Current Psychology (2024) 43:9101–9115
https://doi.org/10.1007/s12144-023-04968-5

The Effects of Using Psychotherapeutic e-Mental Health Interventions on Men's Depression and Anxiety: Systematic Review and Meta-Analysis

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Accepted: 6 July 2023 / Published online: 9 August 2023
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Abstract

While psychotherapeutic e-mental health interventions may circumvent barriers that many men face in accessing mental health care, the effects of men using these interventions have not been evaluated. We aimed to synthesise the characteristics of psychotherapeutic e-mental health interventions for depression or anxiety that have been trialled and evaluated in men, and synthesise and meta-analyse the effects of these interventions on men's depression and anxiety, including examining influences of participant, intervention, and study characteristics on outcomes. Seven papers ($N = 552$ participant men) identified from systematic literature searches met inclusion criteria. A total 177 studies were excluded because although they met all other inclusion criteria, they did not present analysable data on participant men. The seven included interventions varied in content, length, and format; only one intervention was gender sensitive, having been designed specifically for men. All three randomised controlled trials detected no post-trial difference in men's depression symptoms between intervention and control participants. All four treatment studies presenting pre-post data reported post-intervention improvements in depression or social anxiety symptoms; this was supported by our meta-analysis of two studies, which found a medium-sized, positive effect of depression treatment interventions on depression symptoms in pre-post data ($g = 0.64$, $p < 0.005$). Further meta-analyses could not be conducted due to data limitations. Psychotherapeutic e-mental health treatment interventions result in pre- to post-intervention improvements in men's depression symptoms. There is urgent need for consideration of gender and sex in the development, evaluation, and dissemination of e-mental health interventions for men, and for further information on their effects.

Keyword Men · e-health · depression · anxiety · meta-analysis

Depressive and anxiety disorders are among the leading causes of global health burden, with negative impacts on wellbeing, quality of life, physical health, and social, family, and work functioning (Ballenger, 2000). However, only around forty percent of men with current depression or anxiety receive any mental health care (i.e., medication or psychotherapy) from a healthcare practitioner (Blumberg et al., 2015; Terhaag et al., 2020). A variety of factors may help to explain this. Men with depression or anxiety may present as angry or irritable, or engage in risky behaviours rather than reporting better-recognised symptoms such as sadness or worry. These atypical symptoms may not be recognised by men themselves or by healthcare practitioners as indicators of a common mental health issue (Fisher et al., 2021; Rice et al., 2015). Holding traditional masculine beliefs (e.g., stoicism and self-reliance) may also negatively influence help-seeking (Ogeuji & Okoloba, 2022; Seidler et al., 2016), as men may also be less likely to engage with assistance due to conflicts between these norms and key aspects of many therapies (e.g., self-disclosure and vulnerability; Oliffe et al., 2019). Some men feel they do not have

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the skills needed to speak to a healthcare provider (Milner et al., 2019), and men's often low mental health literacy may also reduce their likelihood of accessing assistance (Oliffe et al., 2016). Cultural norms, expectations, and stigma related to masculinity, mental health, and help-seeking (Lindinger-Sternart, 2015), and systemic obstacles including differential access to health care, high costs, long wait lists, appointments clashing with other responsibilities, and lack of local services have also been shown to influence men's mental health care access (Swami et al., 2020).

The ways in which men often prefer to seek mental health assistance appear to sidestep or reduce many of these identified barriers. Men are less likely than women to endorse seeking formal support for depression (Wendt & Shafer, 2016) and to get mental health information from a doctor, but are more likely to seek information about depression on the internet (Beyondblue, 2016). While men tend to consult doctors when a health issue is more advanced and serious, rather than in the earlier stages or for preventive care (Mursa et al., 2022), they have also been found to actively engage in health self-monitoring and informal help-seeking before seeing a doctor (Smith et al., 2008). Given these preferences for privacy, autonomy, self-monitoring, and initial informal help-seeking, e-mental health (eMH) approaches ("mental health services and information delivered or enhanced through the internet and related technologies"; Christensen et al., 2002) have received attention for their potential to provide mental health care in a way that suits men's needs and preferences. EMH may be delivered through a website or smartphone or tablet application ('app'), and can comprise fully self-guided interventions or incorporate assistance via other modalities (e.g., online peer discussion, emailed support from a clinician). Psychotherapeutic eMH programs are commonly based on evidence-based treatments such as cognitive-behavioural therapy (CBT; Cuijpers et al., 2010). Strengths of eMH include the often-ubiquitous nature of smart devices, ability to access assistance without delay, anonymously, and when convenient, affordability, promotion of real-time self-monitoring, and potential for intervention customisation to the individual user (Borghouts et al., 2021; Christensen & Hickie, 2010; Lal & Adair, 2014). Conversely, potential difficulties include a need for technical proficiency and internet/device access, privacy concerns, usage challenges for individuals with health limitations (including mental health-related ones), and suggestions that anonymity may reduce engagement (Borghouts et al., 2021; Lal & Adair, 2014).

In mixed sex/gender samples, eMH interventions appear effective. An umbrella review (systematic review of reviews) of data from nine meta-analytic reviews of 166 studies on internet-delivered CBT for adults showed moderate to large positive effects on panic disorder, social anxiety disorder, generalised anxiety, posttraumatic stress, and major depression (Andersson et al., 2019). However, outcomes may vary according to intervention, trial, and participant characteristics (Firth et al., 2017a, 2017b; Firth et al., 2017a, 2017b; Karyotaki et al., 2018; Renfrew et al., 2020) and for users who are men, may also be influenced by whether an intervention is 'gender sensitive' (that is, whether it has been designed for the specific needs, preferences, and realities that men consider important; World Health Organisation, 2007). To date, the effects of using eMH on men's mental health, and factors influencing any effects, have not been systematically examined.

Objectives

This review aims to (1) synthesise the characteristics of eMH interventions for depression or anxiety that have been trialled and evaluated by men, and (2) synthesise and meta-analyse the effects of eMH interventions on depression and anxiety outcomes in men, including examination of the effects of participant, intervention, and study characteristics.

Methods

A systematic review and meta-analysis were conducted based on an a priori-registered PROSPERO protocol (CRD42020212039).

Eligibility criteria

We sought peer-reviewed, published, English language studies that presented full-text, primary data on the effectiveness of a psychotherapeutic eMH intervention targeting depression or anxiety in men. Studies must have utilised a full- or quasi-experimental study design to detect the effect of the intervention, and must have presented quantitative outcome data on the effect of the intervention.

Population

We sought data on individuals identified as male or a man (as per their reported sex or gender), aged 18 + years, who had participated in studies investigating the effects of one or more eMH interventions for depression or anxiety. Where a study included men aged both 18 + and < 18 years of age, we included that study only if (a) the mean participant men age was 18 + years and (b) less than one-third of men in the sample were aged < 18 years. We excluded studies that included men < 18 years if they did not fit these criteria or where we could not make a reasonable determination due to missing age data. Studies including participants of multiple sexes or genders (e.g., men and women) were eligible if

sex- or gender-disaggregated data for male/men participants were reported separately and in sufficient detail to analyse.

We included studies comprising (a) non-clinical populations (not recruited based on a specific health or wellbeing issue) and (b) populations with high prevalence physical comorbidities or harmful health behaviours such as obesity, Type 2 diabetes mellitus, smoking, or physical inactivity. We sought to exclude medical or psychosocial conditions that did not fit these criteria (exclusions based on this criterion included samples comprising individuals with multiple sclerosis, traumatic brain injury, dementia, and schizophrenia). Studies of participants with both included and excluded conditions were eligible if data for participants with only included conditions could be extracted separately.

Interventions

We sought quantitative data on the effects of psychotherapeutic eMH interventions primarily administered via an app or website. The intervention had to be specifically designed to prevent or treat a depressive or anxiety disorder or a key symptom of depression or anxiety. Depressive and anxiety disorders were classified in accordance with the Depressive and Anxiety Disorders chapters of the Diagnostic and Statistical Manual of Mental Disorders-5 (DSM-5; American Psychiatric Association, 2013). In accordance with these chapters, includable disorders included major depressive disorder, persistent depressive disorder (dysthymia), generalised anxiety disorder, specific phobia, panic disorder, social anxiety disorder (social phobia), agoraphobia, and unspecified anxiety and depressive disorders. We also included interventions that aimed to prevent or treat a key symptom of an anxiety or depressive disorder, rather than an actual disorder. As per the DSM-5 diagnostic criteria for depressive and anxiety disorders, for depression, we included interventions targeting depressed or low mood, while for anxiety disorders, we included those that targeted anxiety, worry, or fear (American Psychiatric Association, 2013). We excluded interventions designed to prevent or treatment any disorders or symptoms not fitting these criteria.

Psychotherapeutic eMH interventions are designed to "create positive cognitive, behavioural, and emotional change" (Barak et al., 2009). Their content is generally informed by evidence-based psychotherapy and presented in structured, interactive modules. They may incorporate psychoeducation, symptom and goals monitoring, provide the user with feedback, and take the user through steps to make cognitive and/or behavioural changes (Barak et al., 2009). We included studies that examined any intervention fitting this definition. We excluded those that examined an intervention that (a) was primarily about exercise, neuropsychological interventions for improving cognition/memory/attention, or that was otherwise non-psychotherapeutically focused, or (b) included only psychoeducation/was not interactive, or (c) was not primarily self-administered, or (d) used a lab-based trial.

Comparison

Studies with any or no comparator were eligible. A comparison group not subjected to the psychotherapeutic eMH intervention was not required.

Outcomes

Outcomes included characteristics of the psychotherapeutic eMH interventions for depression or anxiety that had been trialled and evaluated in men, including features of the conducted studies and their participant men. Additional outcomes were the effects of psychotherapeutic eMH interventions on depression and anxiety outcomes, including the impacts of participant, intervention, and characteristics on those effects.

Data sources and search strategy

We followed the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines (Moher et al., 2009) in the conduct and reporting of this study (Supplementary Table S1). We conducted systematic searches for peer-reviewed, English language, published literature in six electronic databases (Cochrane Library, PubMed, PsycINFO, CINAHL, Web of Science, and Embase). Our search strategy was developed based on the PICO criteria previously presented, adapted for each database with input from an experienced research librarian (Supplementary Table S2). Database-specific indexing, thesaurus terms, and free text expressions were used. With online mental health programs beginning in the early 2000s (Andersson, 2018), we searched for studies published between 1 January 2000 and the search date (8 October 2020). We also manually searched reference lists of articles meeting inclusion criteria and relevant systematic reviews and conducted citation searching on eligible studies to identify potentially eligible studies not captured in the initial searches.

Screening and full text review

Initial search results were merged, and duplicates were automatically removed and then manually checked in Endnote X9 (2013, Clarivate, Philadelphia). The de-duplicated results were then uploaded to Covidence (Veritas Health Innovation, Melbourne) for title and abstract screening, full text review, data extraction, and quality assessment. MJO screened all abstracts and full-text papers. Inter-rater agreement with co-screeners across 10% of total titles and

abstracts was 94% (GW) and 95% (DT), with disagreements resolved by discussion. Agreement with MO across 5% of full-text papers was unanimous.

Data extraction

A data extraction form was developed and piloted on two included studies with no changes required. Data extracted from each article included (i) study design and characteristics, (ii) intervention characteristics, (iii) participant characteristics, and (iv) depression and anxiety outcomes. MJO extracted the data, which was checked by HG, with discrepancies resolved by discussion. We attempted to contact authors from four studies to clarify extracted data; two responded with the requested information (Fogarty et al., 2017; Geraedts et al., 2014). The other two studies were excluded because we did not have data necessary for their inclusion and did not receive a response to our requests for this data.

Quality assessment

Study quality was assessed using the QualSyst checklist for quantitative studies (Kmet et al., 2004). This checklist comprises 14 items related to study reporting and method (e.g., "Some estimate of variance is reported for the main results?"), with possible ratings of Yes (2), Partial (1), No (0), and where relevant, Not Applicable. A summary score is calculated by dividing the total by the possible total. We prespecified a "relatively liberal" (Kmet et al., 2004) minimum summary score of 0.55 for inclusion. Quality assessments were conducted independently by MJO and HG, with disagreements resolved by discussion.

Data synthesis and meta-analysis

Extracted data were narratively synthesised before meta-analyses were conducted in Comprehensive Meta-Analysis (CMA; Biostat Inc., Engelwood, NJ). Data were input into CMA as published or as provided by study authors. Where a study reported eligible data on two measures for the same condition (e.g., two depression measures), we used the primary measure if specified, or the most common measure across included studies if not.

We used Hedges' g as the effect size estimate to enable correction for smaller samples. Interpretation of effect sizes was based on guides of 0.2, 0.5, and 0.8 representing small, medium, and large effect sizes, respectively (Cohen, 1988). As studies did not routinely report the correlation between their pre-post outcomes, we imputed a conservative estimate of $r = 0.70$. Random effects models were used throughout to account for the likelihood that effects may have differed between studies due to intervention, study, sampling, or other differences. Effects were interpreted as statistically significant where $p < 0.05$.

We pre-planned to analyse depression and anxiety outcome data separately and followed Cochrane guidance that "two studies is a sufficient number to perform a meta-analysis, provided that those two studies can be meaningfully pooled and provided their results are sufficiently 'similar'" (Ryan & Cochrane Consumers and Communication Review Group, 2016). As such, we could conduct meta-analyses only of pre-post data from depression treatment studies ($N_{studies} = 2$). The small number of included studies and/or their variance meant that we could not conduct planned analyses of (a) the overall effects of interventions on depression and anxiety, (b) between-group RCT data (e.g., intervention vs. control), (c) the effects of prevention interventions, and (d) the impacts of other participant, study, and intervention characteristics on outcomes.

Between-study heterogeneity was evaluated using I^2, which estimates the percentage of variation across studies due to heterogeneity, and Cochran's Q, which evaluates variation across studies versus within-subjects in individual studies. A significant Q or an I^2 of $\geq 75\%$ indicated considerable between-study heterogeneity. Given the low number of studies in our analysis, we did not inspect funnel plots or associated tests of significance to assess asymmetry. Instead, potential for publication bias was assessed by calculating Orwin's fail-safe N (Nfs; Orwin, 1983) for each effect. N_{fs} determines how many missing studies would be needed to bring the overall effect to below the lowest possible level of practical importance (set at $g < 0.2$ here). N_{fs} was considered acceptable where it was greater than the number of studies in that effect size analysis ($N_{fs} > N_{studies}$). We considered a finding to be meaningful if the effect size (g) was ≥ 0.2 (at least a small effect), the finding was statistically significant ($p < 0.05$), and the fail-safe N was acceptable ($N_{fs} > N_{studies}$).

Reporting of participant gender/sex

Sex (the biological and physiological characteristics of males, females, and intersex persons) and gender (the socially-constructed roles, behaviours, and norms of men, women, and individuals identifying as other genders; World Health Organisation, 2022) are distinct concepts, and both are important determinants of health and wellbeing (Heidari et al., 2016). However, these concepts are not always easily separable, and combining data from participants described as men and male adds complexities for respectful, precise reporting. We have attempted to follow Sex and Gender Equity in Research (SAGER) guidance (Heidari et al., 2016) that data should be disaggregated by sex and gender wherever possible. As such, when referring to individual primary sources, we have endeavoured to use the participant descriptor (male/males or man/men) reported by the original

researchers. However, for ease of reading, where we cite multiple studies and in our synthesis, analysis, and discussion we have used gender descriptors (man/men) regardless of whether participants were described as men or males in primary data.

Results

Study selection

Searches identified a total of 14,330 records, of which 4772 were duplicates. A total of 9557 non-duplicate references were screened at title and abstract level, with 9077 excluded at this point. Of the 482 reports retrieved for full-text assessment, 475 were excluded; seven eligible articles progressed to quality assessment (Fig. 1).

Quality assessments

Quality scores for the seven evaluated studies were high (Table 1; Supplementary Table S3). With a lowest total of 0.85 (Botella et al., 2016), no studies were excluded due to a sub-threshold total and all seven studies were included. The most common potential biases were group selection methods or information sources not being described or appropriate (Botella et al., 2016; Rice et al., 2020) and studies not having adequate controls for confounding (Davidson et al., 2020; Deady et al., 2018; Fogarty et al., 2017; Geraedts et al., 2014; Nolte et al., 2021; Rice et al., 2020). Nine quality criteria, including use of appropriate study designs and analytic methods, reporting an estimate of variance, and conclusions that were supported by the results, were fulfilled by all included studies (Fig. 2).

Study characteristics

Table 1 details the characteristics of each included study. All were published from 2014 onwards and conducted in high income, 'Western' countries: Australia (Davidson et al., 2020; Deady et al., 2018; Fogarty et al., 2017; Rice et al., 2020), Spain (Botella et al., 2016), Netherlands (Geraedts et al., 2014), and Germany (Nolte et al., 2021).

Three studies were RCTs (Botella et al., 2016; Geraedts et al., 2014; Nolte et al., 2021) and four used single arm pre-post designs (Davidson et al., 2020; Deady et al., 2018; Fogarty et al., 2017; Rice et al., 2020). Five targeted depression (Botella et al., 2016; Deady et al., 2018; Fogarty et al., 2017; Geraedts et al., 2014; Nolte et al., 2021), one targeted depression and anxiety (Davidson et al., 2020), and the other

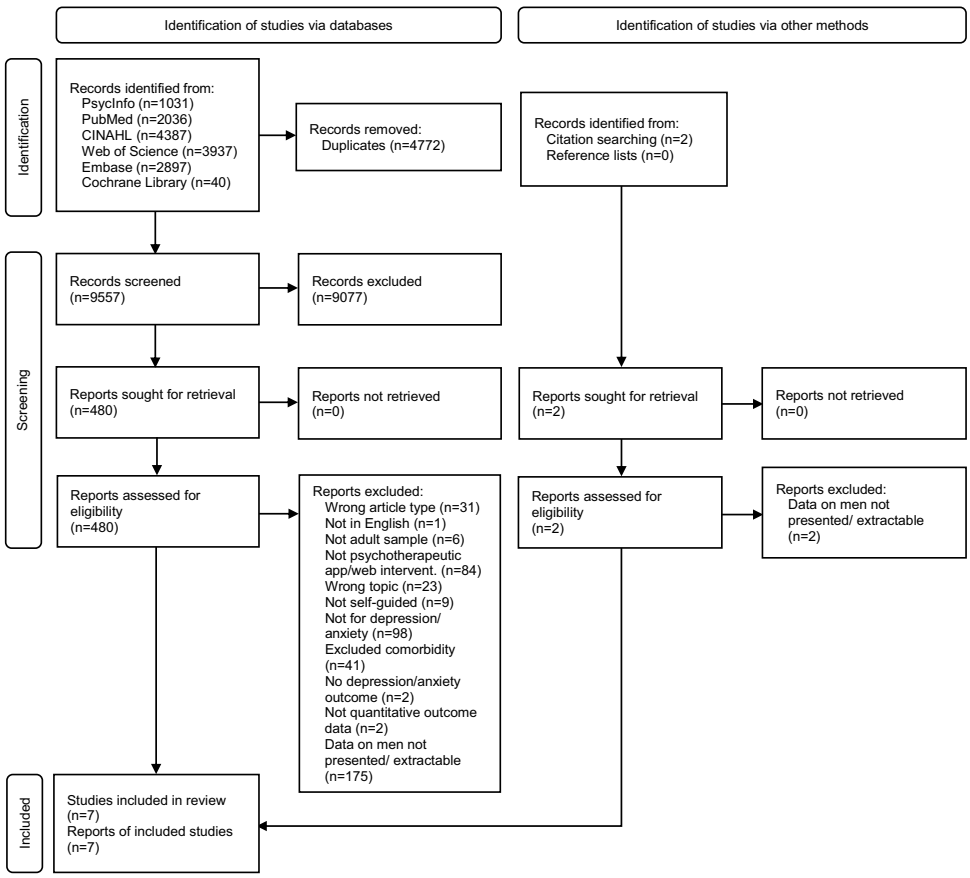

Fig. 1 PRISMA 2020 Flow Chart

Table 1 Study Characteristics

Author (year), country	Design	Arms	Treatment/prevention	Outcome(s)	Population/setting	Recruitment	Quality score
Botella et al. (2016), Spain	RCT	Intervention only Intervention + sensors[a] Control[b]	Prevention	Depression	Unemployed men with normal or mild depressive symptoms	Community	0.85
Davidson et al. (2020), Australia	Single arm pre-post	Intervention	Prevention	Depression, generalised anxiety	Taxi drivers	Community, workplace	0.91
Deady et al. (2018), Australia	Single arm pre-post	Intervention	Treatment	Depression	Employees in MDIs	Community, workplace	0.95
Fogarty et al. (2017), Australia	Single arm pre-post	Intervention	Treatment	Depression	Men with at least mild depressive symptoms	Community	0.95
Geraedts et al. (2014), Netherlands	RCT	Intervention CAU[c]	Treatment	Depression	Employees with elevated depressive symptoms not on sick leave	Workplace	0.96
Nolte et al. (2021), Germany	RCT	Intervention + CAU CAU[d]	Treatment	Depression	Individuals with mild/moderate depressive symptoms	Clinical, community	0.96
Rice et al. (2020), Australia	Single arm pre-post	Intervention	Treatment	Social anxiety	Young people experiencing social anxiety	Clinical	0.91

CAU, care as usual; MDI, male-dominated industry; RCT, randomised controlled trial

[a]Intervention + sensors group participants undertook the intervention and wore sensors to monitor brain activity (once daily) and physiological state/physical activity (24 h), with feedback given on the sensor data

[b]Control participants in this study answered pretreatment questionnaires, waited 10 weeks, then answered posttreatment and follow-up questionnaires

[c]CAU participants in this study received an email with the randomisation outcome only and were advised to consult their physician or psychologist if they wanted treatment for their depressive symptoms; both CAU and intervention groups were free to seek additional mental healthcare

[d]The protocol for this study (Klein et al., 2013) states that CAU participants would not receive treatment or support from the researchers but were free to seek any other desired help; they would receive the intervention after the one-year follow-up

targeted social anxiety (Rice et al., 2020). Three focused on work populations: unemployed men (Botella et al., 2016), employees in male-dominated industries (Deady et al., 2018), and taxi drivers (Davidson et al., 2020). Three targeted people with particular levels of symptoms: men with at least mild depression (Fogarty et al., 2017), individuals with mild to moderate depressive symptoms (Nolte et al., 2021), and young people with social anxiety (Rice et al., 2020). One targeted both workplace and symptom levels, investigating current employees with depression (Geraedts et al., 2014). Two studies were centred on prevention (Botella et al., 2016; Davidson et al., 2020), while five focused on treatment/symptom reduction (Deady et al., 2018; Fogarty et al., 2017; Geraedts et al., 2014; Nolte et al., 2021; Rice et al., 2020). Participant recruitment occurred in clinical (Nolte et al., 2021; Rice et al., 2020), community (Botella et al., 2016; Davidson et al., 2020; Deady et al., 2018; Fogarty et al., 2017; Nolte et al., 2021), and workplace settings (Davidson et al., 2020; Deady et al., 2018; Geraedts et al., 2014).

EMH intervention characteristics

The characteristics of each eMH intervention are reported in Table 2. The interventions' psychotherapeutic components were almost exclusively centred on CBT or cognitive therapy (CT) techniques but varied widely in their content, length, and format. For example, Deady et al.'s (2018) psychotherapeutic component was one short task per day for 30 days. Geraedts et al. (2014) used six weekly sequential sessions, and Davidson et al. (2020) comprised 31 short activities for use in any order. In Nolte et al. (2021), users completed 12 weekly 10–60 min sequential sessions organised as a simulated interactive dialogue. Fogarty et al.'s (2017) intervention comprised three personalised weekly sequential

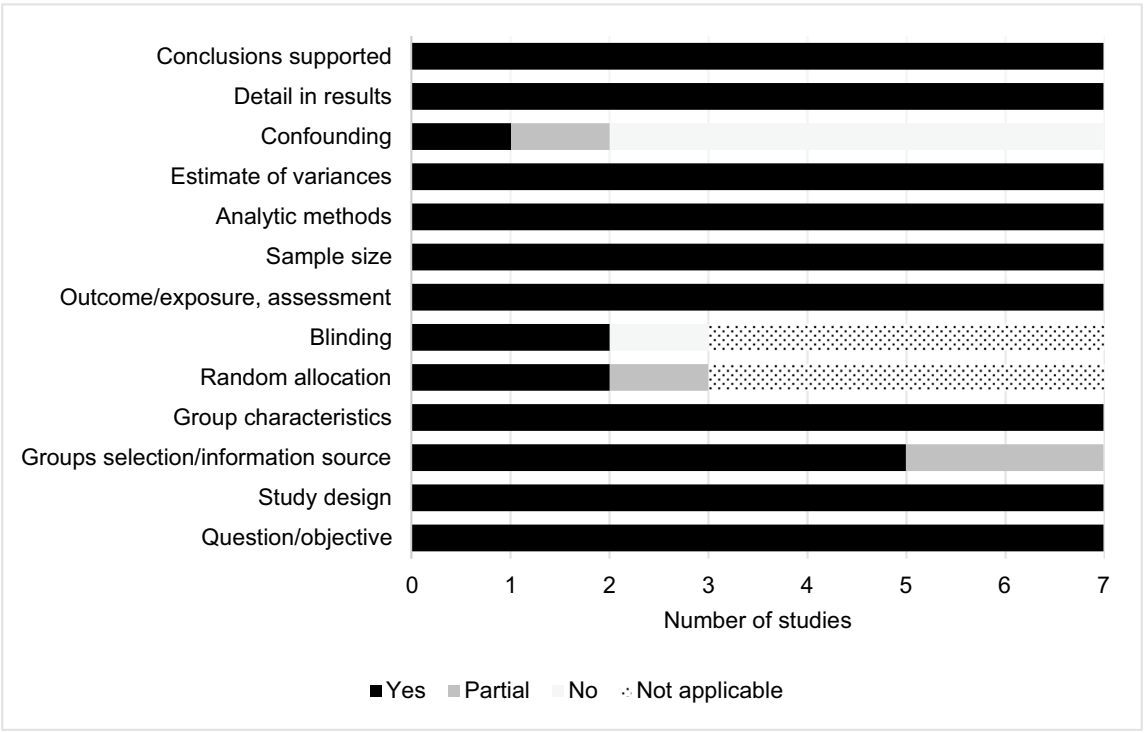

Fig. 2 Aggregated Study Quality Assessment Item Ratings

interactive sessions. In Rice et al. (2020), the therapeutic content was delivered via bespoke interactive online comics. Additional aspects of some interventions included between-session homework tasks (Geraedts et al., 2014; Rice et al., 2020), mood or activity self-assessment/monitoring (Botella et al., 2016; Davidson et al., 2020; Deady et al., 2018; Fogarty et al., 2017), details of further supports (Davidson et al., 2020; Deady et al., 2018), and the ability to receive reminders via SMS or email (Fogarty et al., 2017; Geraedts et al., 2014). Total time allowed to use or complete the interventions ranged from four (Davidson et al., 2020; Fogarty et al., 2017) to twelve weeks (Nolte et al., 2021; Rice et al., 2020).

Three interventions incorporated human interaction, such as coaches providing written feedback on homework or moderator-facilitated peer social networking (Geraedts et al., 2014; Nolte et al., 2021; Rice et al., 2020). Nolte et al. (2021) provided feedback on program use and the ability to contact a clinician only to participants with moderate depressive symptoms ($n = 308/509$).

Just one intervention was classified as gender sensitive, having been designed for the needs, preferences, realities, and/or roles that men consider important. This intervention, *Man Central*, was developed "for men with depression, based on the results of two previous phases of research exploring men's use of and preferred positive strategies to prevention and manage symptoms of depression" (Fogarty et al., 2017). Two interventions (*HeadGear* (Deady et al., 2018) and *Driving to Health* (Davidson et al., 2020)) were developed for people working in 'male-dominated' industries but not specifically for men in those industries. The Rice et al. (2020) intervention was not designed specifically for men, but the researchers incorporated gender-sensitive strategies aiming to reduce their attrition.

Characteristics of participant men

Participant characteristics and outcomes data are reported in Table 3. A total of 552 men made up the study intervention groups (39 (Geraedts et al., 2014) to 159 (Nolte et al., 2021) per study). Four samples (Botella et al., 2016; Davidson et al., 2020; Deady et al., 2018; Fogarty et al., 2017) comprised only men; in the others, they made up 31% (Nolte et al., 2021) to 48% (Rice et al., 2020) of the intervention groups. Participant men's ages were reported in five studies (Botella et al., 2016; Davidson et al., 2020; Deady et al., 2018; Fogarty et al., 2017; Rice et al., 2020), with means ranging from 20 (Rice et al., 2020) to 40 years (Fogarty et al., 2017). The majority of the studies investigated participant men aged in their 30 s or 40 s (Botella et al., 2016; Davidson et al., 2020; Deady et al., 2018; Fogarty et al., 2017).

Table 2 Characteristics of the E-Mental Health Interventions

Author (year)	Name and components	Therapeutic modality	Weeks to use	Gender sensitive	Human contact
Botella et al. (2016)	Smiling Is Fun: 8 interactive modules with exercises; coping, mood, stress self-ratings, ratings of time active and extent activities aligned with goals/values, satisfaction with activities, graphical feedback	CBT, BA, "other psychological strategies"	6–10	No	No
Davidson et al. (2020)	Driving to Health: 4 components for use in any order: 'how this can help', 'check your health', 'healthy activities' (31 activities to reduce depression, stress, etc.), 'find help now'	CBT, relaxation, mindfulness, physical activities	4	No, but designed for MDI	No
Deady et al. (2018)	HeadGear: Main component 30-day challenge in which user completes one 5–10-min challenge daily, e.g., goal setting. Also: mood monitoring and support service details	BA, mindfulness	5	No, but designed for MDIs	No
Fogarty et al. (2017)	Man Central: Personalised intervention based on initial symptoms. 3 brief interactive sessions. Home task set at end of sessions/reviewed at next session. Includes mood monitoring, tips by email/SMS, online journal, reminders	CBT, problem-solving therapy	4	Yes	No
Geraedts et al. (2014)	Happy@Work: 6 weekly lessons. Each contains information, examples, and assignments. Feedback on assignments from coach. Email reminders if deadlines unmet	Problem-solving therapy, CT	7	No	Yes
Nolte et al. (2021)	Deprexis: 10 10–60-min illustrated modules plus introduction, summary. Each organised as interactive simulated dialogue. Participants with baseline PHQ-9 of 10 + (moderate depression): received 'supported program' with added emailed weekly feedback, ability to contact clinician	"Mainly based on CBT methods"	12	No	Only for $n = 308$ with moderate depression
Rice et al. (2020)	Entourage: Psychosocial content via interactive, tailored therapeutic comics, with tasks to practice in daily life. Includes social network with user interaction and discussion. Moderators had regular contact with users and facilitated online user problem-solving discussions. Young people with lived experience provided online peer support	CT	12	No, but used gender-sensitive retention strategies	Yes

BA, behavioural activation; CBT, cognitive-behavioural therapy; CT, cognitive therapy; MDI, male-dominated industry; PHQ-9, Patient Health Questionnaire-9

Table 3 Characteristics and E-Mental Health Intervention Outcomes Data of Participant Men

	Participants			Outcomes					
Author (year)	Arms	N men (% men within arm)	M men age, years (SD)	Assessments	Intervention use and completion	Satisfaction and perceived usefulness	Effect measure[a]	Pre-post effects	Between-group effects
Botella et al. (2016)	Intervention only Intervention + sensors Control	22 (100) 19 (100) 24 (100)	32.4 (9.6)	6–10 wks, 3 mo	Intervention only group: 86% completed post-trial assessment Intervention + sensors group: 100% completed post-trial assessment	In intervention groups combined ($N = 41$): M = 8.3 (SD = 1.5) out of 10 "how satisfied are you with the treatment?" M = 8.8 (SD = 1.5) out of 10 "how confident do you feel recommending this treatment to a friend with the same problem?" M = 7.1 (SD = 2.1) out of 10 "what extent do you think the treatment was helpful for you?"	BDI-II	No change in depression symptoms in intervention groups at 3-month follow-up (Intervention only: 95%CI: -0.87, 2.05; Intervention + sensors: 95%CI: -0.06, 1.60)	No difference in depression symptoms at post-intervention between Intervention, Intervention + sensors, and control groups, when controlling for pre-intervention depression ($p = 0.66$)
Davidson et al. (2020)	Intervention	42 (100)	38.2 (9.8)	4 wks	91% completed follow-up questionnaires	67% "above average" or "one of the best apps I have ever used", 62% "would recommend to many people" or to "everyone"	DASS	No change in depression symptoms at post-intervention ($p = 0.22$), increase in anxiety symptoms ($p = 0.02$)	N/A
Deady et al. (2018)	Intervention	84 (100)	38.6 (9.2)	5 wks	41% completed follow-up questionnaires	76% app "mostly" or "completely appropriate", "over 90%" said app "somewhat", "mostly", or "completely helped improve mental fitness"	PHQ-9	Reduction in depression symptoms at post-intervention ($p = 0.02$)	N/A

Table 3 (continued)

	Participants			Outcomes					
Fogarty et al. (2017)	Intervention	144 (100)	40.5 (10.9)	4 wks	35% provided any post-intervention data, 71% used mood monitoring at least once, 65% accessed intervention at least once	80% agreed "convenient to use", 69% agreed "easy to understand", 55% agreed "kept my attention", 47% agreed "improved my stress, low mood, or anxiety", 55% agreed "taught me skills to handle future problems"	PHQ-9	Reduction in depression symptoms at post-intervention ($p < 0.001$)	N/A
Geraedts et al. (2014)	Intervention CAU	39 (34) 48 (42)	N/R for participant men (in total sample: 43.4 [9.2])	8 wks, 6 mo, 1 yr	N/R	N/R	CES-D	N/A	No difference between intervention and CAU over 1 year of follow-up ($p = 0.85$)
Nolte et al. (2021)	Intervention + CAU CAU	159 (31) 159 (32)	N/R for participant men (in total sample: 43 [N/R])	12 wks (6 mo, 1 yr data N/R)	N/R	N/R	PHQ-9	Reduction in depression symptoms in Intervention + CAU group at post-intervention (95%CI: 0.54, 0.99)[b]	No difference between intervention and CAU at pre- (95%CI: -0.14, 0.42) and post-intervention (95%CI: -0.07, 0.80)
Rice et al., 2020)	Intervention	43 (48)	20.8 (3.8)	12 wks	M = 19.2 logins, M = 14.4 therapy modules completed, M = 3.9 behavioural tasks completed, M = 5.4 messages to moderator	N/R	LSAS	Reduction in social anxiety symptoms at post-intervention ($p < 0.001$)	N/A

95%CI, 95% confidence interval; BDI-II, Beck Depression Inventory-II; CAU, care as usual; CES-D, Centre for Epidemiological Studies Depression Scale; DASS, Depression, Anxiety, Stress Scale; K10, Kessler Psychological Distress Scale; LSAS, Liebowitz Social Anxiety Scale; M, mean; mo, month; N/R, not reported; *p*, p-value; PHQ-9, Patient Health Questionnaire-9; SD, standard deviation; wks, weeks; yrs, years

[a]All measures were used to assess symptom levels (not whether or not symptoms fulfilled diagnostic criteria)

[b]Calculated from data presented in published article

Outcomes

Four studies did not assess participants beyond post-intervention (Davidson et al., 2020; Deady et al., 2018; Fogarty et al., 2017; Rice et al., 2020) and the longest follow-up was one year post-intervention in one study (Geraedts et al., 2014). No study reported the specific number of days post-intervention at which participants had completed measures. Rates of post-intervention questionnaire completion varied widely, from 35% (Deady et al., 2018) to 100% (Botella et al., 2016).

All studies used patient self-report symptom questionnaires to measure the depression/anxiety outcome(s) of interest. Most common was the Patient Health Questionnaire-9 (PHQ-9), which was used in three studies (Deady et al., 2018; Fogarty et al., 2017; Nolte et al., 2021). All studies reported symptom levels, rather than whether or not a participant fulfilled diagnostic criteria for the outcome condition. A total of six studies (four treatment studies Deady et al., 2018; Fogarty et al., 2017; Nolte et al., 2021; Rice et al., 2020) and two prevention studies (Botella et al., 2016; Davidson et al., 2020)) reported pre- to post-intervention changes in these outcomes for men. All four treatment studies demonstrated post-intervention symptom reductions: three in depression (Deady et al., 2018; Fogarty et al., 2017; Nolte et al., 2021) and one in social anxiety (Rice et al., 2020). Conversely, both prevention studies reported no post-intervention reductions: Botella et al. (2016) reported no change in depression symptoms at 3-month follow-up despite medium/large positive effects ($d = 0.59–0.77$), and Davidson et al. (2020) found no change in depression symptoms and an increase in generalised anxiety symptoms. In between-group analyses, all three RCTs reported no detectable difference between intervention and control participant men's depression symptoms at post-intervention (Botella et al., 2016; Nolte et al., 2021) or over one year (Geraedts et al., 2014).

Four studies reported men's satisfaction and perceptions of the intervention's usefulness (Botella et al., 2016; Davidson et al., 2020; Deady et al., 2018; Fogarty et al., 2017). Their average ratings of satisfaction and usefulness appeared largely positive in all studies, though significant variation in questions used to assess these made between-studies comparisons problematic. Within studies, participants' ratings varied widely depending on the particular outcome. For example, in Fogarty et al. (2017), 80% said the intervention was convenient to use, 69% said it was easy to understand, 55% said it had taught them skills to handle future problems, and 47% said it led to symptom improvements (Table 3).

Meta-analysis

Meta-analysis of the two depression treatment studies (Deady et al., 2018; Nolte et al., 2021; pre-intervention $N = 193$, post-intervention $N = 192$) showed a significant, medium-sized, positive effect on depression symptoms ($g = 0.64$, 95%CI: 0.29, 0.99, $p < 0.005$, $N_{fs} = 4.4$), which met the criteria for a meaningful finding. Heterogeneity was low ($I^2 = 48.87$; $Q = 1.96$, $p = 0.16$).

Discussion

We believe this to be the first systematic review and meta-analysis of the effects of psychotherapeutic eMH interventions on men's depression and anxiety. Seven eligible studies were included. Study quality was high. Five eMH interventions targeted depression, one targeted depression and generalised anxiety, and one targeted social anxiety. Though their psychotherapeutic components almost exclusively centred around CBT or CT, there was little overlap in the interventions' length, format, and inclusion of human interaction. Just one intervention was gender sensitive. Most participant men were aged in their 30 s or 40 s. All studies used non-gendered, self-assessed symptom questionnaires to measure the reviewed outcomes and few assessed participants beyond immediately post-intervention. Men appeared generally satisfied with the interventions and rated them as useful. All three RCTs (two treatment studies, one prevention study) reported no post-intervention difference between intervention and control group participant men on depression outcomes (no RCTs addressed anxiety). In studies reporting pre-post (intra-individual) intervention group data, all four treatment studies reported pre- to post-intervention improvements in either depression symptoms ($N_{studies} = 3$) or social anxiety symptoms ($N_{studies} = 1$), while both prevention studies ($N_{studies} = 2$) reported no positive post-intervention symptom changes. These findings were supported by our meta-analysis of two studies, which showed a positive, medium-sized effect ($g = 0.64$, $p < 0.05$) of treatment interventions on men's depression symptoms in pre-post data.

Our review did not include any studies comparing eMH to clinician-based therapy. However, eMH interventions are not intended to compete with or decrease men's use of clinician-facilitated face-to-face or telehealth treatments. On the contrary, eMH may provide a complementary path to help, especially for those who may not otherwise access care (Christensen & Hickie, 2010). For example, eMH may act as an introduction to therapy, increasing men's confidence to access clinician-based assistance at a later date. It may also facilitate access to care where clinician assistance is delayed, unwanted, stigmatised, or inaccessible, or allow men to monitor and better understand

their symptoms before deciding whether to see a doctor. Our review provides preliminary evidence that psychotherapeutic eMH interventions can reduce the negative symptoms of common mental health issues in men under two conditions: (1) where the intervention aims to treat existing depression symptoms, and (2) in intra-individual pre- to post-intervention effects. The outcomes of the included RCTs in our review suggest that psychotherapeutic eMH interventions for men may not be significantly more effective than inactive/care as usual control conditions; however, two of the included RCTs that did not find significant between-group effects did report larger positive effects in their intervention groups than their controls, despite both studies suffering from low power and small samples (Botella et al., 2016; Nolte et al., 2021) and one investigating participants with minimal (normal or mild) baseline depressive symptoms (Botella et al., 2016). In the third RCT (Geraedts et al., 2014), both intervention and control participants had improved at follow-up. We are yet to understand how psychological factors, including expectancy effects and the benefits of attention, may influence intervention outcomes in this field. Research is also needed into 'digital placebo effects', wherein engaging with an online intervention leads to psychological benefits regardless of the intervention content (Firth et al., 2017a, 2017b). Unsurprisingly, interventions to treat existing symptoms showed more positive effects than those aiming to prevent them, given that the two prevention studies (Botella et al., 2016; Davidson et al., 2020) did not aim to, or tried not to, recruit participants with significant symptoms and were not aiming to reduce symptoms.

Due to the limited and variant data, we could not conduct further analyses on the influence of participant, intervention, and study factors on depression and anxiety outcomes. Previous mixed-sex/gender meta-analyses of eMH interventions have found greater benefits for mild to moderate rather than severe depression, and larger effects when compared to inactive rather than active controls in trials for depression (Firth et al., 2017a, 2017b) and anxiety (Firth et al., 2017a, 2017b). In a further individual patient data meta-analysis of internet interventions for adult depression (Karyotaki et al., 2018), older and native-born participants were more likely than younger and ethnic minority participants to respond positively to treatment. Evidence is also mixed as to whether incorporating human support (e.g., clinician feedback on homework tasks) into eMH interventions influences outcomes (Renfrew et al., 2020). Assessment of the effects of factors such as age, symptom severity, intervention content, format, duration, and inclusion of human feedback or interaction will be important inclusions in subsequent studies. With most included studies reporting only short-term follow-up, further research is also needed to investigate longer-term effects.

Previous reviews into mental health promotion interventions for men indicate that those with a gender-sensitive approach are more likely to be successful (Robertson & Baker, 2016; Seaton et al., 2017). With only one gender-sensitive intervention included in this review, further research into gender sensitive eMH interventions and comparisons of gender sensitive and non-gendered approaches will be important. Research is needed regarding methods of disseminating or promoting psychotherapeutic eMH interventions to men (Christensen et al., 2006). Within-group studies of variation in men's needs and experiences related to eMH interventions are also needed and should be considered opportunities to optimise and personalise interventions for varied populations of men (Firth et al., 2017a, 2017b).

The psychotherapeutic eMH interventions in our review were almost exclusively centred around CBT or CT strategies but were diverse in length, content, format, and focus. As the men's eMH evidence base grows, it will be preferable to analyse results from multiple trials of individual eMH interventions rather than pooling multiple diverse interventions. Future studies should also consider employing gender-sensitive mental health assessments when evaluating psychotherapeutic eMH interventions for men. While two studies in our review (Fogarty et al., 2017; Rice et al., 2020) did just that, we did not analyse data from those gender-sensitive measures as they were not the primary outcomes of interest. It is unclear whether the primary measures used by the included studies were able to fully capture men's mental health symptoms and any effects the intervention had on these outcomes.

Strengths and limitations

A major limitation of our review was that we could not include 177 studies that met all other inclusion criteria (i.e., included men as participants, investigated the effects of a psychotherapeutic eMH intervention for depression or anxiety, etc.), but did not present sex- or gender-disaggregated data. Failure to report sex and gender-based analyses is common in many disciplines (Heidari et al., 2016) and appears similarly poor in eMH intervention evaluations. Lack of attention to sex/gender in eMH is problematic because it can influence intervention efficacy, preferences, experiences, and adherence (Karyotaki et al., 2018; Wang et al., 2020). We echo previous recommendations (Wang et al., 2020) that sex and gender be considered throughout future eMH intervention design, dissemination, and evaluation and that sex- and gender-disaggregated data be routinely collected, analysed, and reported as per the SAGER guidelines (Heidari et al., 2016). An individual patient data meta-analysis of data from participant men in the seven studies in this review and the aforementioned 177 excluded studies may represent a valuable step in this field, allowing investigation of outcomes and subanalyses that could not be conducted here due to the limited and variant available data.

Our review had a number of strengths. We cast a wide net to ensure all potentially relevant papers were included, conducting rigorous, comprehensive searches in six databases. The review followed an a priori registered protocol and PRISMA guidelines. While recognising that RCTs are the gold standard for evaluations, we elected to include any study design that quantitatively investigated the effects of interventions. As the first review of this topic, this allowed us to conduct a broad analysis and compare evidence from studies using varying designs. While our inclusion of only depression- and anxiety-targeted interventions was deliberate to facilitate a focused review targeting the two most common, frequently comorbid categories of mental health issues (Yang et al., 2021), it likely resulted in the exclusion of studies on more positively-focused, strengths-based psychotherapeutic eMH interventions (e.g., those aiming to improve wellbeing or resilience) that may also impact anxiety and depression and appeal to men.

Subsequent investigations will benefit from using randomised between-groups designs, evaluation of longer-term effects, and investigation into the impacts of expectancy effects, age, baseline symptom severity, intervention content, and human interaction on outcomes. Further, with all studies fitting our inclusion criteria having been conducted in high income, 'Western' countries and the majority focusing on men aged in their 30 s and 40 s, there is a need for further research involving more diverse populations of men. Investigation into the effects of eMH on a broader range of mental health and wellbeing outcomes in men is also needed.

Conclusion

The findings of our review indicate that men find psychotherapeutic eMH interventions useful and satisfactory, and that their use may lead to improvements in men's depression symptoms. Development of future eMH interventions for men should emphasise men's specific needs, desires, and circumstances throughout their design, dissemination, and evaluation, with particular consideration to developing gender-sensitive interventions, using gender-sensitive outcome measures, and reporting gender/sex-disaggregated data.

Supplementary Information The online version contains supplementary material available at https://doi.org/10.1007/s12144-023-04968-5.

Funding Open Access funding enabled and organized by CAUL and its Member Institutions. MJO was supported by a Freemasons Centre for Male Health and Wellbeing postdoctoral fellowship during this work. No funding or sponsorship was obtained for this study. The authors have no relevant financial or nonfinancial interests to disclose.

Data availability All data analysed during this study are included in this published article and supplementary documentation.

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References

Asterisk denotes reviewed paper

American Psychiatric Association. (2013). *Diagnostic and statistical manual of mental disorders* (5th ed.). APA.

Andersson, G. (2018). Internet interventions: Past, present, and future. *Internet Interventions, 12*, 181–188. https://doi.org/10.1016/j.invent.2018.03.008

Andersson, G., Carlbring, P., Titov, N., & Lindefors, N. (2019). Internet interventions for adults with anxiety and mood disorders: A narrative umbrella review of recent meta-analyses. *Canadian Journal of Psychiatry, 64*(7), 465–470. https://doi.org/10.1177/0706743719839381

Ballenger, J. C. (2000). Anxiety and depression: Optimising treatments. *Journal of Clinical Psychiatry, 2*(3), 71–79. https://doi.org/10.4088/pcc.v02n0301

Barak, A., Klein, B., & Proudfoot, J. G. (2009). Defining internet-supported therapeutic interventions. *Annals of Behavioural Medicine, 38*(1), 4–17. https://doi.org/10.1007/s12160-009-9130-7

Beyondblue. (2016). Beyondblue depression monitor: Independent findings from 2004 to 2012. https://resources.beyondblue.org.au/prism/file?token=BL/1131

Blumberg, S. J., Clarke, T. C., & Blackwell, D. L. (2015). *Racial and ethnic disparities in men's use of mental health treatments (NCHS data brief no. 206).* National Centre for Health Statistics. www.cdc.gov/nchs/data/databriefs/db206.pdf

Borghouts, J., Eikey, E., Mark, G., De Leon, C., Schueller, S. M., Schneider, M., Stadnick, N., Zheng, K., Mukamel, D., & Sorkin, D. H. (2021). Barriers to and facilitators of user engagement with digital mental health interventions: Systematic review. *Journal of Medical Internet Research*, *23*(e24387). https://doi.org/10.2196/24387

*Botella, C., Mira, A., Moragrega, I., García-Palacios, A., Bretón-López, J., Castilla, D., Riera López Del Amo, A., Soler, C., Molinari, G., Quero, S., Guillén-Botella, V., Miralles, I., Nebot, S., Serrano, B., Majoe, D., Alcañiz, M., & Baños, R. M. (2016). An internet-based program for depression using activity and physiological sensors: Efficacy, expectations, satisfaction, and ease of use. Neuropsychiatric Diseases and Treatment, 12, 393-406. https://doi.org/10.2147/NDT.S93315

Christensen, H., Griffiths, K. M., & Evans, K. (2002). *E-mental health in Australia: Implications of the internet and related technologies for policy (ISC discussion paper no. 3).*

Christensen, H., Griffiths, K., Wells, L., & Kljakovic, M. (2006). *Models of mental health delivery: Efficacy, support, and policy*. https://rsph.anu.edu.au/files/full_report_49239.pdf

Christensen, H., & Hickie, I. B. (2010). Using e-health applications to deliver new mental health services. *Medical Journal of Australia, 192*(11), S53. https://doi.org/10.5694/j.1326-5377.2010.tb03695.x

Cohen, J. (1988). *Statistical power analysis for the behavioural sciences*. Routledge Academic.

Cuijpers, P., Donker, T., van Straten, A., Li, J., & Andersson, G. (2010). Is guided self-help as effective as face-to-face psychotherapy for depression and anxiety disorders? A systematic review and meta-analysis of comparative outcome studies. *Psychological Medicine, 40*(12), 1943–1957. https://doi.org/10.1017/S0033291710000772

* Davidson, S., Fletcher, S., Wadley, G., Reavley, N., Gunn, J., & Wade, D. (2020). A mobile phone app to improve the mental health of taxi drivers: Single-arm feasibility trial. *JMIR Mhealth Uhealth*, *8*(1). https://doi.org/10.2196/13133

*Deady, M., Johnston, D., Milne, D., Glozier, N., Peters, D., Calvo, R. A., & Harvey, S. (2018). Preliminary effectiveness of a smartphone app to reduce depressive symptoms in the workplace: Feasibility and acceptibility study. JMIR Mhealth Uhealth, 6(12), e11661. https://doi.org/10.2196/11661

Firth, J., Torous, J., Nicholas, J., Carney, R., Pratap, A., Rosenbaum, S., & Sarris, J. (2017a). The efficacy of smartphone-based mental health interventions for depressive symptoms: A meta-analysis of randomised controlled trials. *World Psychiatry, 16*(3), 287–298. https://doi.org/10.1002/wps.20472

Firth, J., Torous, J., Nicholas, J., Carney, R., Rosenbaum, S., & Sarris, J. (2017b). Can smartphone mental health interventions reduce symptoms of anxiety? A meta-analysis of randomised controlled trials. *Journal of Affective Disorders, 218*, 15–22. https://doi.org/10.1016/j.jad.2017.04.046

Fisher, K., Seidler, Z. E., King, K., Oliffe, J. L., & Rice, S. M. (2021). Men's anxiety: A systematic review. *Journal of Affective Disorders*, *295*(688–702). https://doi.org/10.1016/j.jad.2021.08.136

* Fogarty, A. S., Proudfoot, J., Whittle, E. L., Clarke, J., Player, M. J., Christensen, H., & Wilhelm, K. (2017). Preliminary evaluation of a brief web and mobile phone intervention for men with depression: Men's positive coping strategies and associated depression, resilience, and work and social functioning. *JMIR Mental Health*, *4*(3), e33. https://doi.org/10.2196/mental.7769

* Geraedts, A. S., Kleiboer, A. M., Twisk, J., Wiezer, N. M., van Mechelen, W., & Cuijpers, P. (2014). Long-term results of a web-based guided self-help intervention for employees with depressive symptoms: Randomised controlled trial. *Journal of Medical Internet Research*, *16*(7), e168. https://doi.org/10.2196/jmir.3539

Heidari, S., Babor, T. F., De Castro, P., Tort, S., & Curno, M. (2016). Sex and gender equity in research: Rationale for the SAGER guidelines and recommended use. *Research Integrity and Peer Review*, *1*(2). https://doi.org/10.1186/s41073-016-0007-6

Karyotaki, E., Ebert, D. D., Donkin, L., Riper, H., Twisk, J., Burger, S., Rozental, A., Lange, A., Williams, A. D., Zarski, A. C., Geraedts, A., van Straten, A., Kleiboer, A., Meyer, B., Ünlü Ince, B. B., Buntrock, C., Lehr, D., Snoek, F. J., Andrews, G., … Cuijpers, P. (2018). Do guided internet-based interventions result in clinically relevant changes for patients with depression? An individual participant data meta-analysis. *Clinical Psychology Review, 63*, 80–92. https://doi.org/10.1016/j.cpr.2018.06.007

Kmet, L. M., Cook, L. S., & Lee, R. C. (2004). *Standard quality assessment criteria for evaluating primary research papers from a variety of fields*. https://era.library.ualberta.ca/items/48b9b989-c221-4df6-9e35-af782082280e

Lal, S., & Adair, C. E. (2014). E-mental health: A rapid review of the literature. *Psychiatric Services, 65*, 24–32. https://doi.org/10.1176/appi.ps.201300009

Lindinger-Sternart, S. (2015). Help-seeking behaviours of men for mental health and the impact of diverse cultural backgrounds. *International Journal of Social Sciences Studies*, *3*(1). https://doi.org/10.11114/ijsss.v3i1.519

Milner, A., Shields, M., & King, T. (2019). The influence of masculine norms and mental health on health literacy among men: Evidence from the Ten to Men study. *American Journal of Men's Health, 13*(5), 1557988319873532. https://doi.org/10.1177/1557988319873532

Moher, D., Liberati, A., Tetzlaff, J., Altman, D. G., The PRISMA Group. (2009). Preferred reporting items for systematic reviews and meta-analyses: The PRISMA statement. *PLOS Medicine, 6*(7), e1000097. https://doi.org/10.1371/journal.pmed.1000097

Mursa, R., Patterson, C., & Halcomb, E. (2022). Men's help-seeking and engagement with general practice: An integrative review. *Journal of Advanced Nursing, 78*(7), 1938–1953. https://doi.org/10.1111/jan.15240

* Nolte, S., Busija, L., Berger, T., Meyer, B., Moritz, S., Rose, M., Schröder, J., Späth-Nellissen, C., & Klein, J. P. (2021). Do sociodemographic variables moderate effects of an internet intervention for mild to moderate depressive symptoms? An exploratory analysis of a randomised controlled trial (EVIDENT) including 1013 participants. *BMJ Open*, *11*, e041389. https://doi.org/10.1136/bmjopen-2020-041389

Ogeuji, I. A., & Okoloba, M. M. (2022). Seeking professional help for mental illness: A mixed-methods study of Black family members in the UK and Nigeria. *Psychological Studies, 67*(2), 164–177. https://doi.org/10.1007/s12646-022-00650-1

Oliffe, J. L., Hannan-Leith, M. N., Ogrodniczuk, J. S., Black, N., Mackenzie, C. S., Lohan, M., & Creighton, G. (2016). Men's depression and suicide literacy: A nationally representative Canadian survey. *Journal of Mental Health, 25*(6), 520–526. https://doi.org/10.1080/09638237.2016.1177770

Oliffe, J. L., Rossnagel, E., Seidler, Z. E., Kealy, D., Ogrodniczuk, J. S., & Rice, S. M. (2019). Men's depression and suicide. *Current Psychiatry Reports, 21*, 103. https://doi.org/10.1007/s11920-019-1088-y

Orwin, R. G. (1983). A fail-safe N for effect size in meta-analysis. *Journal of Educational Statistics, 8*(2), 157–159.

Renfrew, M. E., Morton, D. P., Morton, J. K., Hinze, J. S., Beamish, P. J., Przybylko, G., & Craig, B. A. (2020). A web- and mobile app-based mental health promotion intervention comparing email, short message service, and videoconferencing support for a healthy cohort: Random comparative study. *Journal of Medical Internet Research, 22*(1), e15592. https://doi.org/10.2196/15592

Rice, S. M., Fallon, B. J., Aucote, H. M., Möller-Leimkühler, A. M., Treeby, M. S., & Amminger, G. P. (2015). Longitudinal sex differences of externalising and internalising depression symptom trajectories: Implications for assessment of depression in men from an online study. *International Journal of Social Psychiatry*, *61*(236–240). https://doi.org/10.1177/0020764014540149

* Rice, S., O'Bree, B., Wilson, M., McEnery, C., Lim, M. H., Hamilton, M., Gleeson, J., Bendall, S., D'Alfonso, S., Russon, P., Valentine, L., Cagliarini, D., Howell, S., Miles, C., Pearson, M., Nicholls, L., Garland, N., Mullen, E., McGorry, P. D., & Alvarez-Jimenez, M. (2020). Leveraging the social network for treatment of social anxiety: Pilot study of a youth-specific digital intervention with a focus on engagement of young men. *Internet Interventions*, *20*, 100323. https://doi.org/10.1016/j.invent.2020.100323

Robertson, S., & Baker, P. (2016). Men and health promotion in the United Kingdom: 20 years further forward? *Health Education Journal, 76*(1), 102–113. https://doi.org/10.1177/0017896916645558

Ryan, R., & Cochrane Consumers and Communication Review Group. (2016). *Cochrane Consumers and Communication Group: Meta-analysis*. http://cccrg.cochrane.org/sites/cccrg.cochrane.org/files/public/uploads/meta-analysis_revised_december_1st_1_2016.pdf

Seaton, C. L., Bottorff, J. L., Jones-Bricker, B., Oliffe, J. L., DeLeenheer, D., & Medhurst, K. (2017). Men's mental health promotion interventions: A scoping review. *American Journal of Men's Health, 11*(6), 1823–1837. https://doi.org/10.1177/1557988317728353

Seidler, Z. E., Dawes, A. J., Rice, S. M., Oliffe, J. L., & Dhillon, H. M. (2016). The role of masculinity in men's help-seeking for depression: A systematic review. *Clinical Psychology Review, 49*, 106–118. https://doi.org/10.1016/j.cpr.2016.09.002

Smith, J. A., Braunack-Mayer, A., Wittert, G., & Warin, M. (2008). "It's sort of like being a detective": Understanding how Australian men self-monitor their health before seeking help. *BMC Health Services Research, 8*, 56. https://doi.org/10.1186/1472-6963-8-56

Swami, N., Terhaag, S., Quinn, B., & Daraganova, G. (2020). Health literacy and health service use among Australian men. In G. Daraganova & B. Quinn (Eds.), *Insights #1: Findings from Ten to Men - The Australian Longitudinal Study on Male Health 2013–16.* Australian Institute of Family Studies.

Terhaag, S., Quinn, B., Swami, N., & Daraganova, G. (2020). Mental health of Australian males. In G. Daraganova & B. Quinn (Eds.), *Insights #1: Findings from Ten to Men - The Australian Longitudinal Study on Male Health 2013–16.* Australian Institute of Family Studies.

Wang, J., Barth, J., Göttgens, I., Emchi, K., Pach, D., & Oertelt-Prigione, S. (2020). An opportunity for patient-centred care: Results from a secondary analysis of sex- and gender-based data in mobile health trials for chronic medical conditions. *Maturitas, 138*, 1–7. https://doi.org/10.1016/j.maturitas.2020.05.003

Wendt, D., & Shafer, K. (2016). Gender and attitudes about mental health help seeking: Results from national data. *Health & Social Work, 41*(1), e20–e28. https://doi.org/10.1093/hsw/hlv089

World Health Organisation. (2007). *Engaging men and boys in changing gender-based inequity in health: Evidence from programme interventions.* https://www.who.int/gender/documents/Engaging_men_boys.pdf

World Health Organisation. (2022). *Gender and health*. Retrieved 14 June from www.who.int/health-topics/gender

Yang, W. Q., Qu, M., Fang, H., Phan, A. T., Wu, H. E., Lang, X. E., & Zhang, X. Y. (2021). Gender differences in prevalence and clinical correlates of anxiety symptoms in first-episode and drug-naïve patients with major depressive disorder. *Comprehensive Psychiatry, 111*, 152275. https://doi.org/10.1016/j.comppsych.2021.152275

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