere; well as; applica; is comp; that of; face the; althoug; studies; develop; nation; satisfac; quality; patient; relation; remain; therape; compar; that of; face the; Countri; especia; low pat; mental; profess; should; be encc; develop; telepsy; system; manag;
Turgoose, D. et al (2017) [46]	Total	Veterans with PTSD		41	To systematically review findings from studies using tele-therapy interventions to treat PTSD in military veterans, in order to provide a more robust overview of lessons learned so far from using tele-therapy in this population, and to inform the use of such interventions in the future.	Quality Assessment Tool for Quantitative Studies	Videoconferencing, telephone-based counselling	Eightee looked : clinical : effective; telether; interve; these, 1; control,; the sam; interve; person.; these st; reporter; therapy; associa; signific; reductio; PTSD s; Of the; studies,; reporter; compar; between; therapy; person; interve; using n; inferior; analyse; nine co; that tel; was as; as in pe; therapy

Note: CBT: Cognitive behavioral therapy; DSM: Diagnostic and Statistical Manual of Mental Disorders; ICBT: Internet-based cognitive behavioral therapy; ICD-International Statistical Classification of Diseases and Related Health Problems; oCBT: Online cognitive behavioral therapy; RCTs: Randomized-controlled trial; Post-traumatic stress disorders. QALY: Quality adjusted life years

## Risk of bias within studies

Most of the studies (n=19, 90%) of the included systematic reviews performed a risk of bias assessment. The most used instrument was the risk of bias Cochrane Collaboration tool (n=12; 57%). [30–32, 34, 35, 37, 40–45]. Seven studies used other tools to assess the risk of bias such as the Effective Public Health Practice Project Quality Assessment Tool (n=2; 9%); Grading of Recommendations Assessment, Development and Evaluation (n=1), and others. Only two studies did not report using any risk of bias tool [38, 39]. Ten studies did not appropriately account for the risk of bias of the individual studies included when interpreting the results of their review.

## Risk of bias across studies

The study by Olthuis et al [44] presented a medium level of confidence and the study by Lewis et al [35] presented low confidence. The rest of the included systematic reviews presented a critically low level of confidence (see Figure 2). On average, the included reviews only met 40% of the AMSTAR-2 risk of bias items. The study by Rees et al [38] failed to accomplish any of the AMSTAR-2 items and the study by Turgoose et al [46], only passed one AMSTAR-2 item.

The AMSTAR-2 items that were the most fulfilled (if applicable) were item 15 (critical) of assessing the presence and likely impact of publication bias (93%), and item 12 (non-critical) of assessing the potential impact of risk of bias in individual studies (73%), in case of meta-analysis. The AMSTAR-2 items that were least fulfilled were item 10 (non-critical) on whether the review reported the funding sources of the included studies. Only the study by Irvine et al. [33] achieved compliance. Two other items that had a low compliance rate (14%) were item 4 (critical) on the adequate literature search, and item 3 (non-critical) on the justification for the decision on the study designs to be included in the review, and only one study met each of these criteria [43].

## Realist synthesis

Synchronous digital mental health interventions provide effective clinical outcomes (see Figure 3). Some systematic reviews identified that digital mental health interventions based on CBT (i.e., telephone, internet-based, videoconferencing, online) were equally effective as face-to-face CBT in the treatment of specific mental health conditions (e.g., social anxiety disorder, PTSD, panic, depressive symptoms, body dissatisfaction, insomnia, specific phobias) [30–33, 39, 44, 46, 47]. In addition, the different theoretical models used in CBT-based digital mental health interventions (i.e., classical, Mindfulness, trans-diagnostic, non-specific) and non-specific digital mental health interventions had a moderate to large effect in reducing depressive, anxious and PTSD symptoms, compared to control situations [32, 34–37, 41–43, 45, 46, 48]. Furthermore, different formats of individual and group electronic interventions (i.e., telephone, videoconferencing), and guided self-help treatment had comparable effectiveness in depression and anxiety treatment [32, 42, 43]. In addition, digital interventions have shown to be effective in different population groups, such as adults and elder people [30, 31, 37, 42], veterans [44, 46], and people with multiple sclerosis [45].

The advantages of interventions using technology are allowing the inclusion of add-ups to the therapy (e.g., written, audio or visual materials to access online or download, diary-keeping, chats [29], emails [29, 44], online forums [29, 40, 43], new platforms or existing ones, such as Skype or Zoom, etc.) [46]. These interventions also promote better coordination of care and early treatment [39, 46].

Guided synchronous components are essential elements in digital interventions to reduce anxiety. They are more effective and improve adherence significantly compared to unguided interventions or those with only asynchronous components [40]. Also, it is unclear which guided synchronous components are the most effective or whether there are cumulative effects when combining them [40]. Of note, CBT-based and heterogeneous digital mental health interventions (not CBT-based) showed no difference in their effectiveness in reducing PTSD symptoms [35].

### Hypothesis 1

*Synchronous digital mental health interventions reach populations otherwise unable to have access through face-to-face interventions, since they do not require the physical presence of the therapist nor the patient, thereby tackling geographic barriers posed by in-person therapy (To expand access).*

Synchronous digital interventions in mental health reach populations that would not have access through face-to-face interventions, such as children, veterans, refugees, and people living in rural areas [47, 49], because these interventions do not require the physical presence of both the patient and the therapist (see Figure 3). We also found that these interventions can reduce geographical barriers to access (e.g. mobilization for several hours). In addition, they can interact in real-time [38], and tackle the geographic barriers of travel required to receive care, thereby being able to access even from remote areas [34, 38, 39, 43–45, 47].

Some aspects need to be taken into consideration for the delivery of successful therapy through synchronous digital mental health interventions. First, to find a quiet area in home or at the usual environment of the patient to receive the session, which could represent a challenge for many [46]. Second, the platform should be as stable as possible since ineffective internet service could lead to withdrawing the therapy [46], and the quality of the image and sound could be associated with satisfaction [36]. Third, the possibility to expand the use of telepsychiatry will require the development or improvement of a software specially designed for that purpose [39]. Finally, the presence of technical support when needed, as one systematic review found that scheduled guidance showed better outcomes on anxiety symptom severity at post intervention and follow-up [40].

The presence of synchronous human support seems to improve the delivery of digital mental health sessions, although the evidence is not conclusive [29, 40]. Guided interventions were superior to completely unguided interventions for symptom severity across mental disorders and presented higher treatment adherence [40]. In studies that used local clinics rather than home-based teletherapy, it was recommended to have local staff on hand to assist, such as to receive homework and other materials via fax machine and disseminate them to participants [39]. However, in the future, artificial intelligence could replace human support to generate computer responses [30].

Additionally, we found some barriers: First, the absence of physical contact. One review identified that patients receiving in-person treatment were more likely to complete the home assessments and tasks given [46]. Second, the safety of the patient could be compromised. It is worth noting a potential issue with

interventions using technology. The distance between patient and therapist could put patients' safety at risk, who could not receive the necessary care in the event of a crisis or emergency [40]. Some studies also suggested the presence of an extra person to provide in-person support in case of emergencies [40, 46], although not all studies showed favorable results [29, 30, 40]. Finally, the presence of technical issues could impose a potentially modifiable barrier. Some flaws found during the therapy delivery were limited connectivity, the lack of human resources and telepsychiatry equipment [39], low image resolution, difficulties for establishing the connection, slight audio delays, and problems with the internet connection [39]. Moreover, a systematic review assessing mindfulness-based cognitive therapy for stress reduction found that the users' dissatisfaction was linked to technical issues [36].

## **Hypothesis 2**

*Synchronous digital mental health interventions reach populations otherwise unable to have access via face-to-face interventions because they can be successfully delivered by non-specialists, which makes them more cost-effective to implement in health services (To expand access).*

A second reason why these interventions reach populations that otherwise would not have access to face-to-face interventions is that they are an accessible and cost-effective treatment in the short term [29]. This may lead to reductions in mental health costs, at least in depression [29]. It should be noted that CBT-based digital interventions tend to be slightly more expensive compared to usual treatment at baseline. Because their cost-effectiveness improves when considering their positive effect on quality-adjusted life years [29] and their costs in the long-term, since they require limited interaction between patient and therapist [31, 39].

This higher cost-effectiveness is associated with different components. Regarding phone sessions, they adhere to a more structured format and focus on problem solving and tasks, resulting in more efficient and direct sessions [33]; and shorter durations than in-person therapies [31, 33]. It should be noted that the session duration of these interventions was not associated with better outcomes in cases of anxiety and depression, although the therapy duration varied from 19 to 150 minutes [37].

Evidence suggests that physicians, psychiatrists, psychologists, or nurses trained for various mental health problems could perform digital interventions such as telepsychiatry or teleconsultations [49]. This enables optimization for using available human resources when there is a reduced number of specialists for large populations, since non-specialists with adequate training and supervision are as effective as specialists for this purpose [38, 40]. For this outcome, it is important to consider some barriers. A potential barrier was the provision of care by non-specialists, highlighting the importance of having appropriate training and supervision to provide long-distant care. Training for therapists providing interventions using technology should include contents on good clinical practices [36, 49], the use of technology [46] and telepsychiatry [49], the management of risk or crises [40], as well as potential ethical and/or legal conflicts [47]. Second, distrust of the health personnel. One study pointed out that therapists showed greater preference for face-to-face interventions compared to online interventions [35], while another found that some professionals may be reluctant to apply electronic interventions using telephones to treat mental health problems, arguing that it could harm the interactions with the user [33]. However, evidence suggests that the use of electronic interventions using telephones does not change interaction patterns in consultations (duration, alliance, disclosure, empathy, attention, and participation) [33].

Some relevant aspects to consider are clinicians' satisfaction, the lack of training for providers, and ethical challenges. For example, a systematic review of teletherapy for veterans with PTSD found high fidelity to the intervention and good therapist competence, as well high levels of satisfaction among clinicians in terms of their confidence for the delivery of these forms of therapies [46]. However, as mentioned before, proper training is needed for successful delivery [36, 46, 49], and the ethical and legal aspects should be established [47].

## **Hypothesis 3**

*Synchronous digital mental health interventions are acceptable by patients and show good results in satisfaction, because they require less need of disclosure and provide more privacy, comfortability, and participation, enabling the establishment of rapport with the therapist (User's satisfaction).*

Telepsychiatry for PTSD patients shows the advantage of diminishing the risk of stigmatization. Since patients are treated from their own homes and are no longer required to visit a psychiatric facility, they feel more motivated to seek mental health care [39]. One systematic review found that patients presented more active participation at distance-delivered therapies compared to face-to-face interviews. This may be due to the feeling of "safety" that being at a different location from the therapist could produce. They found that neither empathy, attention nor participation diminished when using telephone interventions [46]. Additionally, telephonic interventions offer the patient a potentially immediate, anonymous, and easy to access option [31]. Another author pointed out that patients felt that the therapist could understand them better during face-to-face therapies. However, there were no differences for the ability of the therapist to guide the patients to "open themselves" between modalities [33]. It was reported that the efficacy of interventions was similar across modalities and although the interaction between patient and therapist was lower [36], the therapeutic alliance was able to be achieved without limitations [39, 44], except for the difficulties at reading corporal language [46].

Telephone and videocall interventions were usually acceptable and efficient for digital mental health [38]. This was probably because more access to care was allowed for children and adults with comorbid psychiatric and complex medical illnesses in various settings, age spans, and demographic characteristics, including rural areas [49]. However, although there is greater satisfaction on the users' side (and therefore an improvement in mood state), this does not imply that there are improvements in the quality of life, since recovery (the relief of depressive symptoms) does not necessarily amount to parallel improvements in quality-of-life measures [29]. In addition, it should be considered that those two outcomes do not follow the same recovery rate.

Worth noting, during telephone therapies, the patients could develop an awareness of their own emotional and affective changes by listening to their own voice. Moreover, since there is no difference in the measure of how "closely" the therapist could be listening as usual in face-to-face communication, the patients could easier feel the "connection" with their therapist and enhance disclosure of feelings and emotions [33]. It was found that the use of technology did not influence the therapeutic alliance with their patients [36, 44, 46]. This could be explained since, in this context, the therapist's validation is not based on

non-verbal communication but their listening capacity, their verbal clarity, the tone of voice used by the therapist, and how the patient experiences it [40]. Indeed, telephone therapy could work better for introverted patients because it provides more anonymity, creating a sense of safety [31, 40].

Some aspects to consider include barriers such as awkward silence, concerns about privacy and constraint communication. Some patients had expressed their privacy concerns. For instance, veterans with PTSD mentioned questions about the confidentiality of the video transmissions, and the data they shared during the consultation [46]. In that same review, constraint communication for detecting body language and non-verbal communication by clinicians when doing teletherapy for veterans with PTSD was reported. However, they still could develop rapport [46]. Finally, during communications where there is no video of the patient, as in telephone therapy, silences during the patients' speech were more challenging to interpret. [33]

One review noted that only two studies reported to providing ongoing technical support during interventions [36]. In addition, none of the studies included in their review mentioned videoconferencing-specific good practice guidelines, training of facilitators to conduct online psychological interventions, or contingency plans to support remote participants [36]. Also, few studies reported on the frequency of technical problems [36].

## **Gaps**

### *Limitations of digital mental health reported in reviews*

Lastly, even though technology interventions have proven to be as effective as in-person and have 2.13 times more probability of achieving an appointment once a month [49], some limitations should be noted. First, their effectiveness will depend on treatment adherence [37]. Second, there is limited information on whether CBT-based electronic interventions maintain their beneficial effects over time; two systematic reviews did not identify sufficient evidence to support the benefits of this therapy after 3- or 6-months post-treatment for PTSD cases [35, 44]. Third, most of these studies did not use randomization and their sample sizes were small, therefore more research is needed [29, 32–34, 36, 38, 41–43, 45, 46, 48]. Finally, most of the available evidence comes from high-resource countries with integrated health systems and larger research budgets [39]. Hence some results may not be extrapolated to low- or middle-income countries.

## **Confidence in cumulative evidence**

An overall analysis of the CERQual assessment shows that the hypotheses presented have low or very low confidence in the evidence (see Table 2). The main methodological limitations are that the studies come from research with a low or very low confidence level. In terms of coherence, the baseline assumption and hypothesis 1 show adequate coherence between the different findings, while hypotheses 2 and 3 show moderate concern since some reviews show heterogeneous results. Finally, all hypotheses show the adequacy of the data and relevance of the results.

Table 2  
Confidence in cumulative evidence with CERQual.

Summary of review finding	Studies	Methodological limitations	Coherence	Data adequacy	Relevance	CERQual assessment of confidence in the evidence
Diverse synchronous digital interventions (SDI) in mental health effectively reduces symptoms and readmissions, like in-person interventions. However, these SDI are different between them and there is not a clear type of SDI better than others.	19 studies: 31, 32, 33, 34, 35, 36, 37, 38, 39, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50	Serious concerns regarding methodological limitations. One study with medium confidence, one study with low confidence and 17 studies with very low confidence due to lack of exhaustive bibliographic search, absent of review protocol, and of justification for meta-analysis methods.	No or very minor concerns. All reviews found positive or similar results for diverse SDI compared to usual care interventions or waiting list.	No or very minor concerns. These reviews included more than 100 individual studies. Most of these studies assess the effects of these SDI in mental health.	Minor concerns since the review finding is based in systematic reviews which included all recently published data. However, there is still lack of representation of low-middle income countries	Low confidence
SDI in mental health reach under-served populations, since they do not require the <b>physical presence</b> of therapist nor the patient, thereby they tackling geographic barriers posed by in-person therapy. But these interventions could create new challenges as access and literacy for technology and patient security ( <b>Hypothesis 1</b> ).	13 studies: 31, 32, 36, 38, 40, 41, 42, 45, 46, 47, 48, 49, 51	Serious concerns regarding methodological limitations. One study with medium confidence, and 12 studies with very low confidence due to lack of exhaustive bibliographic search, absent of review protocol, incorrect methods for selection and data extraction process.	Minor concerns since these reviews agreed about benefits of SDI in mental health, but not all of them assess the possible new barriers for the under-served population.	Minor concerns since most of these reviews mention the tackling of geographic barriers. But they offered superficial information about this phenomenon, according to few primary studies.	Minor concerns since the review finding is based in systematic reviews which included all recently published data. However, there is still lack of representation of low-middle income countries	Very low confidence
SDI in mental health can be successfully <b>delivered by non-specialists, and therefore they are more cost-effective</b> to implement in health services. But there is a need for training and supervision for human resources, and this can create distrust in some health personals ( <b>Hypothesis 2</b> ).	12 studies: 31, 33, 35, 37, 38, 39, 40, 41, 42, 48, 49, 51	Serious concerns regarding methodological limitations. One study with low confidence, and 11 studies with very low confidence due to lack of exhaustive bibliographic search, absent of review protocol, and incorrect interpretation of risk of bias of individual studies.	Moderate concerns since some reviews acknowledge the higher cost of SDI but, not all of them agreed about the cost-effectiveness of these interventions.	Minor concerns since most of these reviews mention the tackling of geographic barriers. But they offered superficial information about this phenomenon, according to few primary studies.	Minor concerns since the review finding is based in systematic reviews which included all recently published data. However, there is still lack of representation of low-middle income countries	Very low confidence
SDI in mental health <b>are acceptable by patients and show good results in satisfaction</b> , because they require less need of disclosure and provide more privacy, comfortability, and participation, enabling the establishment of rapport with the therapist ( <b>Hypothesis 3</b> ).	10 studies: 31, 33, 35, 38, 40, 41, 42, 46, 48, 51	Serious concerns regarding methodological limitations. All 10 studies with very low confidence due to lack of exhaustive bibliographic search, absent of review protocol, incorrect assessment and interpretation of heterogeneity and risk of bias of individual studies.	Moderate concerns since some reviews also highlighted some barriers for these SDI which could influence in the patients' perceptions about the interventions	Minor concerns since most of these reviews mention the tackling of geographic barriers. But they offered superficial information about this phenomenon, according to few primary studies.	Minor concerns since the review finding is based in systematic reviews which included all recently published data. However, there is still lack of representation of low-middle income countries	Very low confidence

## Discussion

Implementation science is an emerging and rapidly growing field that has established frameworks, methods, and strategies to improve the adoption and sustainability of interventions within the real world [50]; it has also identified different barriers and facilitators to the implementation of digital mental health interventions [50]. However, strategies specifically for implementing digital mental health interventions within the healthcare system are still limited [50–52]. Our study develops a framework based on three hypotheses and a baseline assumption to understand/explain the implementation of synchronous digital mental health interventions.

The implementation of digital mental health interventions allows overcoming many barriers in health access, such as geographic, human resources, and stigma barriers. These types of interventions allow patients and therapists to remain in their usual, more comfortable, or safer location. Another advantage is that our framework supports that other mental health providers with lesser degrees after appropriate training could deliver digital mental health interventions, which would increase the available human resources pool of therapists [38, 40]. In addition, digital mental health interventions could be more attractive than face-to-face therapies, as they present the opportunity to increase privacy and minimize the risk of stigmatization, as they could take place outside of mental health institutions, especially for populations in which the presence of potential social stigma interferes with the decision to attend mental health facilities [39].

Our study provides hypotheses based on systematic reviews, which allow a better understanding for the implementation of synchronous interventions in digital mental health. However, it does not provide specific steps or strategies to carry out the implementation process. Therefore, to fill this gap, other researchers could use the ERIC project framework, which presents four general phases for implementing digital interventions in the health system:

implementation strategy exploration phase, the preparation phase, implementation phase, and sustainability phase [50, 53]. It should be noted that other frameworks that systematize the implementation steps could be used to perform the implementation task, as long as they are adapted to the particularities of the context, the health system, the resources, and the willingness of the actors involved. An alternative that has proven to be useful in favoring the implementation of interventions from heterogeneous contexts are the formative studies that allows for the contextualization of these interventions, while evaluating their acceptability, efficiency, and safety within the health system or community [54]. However, this requires greater investment in research by medium and low-resource countries.

There are currently no frameworks explaining the implementation of digital interventions as the main component in mental health care. A systematic review of barriers and facilitators to the implementation of electronic mental health interventions identified that the acceptability of electronic interventions depends on 1) patients' and professionals' expectations 2) and preferences about what they would receive and what they provide during care 3) the appropriateness of the electronic intervention to address patients' mental health conditions [55]. In the absence of an integrative framework, our study proposes a technical underpinning of available evidence to enable decision-makers to implement electronic interventions to address mental health. We identified different reviews supported by electronic interventions for anxiety, depression, and PTSD, which are equivalent to face-to-face interventions [30–33, 39, 44, 46, 47], and are cost-effective in the long term [29].

Despite evidence in favor of digital mental health interventions, there is a considerable difference between the reports from high-income and low-income countries. Some high-income countries had sufficient evidence to conduct country-focused effectiveness evaluations. For example, a systematic review from the United Kingdom identified 7 out of 48 digital interventions promoted by their health system for depression and anxiety as having a small but consistent effect, and recommended their use [56]. In addition, the disparity in the amount of evidence remains in economic research, where a systematic review of economic studies identified that Internet-based digital interventions for anxiety and depression are cost-effective and recommended their use; however, only studies from high-income countries were identified [57].

In contrast, no reviews of effectiveness, cost-effectiveness, or acceptability of electronic interventions were identified for middle- and low-income countries. The limited evidence from middle- and low-income countries suggests that their health systems made decisions based on little local evidence, low-quality evidence (i.e., expert review), or make decisions based on evidence from high-income countries (i.e., different contexts). Additionally, material and economic resources and internet access are limited in low- and middle-income countries. Thus, sufficient internet access for healthcare providers and users should be assured for implementing these technologies. Other problems that could generate inequity are still limited access to smartphones in rural and low-income areas, low internet speed and network instability, which could generate gaps for an adequate implementation of these technologies.

An additional element to highlight, apart from the effectiveness or cost-effectiveness of electronic interventions, is the positive effects they could have on patients' quality of life. Although quality of life was not an outcome in our study, we found evidence that electronic interventions to treat mental health positively effect in the quality of life [35, 37, 43]. These results are consistent with other systematic reviews that CBT-based interventions (e.g., face-to-face, internet, or group) improve participants' quality of life [58, 59]. Furthermore, this secondary benefit of electronic mental health interventions on quality of life appeared to affect years of life lost due to disability [60]. This explain why this outcome is key for understanding the cost-effectiveness of this type of intervention since its long-term effect is to reduce costs within the health system [29].

## Implementation and Public health implications

Decision-makers and researchers could use this relevant information to support the implementation of electronic mental health interventions within their health systems (i.e., teleconsultation network). There is evidence to support digital intervention due to their effectiveness in depression, anxiety, and PTSD, their feasibility and acceptability, their safety, and additional effect on the quality of life of patients [32, 34–37, 41–43, 45, 46, 48]. The treatment models that have the most empirical support are those based on CBT, so they could be the first type of interventions to be implemented. In addition, evidence supports those electronic interventions are cost-effective, making their implementation within health systems feasible in the long term.

Health systems must develop legislation and basic technological conditions to achieve the implementation of synchronous digital mental health interventions. First, legislation such as privacy policies, terms of use and technological requirements of teleconsultation platforms should be established [4]. All these issues should be covered and regulated by national policies and there should be an entity to enable their regulation. Consequently, healthcare systems should develop an integrated digital health/digital mental health system that is user-friendly for all literacy levels.

Second, there are a need for quality Internet and cell phone services to increase the likelihood of adherence [4, 36, 39]. Collaboration among public and private sectors is needed. Technical support and access to therapies should be flexible in schedules, since participants would adjust the delivery to their own timetables. Hence, night schedules should be considered. On the other hand, training for personnel with minor degrees must be guaranteed in a standardized and systematic way [38, 40, 49].

Third, for the implementation and use of electronic interventions, it is necessary to identify the barriers within each health system to achieve the acceptance of the different actors. Lack of access to technology (especially in low-resource countries), limited training in teleconsultation or reluctance of health personnel to use the technology, problems related to patient safety or privacy, and limited legislation on teleconsultation at country-level are necessary elements to evaluate during the planning of electronic interventions in mental health [61].

Fourth, the context of the COVID-19 pandemic has enhanced the use of technologies to provide health care and reduce health care access gaps, and decision-makers need to take advantage of this context to enhance the implementation and adoption of these types of interventions [3–7]. It should be noted that digital interventions are not only a short-term solution, as the trend is to incorporate them as a key part of cost-effective healthcare systems [29, 31, 39].

## Strengths and limitations

One of the strengths of our study is that we collected information from systematic reviews in a large number of databases, assuring the comprehensiveness of the evidence included. However, our study has limitations. First, the quality of the systematic reviews included was critically low for the most part, so this could limit the confidence in the conclusions of the study. Other studies have already reported the low quality of systematic reviews and clinical practice guidelines in mental health [62–64]. Second, the electronic interventions evaluated are very heterogeneous both in the form of delivery (i.e., telephone, internet-based, videoconferencing, online) and in the theoretical models used (CBT classical, CBT Mindfulness, CBT trans-diagnostic, non-specific). Therefore, there may be variations in effect, safety, and acceptability in the way of delivery and the theoretical model used. Third, most of the research has been conducted in high-income countries, so the results may not be comparable in low-and-middle income countries. Fourth, although a realist review analysis was rigorously carried out, the evidence evaluated has methodological limitations, so that the overall certainty of the evidence is low.

## Conclusions

Our study assessed all available evidence for the implementation of synchronous digital mental health interventions and developed a framework for the implementation of synchronous digital mental health based on three hypotheses. Since it is known that digital mental health interventions are clinically effective, we hypothesized that those interventions reach otherwise inaccessible populations since they abolish the need of physical presence and mobilization (H1), or because non-specialist could deliver it by with the additional advantage of reducing expenses (H2), and, that digital interventions are acceptable for those receiving them and maintain the establishment of rapport (H3). Each hypothesis represented important outcomes in the implementation process. In addition, we analyzed the barriers and facilitators for those outcomes and identified gaps in the body of evidence that require attention from future researchers.

Our study provides a framework to understand the implementation of synchronous digital mental health interventions, suggests elements to consider at the time of implementation, and establishes gaps. This information will guide decision-makers, researchers, health system managers, and implementation teams.

## Declarations

### Ethics approval and consent to participate

Not applicable.

### Consent for publication

Not applicable.

### Availability of data and material

Open Science Framework: PRISMA-P checklist for 'Development of a framework for the implementation of electronic interventions in mental health: A protocol for a meta-synthesis of systematic reviews'. <https://osf.io/3uh4n/>

### Competing interests

No competing interests were disclosed.

### Funding

Jeff Huarcaya-Victoria received funding for this study from EsSalud (Premio Kaelin 2020). *The funder had no role in study design, data collection and analysis, decision to publish, or preparation of the manuscript.*

### Authors' contributions

DVZ: Conceptualization, Methodology, Investigation, Writing - Original Draft, Writing - Review & Editing, Supervision, Project administration, Funding acquisition. ARCA: Conceptualization, Methodology, Investigation, Writing - Review & Editing, Supervision, Funding acquisition. GJMT: Conceptualization, Methodology, Investigation, Writing - Review & Editing, Supervision. RTP: Investigation, Writing - Original Draft, Writing - Review & Editing. ANF: Investigation, Writing - Review & Editing. VC: Methodology, Formal analysis, Writing - Review & Editing. JAM: Investigation, Writing - Original Draft, Writing - Review & Editing. JRV: Formal analysis, Writing - Review & Editing. GA: Formal analysis, Writing - Review & Editing. LAF: Investigation, Writing - Review & Editing. ABRC: Investigation, Writing - Review & Editing. ALC: Investigation, Writing - Review & Editing. JHV: Conceptualization, Methodology, Investigation, Writing - Review & Editing, Supervision, Funding acquisition.

### Acknowledgements

The authors acknowledge Jackeline Garcia, Juan Barrera, and Ana Lindo-Cavero for helping with the initial phases of the information search. We have obtained permission from this people to be named in the manuscript.

### Reporting guidelines

Open Science Framework: PRISMA-P checklist for 'Development of a framework for the implementation of electronic interventions in mental health: A protocol for a meta-synthesis of systematic reviews', [osf.io/3uh4n](https://osf.io/3uh4n/). DOI: 10.17605/OSF.IO/3UH4N.

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## Figures

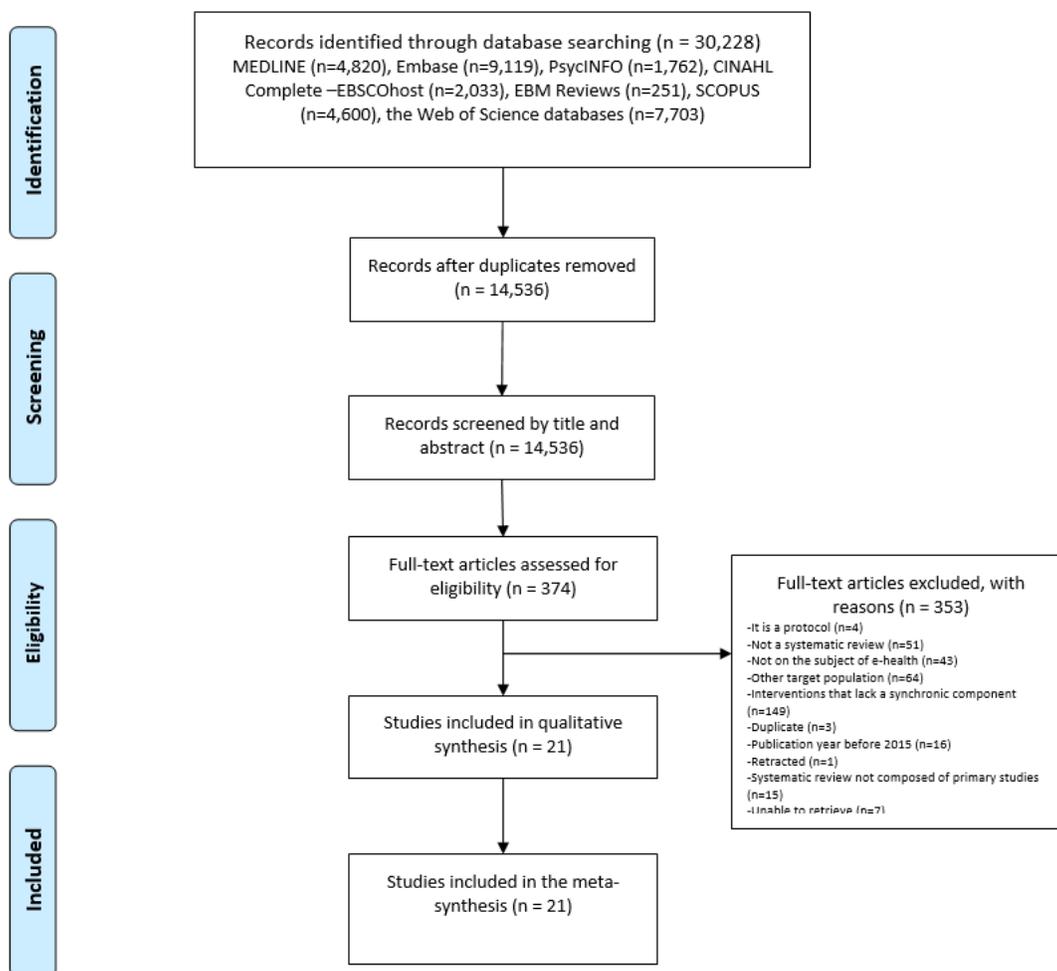


Figure 1

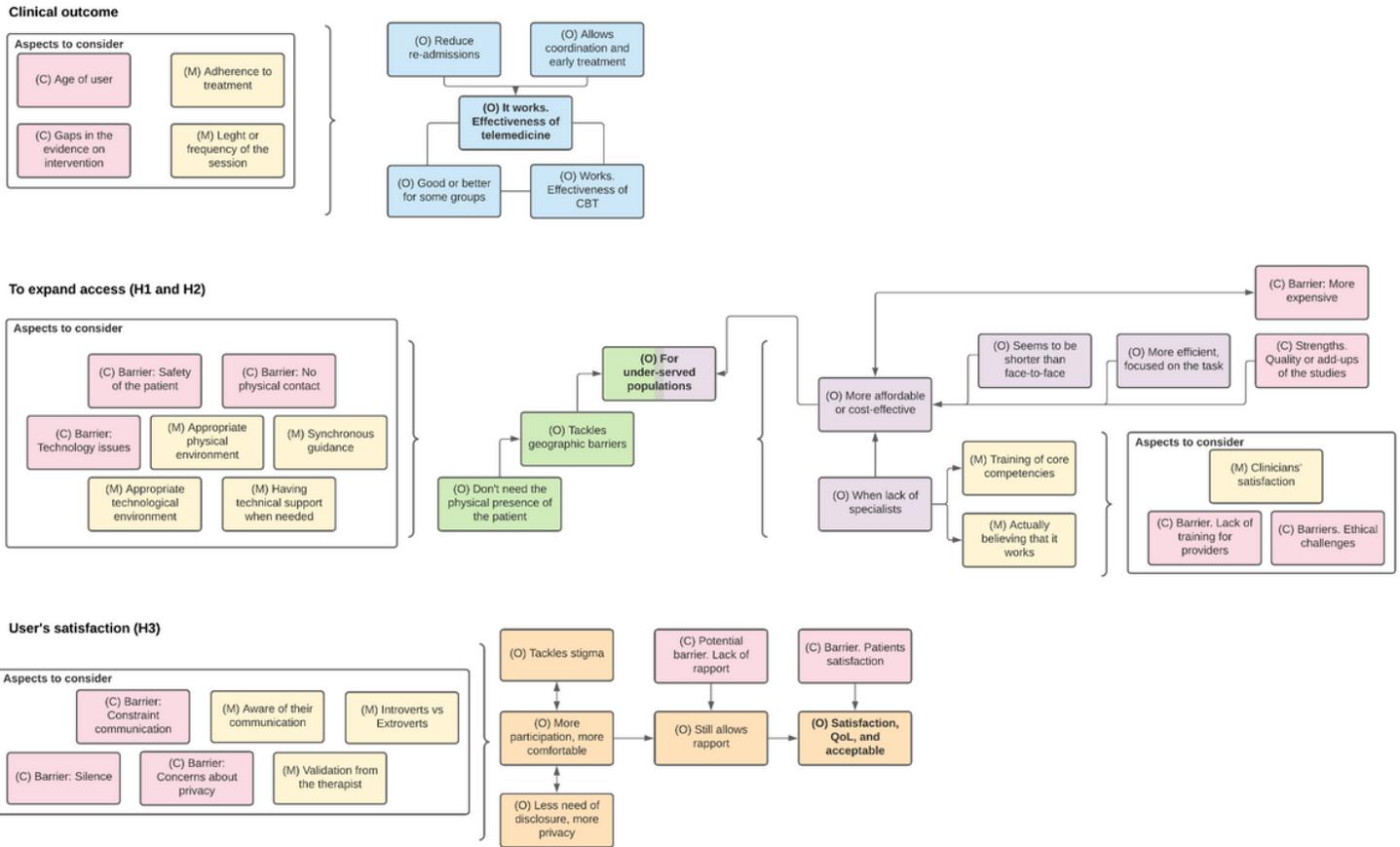
Flowchart of the study selection process.

First author and year /Criteria	1	2*	3	4*	5	6	7*	8	9*	10	11*	12	13*	14	15*	16	Confidence
Ahern, E. et al. (2018)	+	-	-	+	-	-	-	+	-	-	+	-	-	+	+	+	Critically low
Carlbring, P. et al. (2017)	+	-	-	-	-	-	-	-	+	-	+	+	+	+	+	+	Critically low
Castro, A. et al. (2020)	+	+	-	+	+	+	-	+	+	-	-	+	+	+	+	+	Critically low
Coughtrey, A. et al. (2016)	-	-	-	+	-	-	-	+	+	+	+	NA	NA	-	-	NA	Critically low
Cuijpers, P. et al. (2019)	+	+	+	+	+	+	-	+	+	-	+	+	+	+	+	+	Critically low
Domhardt, M. et al (2018)	+	+	-	+	+	+	-	+	+	-	-	+	+	+	+	+	Critically low
Drago, A. et al. (2016)	-	-	-	-	-	+	-	-	-	-	-	-	-	+	+	+	Critically low
Finley, B. et al. (2020)	NA	-	-	+	+	-	-	NA	-	-	NA	NA	-	-	NA	+	Critically low
Irvine, A. et al. (2020)	-	-	-	+	-	-	-	+	+	+	+	-	-	-	-	+	Critically low
Josephine, K. et al (2017)	+	+	-	+	+	+	-	+	+	-	-	+	+	+	+	+	Critically low
Kampmann, I. et al (2016)	-	-	-	+	-	-	-	-	+	-	-	-	-	-	-	+	Critically low
Lewis, C. et al (2017)	+	+	-	+	+	+	+	+	+	-	-	+	+	+	+	-	Low
Linde, K. et al (2015)	+	+	-	+	+	+	-	+	+	-	-	+	+	+	+	+	Critically low
Moulton-Perkins, A. et al (2020)	-	+	-	+	+	+	-	+	+	-	NA	NA	-	-	NA	-	Critically low
Olthuis, J. et al (2015)	+	+	+	+	+	+	+	+	+	-	-	+	+	+	+	+	Medium
Olthuis, J. V. et al (2016)	+	-	+	+	+	+	-	+	+	-	+	+	+	+	+	-	Critically low
Pasarelu, CR. et al (2016)	-	-	-	+	+	-	-	+	+	-	-	+	+	+	+	+	Critically low
Proctor, B. J. et al (2018)	-	-	-	+	-	-	-	-	+	-	-	+	+	+	+	-	Critically low
Rees, C. S. et al (2015)	-	-	-	-	-	-	-	-	-	-	NA	NA	-	-	NA	-	Critically low
Sunjaya, A. et al (2020)	+	-	-	+	-	-	-	-	-	-	NA	NA	-	-	NA	+	Critically low
Turgoose, D. et al (2017)	-	-	-	-	-	-	-	-	+	-	NA	NA	-	-	NA	+	Critically low

+ Yes    
- No    
+ Partial Yes    
NA Not applicable

Figure 2

Risk of bias assessment of individual studies, according to AMSTAR-2. Note: The criterion of the Risk of bias: 1. Did the research questions and inclusion criteria for the review include the components of PICO? \*2. Did the report of the review contain an explicit statement that the review methods were established prior to conduct of the review and did the report justify any significant deviations from the protocol? (critical item) 3. Did the review authors explain their selection of the study designs for inclusion in the review? \*4. Did the review authors use a comprehensive literature search strategy? (critical item) 5. Did the review authors perform study selection in duplicate? 6. Did the review authors perform data extraction in duplicate? \*7. Did the review authors provide a list of excluded studies and justify the exclusions? (critical item) 8. Did the review authors describe the included studies in adequate detail? \*9. Did the review authors use a satisfactory technique for assessing the risk of bias (RoB) in individual studies that were included in the review? (critical item) 10. Did the review authors report on the sources of funding for the studies included in the review? \*11. If meta-analysis was justified did the review authors use appropriate methods for statistical combination of results? (critical item) 12. If meta-analysis was performed did the review authors assess the potential impact of RoB in individual studies on the results of the meta-analysis or other evidence synthesis? \*13. Did the review authors account for RoB in individual studies when interpreting/ discussing the results of the review? (critical item) 14. Did the review authors provide a satisfactory explanation for, and discussion of, any heterogeneity observed in the results of the review? \*15. If they performed quantitative synthesis did the review authors carry out an adequate investigation of publication bias (small study bias) and discuss its likely impact on the results of the review? (critical item) 16. Conflict of interest declaration.



**Figure 3**  
 Results of the three hypotheses of the realist synthesis. Note: C = Context (pink). M = Mechanism (yellow). O = Outcome (different colors for each hypothesis). H = Hypothesis.

## Supplementary Files

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