

Brief digital mental health interventions for adults with emerging symptoms: part II. User experience outcomes based on a systematic review

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Abstract

Purpose – Brief digital mental health interventions (DMHIs) provide timely and accessible support, diminishing existing treatment access gaps. This paper aims to synthesize the user experience (UX) of adults (≥ 25 years) engaging with brief DMHIs (≤ 3 h), a critical component to ensure intervention uptake.

Design/methodology/approach – This systematic review examined the UX of fully or partially guided brief DMHIs for adults, including their perceived usefulness, usability, findability, credibility, desirability, accessibility and value. Published and unpublished literature searches revealed 13,963 records. Only 14 of these reported on UX outcomes and were included in the study.

Findings – DMHIs demonstrated effectiveness in delivering outcomes that users find useful, usable, valuable, credible and accessible. No outcomes were found for the domains concerning findability or desirability. DMHI elements that positively influence multiple UX outcomes included multimedia, interactivity (i.e. value, usable) and flexible access (i.e. useful, usable). Elements perceived as valuable included personalization, skilled and empathetic providers/facilitators, skill acquisition exercises and downloadable/printed resources. Useful elements included modularized interventions and phone-based support. Privacy and confidentiality contributed to credibility. Mixed UX outcomes were observed for videoconference-delivered interventions and the optimal duration of the intervention. No DMHI elements were associated with poor UX outcomes.

Originality/value – Findings underscore the importance of considering UX alongside socioemotional outcomes in evaluating DMHI effectiveness. Recommendations are offered for improving UX psychometric instrumentation and diversity inclusion in future research and for designing and implementing user-centered DMHIs in practice.

Keywords Systematic review, Adult mental health, User experience, Online, Digital, mHealth

Paper type Literature review



Introduction

One in four adults will experience a mental health condition over their lifetime ([World Health Organization, 2023](#)). This high demand for mental health support increasingly exceeds the capacity of health-care systems, resulting in unmet needs, impacting the chronicity and personal challenges ([Johnson et al., 2022a](#); [Rens et al., 2020](#)). In addition, geographical, financial and social barriers make traditional face-to-face therapeutic services often inaccessible ([Dawkins et al., 2021](#); [van Gaans and Dent, 2018](#)). Low health literacy and privacy concerns form further barriers to accessing services ([Amone-P'Olak et al., 2023](#); [Shen et al., 2019](#)). The resulting service provision gap has called for alternative approaches to adult mental health care ([Simpson et al., 2021](#); [Stawarz et al., 2019](#)), leading to a notable surge in the development and implementation of digital mental health interventions (DMHIs).

DMHIs represent a broad spectrum of technology-based solutions aiming to enhance individual well-being and mitigate mental health symptoms ([Lattie et al., 2022](#); [Pineda et al., 2023](#)). The ubiquity of the internet, mobile phones and computers, along with their scalability ([Fairburn and Patel, 2017](#); [McGorry et al., 2022](#)) and accessibility ([Jiménez-Molina et al., 2019](#); [Choi et al., 2024](#)) make DMHIs a flexible and affordable tool in supporting mental health and well-being, particularly for those in underserved areas ([Philippe et al., 2022](#)). Previous research on socioemotional outcomes found DMHIs to be as effective as traditional in-person therapy ([Andrews et al., 2018](#); [Moshe et al., 2021](#); [Kryzaniak et al., 2021](#)). DMHIs were found to empower individuals to take control of their mental health, promote autonomy and self-efficacy ([Domhardt et al., 2021](#); [Lancaster et al., 2018](#)). They reduced stigma and barriers to seeking help ([Johnson et al., 2022b](#); [Rodríguez-Rivas et al., 2022](#)). DMHIs are also a less intimidating entry point for those new to seeking mental health support as their anonymity allows safe engagement without fear of judgment or negative consequences ([Marshall et al., 2024](#); [Prescott et al., 2019](#); [Rajgopal et al., 2021](#)). DMHIs are especially beneficial for emerging, non-acute mental health issues below diagnostic thresholds, i.e. indicated populations ([van Doorn et al., 2021](#); [Opie et al., 2024a](#)), providing rapid access for those in need and alleviating strain on the wider mental health-care system ([Andrews et al., 2018](#)).

Despite clear advantages of DMHIs, there are concerns about their appropriate utilization, sustained usage and long-term efficacy ([Alqahtani and Orji, 2019](#); [Opie et al., 2024a](#); [Schueller et al., 2017](#)). One central limitation is low adherence and high disengagement rates ([Alqahtani and Orji, 2019](#); [Schueller et al., 2017](#)). This lack of sustained engagement can negatively impact outcome effectiveness ([O'Sullivan et al., 2023](#)) and thereby the integration of DMHIs into broader health-care systems ([Gan et al., 2021](#)).

New evidence on factors contributing to poor DMHI participation and engagement included poor design and poor interface ([Ho et al., 2024](#); [Ramos et al., 2023](#)), lack of personalization ([Borghouts et al., 2021](#)), uncertainty about the credibility of content ([Borghouts et al., 2021](#); [Kodish et al., 2023](#)), concerns about establishing client rapport ([Cowan et al., 2019](#)), lack of fit or irrelevance and perceived unhelpfulness ([Ho et al., 2024](#)) and technological limitations ([Ho et al., 2024](#), e.g. internet connectivity issues; [Abi Ramia et al., 2024](#); [Simblett et al., 2018](#)). In addition, individual factors also impacted engagement ([Ho et al., 2024](#); [Ramos et al., 2023](#)), like low motivation, low digital literacy, negative prior user experiences, program or internet related costs ([Cowan et al., 2019](#); [Borghouts et al., 2021](#); [Simblett et al., 2018](#)), concerns about data security and the sharing and storage of personal data ([Kodish et al., 2023](#); [Rusch et al., 2022](#); [Cowan et al., 2019](#)).

Benefits of DMHIs for socioemotional outcomes in adults, like depression, anxiety and stress, are increasingly understood ([Conley et al., 2016](#); [Bisby et al., 2024](#)), but the drivers of

outcome effectiveness of DMHIs remain largely unclear. In particular, the contribution of user experience (UX) and behavior (e.g. how clients perceive, interact and engage with DMHIs) is yet to be systematically explored (O'Brien *et al.*, 2018; Siek and Fariz, 2023; Zheng *et al.*, 2024). For instance, if accessibility issues deter potential participants from joining a DMHI, no benefits will arise. Given user experience outcomes and socioemotional outcomes may be two sides of the same coin, the effectiveness of DMHIs is best addressed by evaluating socioemotional outcomes, user experience outcomes and their interaction (Opie *et al.*, 2024a). Figure 1 illustrates this.

Research has found that effective DMHIs capture end user's needs (Mental Health Network NHS Confederation, 2023), interests, preferences (Mayer *et al.*, 2022; Lipschitz *et al.*, 2023), promoting continued use (Patel *et al.*, 2020) and engagement (Gan *et al.*, 2022; Saleem *et al.*, 2021). Considering UX indicators is essential when evaluating DMHIs as they offer valuable insights into user interaction, perception and commitment to the intervention. They allow researchers and developers to create interventions that are more engaging, user-friendly and tailored to the needs of the target population. Present research on UX indicators includes user satisfaction (Konduri *et al.*, 2017; Villarreal-Zegarra *et al.*, 2022), perceived usefulness (Siek and Fariz, 2023; Zheng *et al.*, 2024), intervention usability (Balcombe and De Leo, 2023; Saleem *et al.*, 2021; Chen *et al.*, 2019), user engagement (Balcombe and De Leo, 2023; Gan *et al.*, 2022; Saleem *et al.*, 2021; O'Brien *et al.*, 2018), completion metrics (Opie *et al.*, 2024b), content appropriateness (Rice *et al.*, 2020) and acceptability (Villarreal-Zegarra *et al.*, 2022; Balcombe and De Leo, 2023).

Social components of UX, such as connecting with other users (Borghouts *et al.*, 2021; Saleem *et al.*, 2021), person-centered care tailored to users' needs (Lipschitz *et al.*, 2023; Patel *et al.*, 2020; Saleem *et al.*, 2021) and privacy and anonymity features that ensure a safe environment (Borghouts *et al.*, 2021) are key facilitators of user engagement. Automated reminders and moderated peer groups have also successfully maintained user engagement

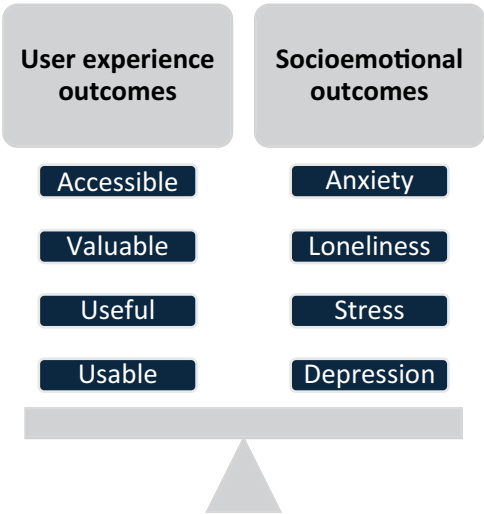


Figure 1. Digital mental health intervention efficacy equilibrium, illustrating the necessity of both efficacious socioemotional outcomes and positive user experience outcomes

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(Gan *et al.*, 2021; Philippe *et al.*, 2022; Lipschitz *et al.*, 2023; Hadler *et al.*, 2021). Emerging research found providing both content and technical assistance enhanced UX outcomes for adult DMHIs (Philippe *et al.*, 2022; Schueller *et al.*, 2017). Credible content sustained interactions with DMHIs (Borghouts *et al.*, 2021), while concise and succinct content reduced dropouts (Patel *et al.*, 2020). Easy to navigate interfaces (Patel *et al.*, 2020) and appropriately sized content/activities (Borghouts *et al.*, 2021) contribute to positive user engagement. Flexibility and convenience of access as well as providing users with a record of their information to monitor over time (Borghouts *et al.*, 2021) facilitate uptake and use.

DMHIs can be categorized by the level of support they provide, including guided interventions with regular support, partially guided and self-guided interventions (Pineda *et al.*, 2023). One approach to address poor DMHI engagement is incorporating human support (Patel *et al.*, 2020). Guided support can be delivered synchronously (Villarreal-Zegarra *et al.*, 2022) or asynchronously (Lattie *et al.*, 2022). A comprehensive meta-review of 304 prior meta-analyses and systematic reviews concluded that guided DMHIs with real-time health-care provider support are comparable to face-to-face treatments for various mental health concerns, including anxiety and depression (Philippe *et al.*, 2022). Wright *et al.* (2019) found that guided internet-based treatments for depression were significantly more effective when human support was provided.

DMHIs can also assist with two main drawbacks to multi-session psychotherapy: requiring clients to attend consecutive sessions scheduled at intervals and the notable time commitment from both the therapist and client (Kim *et al.*, 2023). Single session interventions (i.e. just one encounter with a provider or program; Schleider *et al.*, 2020) offer an alternative. Single session DMHIs have achieved positive outcomes (Maity *et al.*, 2023) and helped to manage mild anxiety, stress and adjustment disorders (Zhu *et al.*, 2023). Their outcomes are comparable to longer-term therapies (Schleider and Weisz, 2017). They are particularly well-suited to those with less severe or emerging symptoms (Hoyt *et al.*, 2018; Hoyt *et al.*, 2021), preventing the development of more severe mental health problems (Walker, 2021).

Previous reviews emphasized the use of *objective* UX measures, such as digitally recorded usage data relating to completion rates, number of sessions or activities completed, log-ins and time spent on the DMHI (Gan *et al.*, 2022). Research on UX strategies concentrated on persuasive technology features, such as coaching, reminders and personalized information (Gan *et al.*, 2022; Saleem *et al.*, 2021), neglecting DMHI inbuilt interactive features, like content-related information, interactive material and multimedia (Gan *et al.*, 2022; Wahle *et al.*, 2017; Zahiri Esfahani *et al.*, 2020). This highlights the need for a comprehensive examination of both, *objective* usage elements and *subjective* UX data, to establish a robust evidence base (Saleem *et al.*, 2021; Yardley *et al.*, 2016).

Despite a growing interest in DMHI elements influencing UX outcomes there is a scarcity in research. To date, the DMHI elements and UX outcomes of DMHIs for adults have not been examined systematically. The scope of existing research on the effectiveness of DMHI centers on young people or young adults from 16 to 25 years of age (e.g. Hollis *et al.*, 2017; Potts *et al.*, 2025), or youth aged between 10 and 25 years (e.g. Lehtimäki *et al.*, 2021; Opie *et al.*, 2024a; Zhou *et al.*, 2021), leaving a knowledge gap on their effectiveness for adult populations. Moreover, there is currently a reliance on published works, with insufficient consideration given to relevant gray literature (Saleem *et al.*, 2021; Balcombe and De Leo, 2023; Gan *et al.*, 2022). In this light, the current systematic review aimed to:

- Identify and synthesize evidence-based brief DMHIs for adults (≥ 25 years) with emerging mental health symptoms.

- Identify UX outcomes for adults participating in these brief DMHIs (i.e. Useful, Usable, Findable, Credible, Desirable, Accessible and Valuable UX outcomes).
- Explore the impact of specific elements within these DMHIs on UX outcomes, including design features and support components particularly effective or ineffective for this intervention type.

Methods

This is a two-part review, with Part I reporting on socioemotional outcomes (see [Opie et al., 2025](#)) and part II (the present review) reporting on UX outcomes. A two-part review was deemed necessary due to the large number of outcomes examined. Both are based on the same design process, inclusion criteria, search strategy and quality assessment (see [Opie et al., 2025](#)). Details on the data extraction and synthesis as well as UX outcomes can be found below. The review protocol, including the inclusion and exclusion criteria, was preregistered in the International Prospective Register of Systematic Reviews (PROSPERO) on December 12, 2023 (registration: CRD42023485124). See Supplementary Table A1 for the details of the study inclusion criteria using the PICOS framework.

Data extraction

Conducted by two independent reviewers (JO, AV) and disagreements resolved through discussions. Full-text articles were charted by one reviewer and reviewed by the second reviewer. Predefined standardized data extraction forms were used, aligning with the content outlined in Supplementary Table A2–A3.

Data synthesis

Studies meeting inclusion criteria were aggregated under user experience subheadings (see Supplementary Table A3). Due to the scarcity of previous research, finding presentation has been data informed. Outcomes most commonly reported were narratively synthesized ([Popay et al., 2006](#)) as the lack of data and heterogeneity did not permit a meta-analysis.

User experience (UX) outcomes

UX outcomes documented in two or more studies were included. Findings were categorized into seven UX categories: useful, usable, findable, credible, desirable, accessible and valuable (definitions are given in [Table 1](#)) ([Morville, 2014](#)).

Results

This is a two-part review, with part I reporting on socioemotional outcomes (see [Opie et al., 2025](#)) and part II (the present review) reporting on UX outcomes.

Summary of part I

Part I revealed effectiveness of DMHIs for anxiety, stress, depression, negative affect, psychological distress and knowledge/skill development, in the short-term as most studies only examined effects ≤ 4 weeks post-completion. Results suggest DMHIs are less effective or ineffective, even short-term, for the promotion of positive affect and anger management, while mixed evidence was found for well-being and loneliness. Of the ten socioemotional outcomes examined, sustained benefits ≥ 3 months were found for loneliness, depression and anxiety. DMHIs allowing for personalization of content and

Table 1. User experience outcomes examined from [Morville \(2014\)](#)

UX outcome	Definition
Useful	How helpful and purposeful is the intervention to users? This includes usefulness, acceptability and helpfulness
Usable	How easy to use is the intervention to accomplish its given purpose? This includes usage, completion, attrition, adherence and engagement
Findable	How navigable is the interface and can users find what they need?
Credible	How much do users trust or believe the contents? This includes users perceived safety and privacy
Desirable	How visually appealing is the intervention to the user and what elements are appreciated?
Accessible	How easily available is the intervention?
Valuable	How satisfied are users and is the intervention of value to users overall?

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approach demonstrated broad efficacy, as did mindfulness-based interventions and cognitive behavioral therapy approaches.

Study selection

A systematic search resulted in 13,963 records after excluding duplicates. After excluding 13,941 records at title and abstract ($n = 13,786$), or full text review ($n = 155$), 22 primary studies were originally included in part I of the review. However, only 14 studies reported on UX outcomes (part II), forming the basis for this study. Details on the 22 studies are provided in [Opie et al. \(2025\)](#), including each stage of the selection process and the reasoning behind study exclusion.

Study quality assessment

Study quality was moderate-to-weak; six studies were of moderate quality (42.86%), another six (42.86%) were of weak quality. The remaining two (14.29%) were of high quality. See part I for further details.

Study characteristics

Most studies (78.6%, $n = 11$) were published works. The remaining were unpublished theses (14.3%, $n = 2$) and a report (7.1%).

Studies were predominantly quantitative (78.6%, $n = 11$) including four Randomized Controlled Trials (RCTs; 2 two-arm and 2 three-arm RCTs), three pre-post studies ([Arevian et al., 2018](#); [Hawkins et al., 2020](#); [Tacca, 2022](#)), one prospective study ([Sung et al., 2023](#)) and three pilot studies ([Tarquinio et al., 2021](#); [Williams et al., 2021](#); [Wittenberg et al., 2018](#)). Three mixed-methods studies were included ([Harris-Lane et al., 2023](#); [Hartley et al., 2023](#); [MHCC, 2019](#)).

Five studies (35.7%) included a comparison group. Three studies used a waitlist control ([Krohner, 2022](#); [Rubin et al., 2022](#); [Ziadni et al., 2021](#)). One study ([Rubin et al., 2022](#)) involved both active (Mindfulness only or Mindfulness and Compassion intervention) and inactive controls. One study included two active control groups ([McLean et al., 2023](#)), while another study included one active control group ([Tacca, 2022](#)).

Post-intervention intervals varied, with six studies (42.9%) using a pre- and post-intervention approach focusing on short-term outcomes (i.e. within 4 weeks post-intervention).

Longer term outcomes (≥ 5 weeks) were only assessed in one instance (Hartley et al., 2023). A single study (Ziadni et al., 2021) examined both short-term and longer-term outcomes. Supplementary Table A2 provides detailed study characteristics.

Sample characteristics

Sample size varied ($M = 565.07$; $17-3,213$). Mean attrition rate was 31.3% in the 10 (71.4%) studies reporting. Samples were predominantly female (69.3%, 10 studies reported gender) and participants' average age was 40.1 years (26.1–65.4 years).

Data collected came from adult clients (50%, $n = 7$), health-care providers, such as nurses and therapists (Arevian et al., 2018; Harris-Lane et al., 2023; Krohner, 2022, Mental Health Commission of Canada, 2019, Hartley et al., 2023; Tarquinio et al., 2021), caregivers (Wittenberg et al., 2018) or multiple family members (Hartley et al., 2023). Additional information on study and sample characteristics (e.g. data collection/recruitment methods, race, ethnicity and sexual orientation) can be found in Supplementary Material 1.

Guided intervention characteristics

Most studies included named interventions (57.1%, $n = 8$), comprising Single Session Mindfulness Intervention for Loneliness (SSMILe), Walk-In Together (WIT), Beyond Blue Support Service, Single-Session Consultation (SSC), URGeT Eye Movement Desensitization and Reprocessing (URG-EMDR), Lifeline Text, Empowered Relief and Stepped Care 2.0 E-Mental Health interventions. Detailed characteristics of these interventions are provided in Part I.

Length of interventions ranged from as short as 30 min (Arevian et al., 2018) to 134 min (Tarquinio et al., 2021), with an average duration of 60 min ($n = 8$). Most studies were conducted individually (78.57%, $n = 11$), only two studies (14.29%) (Hartley et al., 2023; Ziadni et al., 2021) offered group sessions, and one was adaptable to offer both individual and group support (MHCC, 2019).

Guidance occurred predominantly in real-time (85.7%; $n = 12$). One study offered delayed (asynchronous) guidance (Williams et al., 2021), another provided a mix of synchronous and asynchronous support depending on the intervention component (Hawkins et al., 2020). Guidance providers varied from clinical practitioners ($n = 6$), students (i.e. Doctoral/Masters students, $n = 5$) to researchers (Wittenberg et al., 2018). Another study was delivered by clinicians or peers (MHCC, 2019) or personnel trained in business psychology (Williams et al., 2021).

Delivery methods included videoconferencing ($n = 7$), online support platforms (Hartley et al., 2023; McLean et al., 2023) and telephone communication (Wittenberg et al., 2018). Some interventions used a combination of these (Harris-Lane et al., 2023; Hawkins et al., 2020), text messaging (Williams et al., 2021), or e-mental health tools (MHCC, 2019). Eleven interventions were conducted in the client's own space and only one in a clinical setting (Arevian et al., 2018).

Underpinning theory. Most studies (71.4%) did not mention a theoretical framework. The remaining four studies were based on attachment theory and emotion-based models (Krohner, 2022), common factors theory (Tacca, 2022), specific models of practice (Wittenberg et al., 2018) and a recovery-oriented, strengths-based model (MHCC, 2019). Additional intervention characteristics are provided in Supplementary Material 2.

User experience

Seven UX outcomes were evaluated; no results were identified for the 'findable' or 'desirable' outcomes (see Supplementary Table A3). Findings suggest that brief (partially)

guided DMHIs appear to meet the remaining five criteria. Caution is advised as only four of the included studies were randomized controlled trials (Krohner, 2022; McLean *et al.*, 2023; Rubin *et al.*, 2022; Ziadni *et al.*, 2021) and some studies relied on small samples. Most measures (64.3%, $n=9/14$) used only study-specific metrics, raising concerns about psychometric properties, including the reliability and validity of these measures. See Supplementary Table A3 for key UX outcomes of included studies.

Use of validated user experience measures. Various validated measures were used to evaluate UX in the included studies, but each measure was only used in a singular study and focused on distinct aspects of the UX within the respective intervention. Only two studies (Rubin *et al.*, 2022; Tacca, 2022) solely used validated UX measures while three studies (Harris-Lane *et al.*, 2023; MHCC, 2019; Sung *et al.*, 2023) used a mix of both validated and study-specific, non-validated measures. The validated measures used in these studies include the Acceptability of Intervention, Intervention Appropriateness and Feasibility of Intervention Measure (AIMS/IAM/FIM; Weiner *et al.*, 2017), Credibility/Expectancy Questionnaire (CEQ; Devilly and Borkovec, 2000), Client Satisfaction Questionnaire-8 (CSQ-8; Attkisson and Zwick, 2000), Working Alliance Inventory-Short Revised (WAI-SR; Hatcher and Gillaspay, 2006), Presence Questionnaire (PQ; Witmer *et al.*, 2005), Perceived Restorativeness Scale (PRS; Hartig *et al.*, 1997), Readiness Diagnostic Scale (RDS; Scott *et al.*, 2017), Readiness for Organizational Change (ROC; Holt *et al.*, 2007) and Session Evaluation Questionnaire (SEQ; Stiles *et al.*, 1994). Overall, validated scales differed considerably in range of items and scaling of responses. Most measures were client-reported while three measures were clinician/provider-rated (AIM/IAM/FIM, ROC and RDS), adding further to the heterogeneity.

Use of non-validated user experience measures. Nine studies exclusively used non-validated UX measures in assessing the efficacy of DMHIs. These non-validated measures mainly assessed participants' satisfaction levels via rating scales ($n=6$). Other non-validated measures were limited to "yes or no" answers (e.g. If text was unavailable, would you have sought help elsewhere?, Williams *et al.*, 2021), ratings of accessibility (Krohner, 2022; Sung *et al.*, 2023; MHCC, 2019) or feedback via open-ended questions (Hartley *et al.*, 2023; Williams *et al.*, 2021).

Usefulness. Participants in nine studies across different settings perceived DMHIs as acceptable and useful. Krohner (2022) found that most of the 42 participants were highly motivated (83.3%), attentive (75.6%), more insightful (71.4%) and open to disclosing new personal information (61.5%) immediately after a Single-Session Psychodynamic intervention. Sung *et al.* (2023) highlighted high acceptability from clients (average score of 4.35 / 5) regarding Single Session Consultations (SSC); clients found it helpful and enjoyable when assessed immediately post-SSC completion [$M(SD) = 4.20 (0.91)$ out of 5].

Tacca (2022) found a user preference for virtual reality (VR) settings over traditional video conferencing via Zoom. The VR therapy group rated the therapeutic environment (i.e. suitability of intervention for therapeutic healing, including comfort and ability to focus on therapist) as significantly higher than the Zoom therapy group (Cohen's $d=0.259$, $p=0.0036$). Williams *et al.* (2021) reported high program satisfaction, with most respondents (87.9%) rating the service as easy to use. Similarly, Wittenberg *et al.* (2018) indicated high levels of intervention satisfaction, with follow-through on action plans reported at 100% for some cohorts (Cohort 1 Diagnosis; Cohort 2 Treatment), and a high degree of preparedness for tackling issues (range = 60–80% reported being "very prepared"). MHCC (2019) found that 62% ($n=21 / 34$) of clients found their e-mental health interventions to be helpful. Hartley *et al.* (2023) similarly identified high client satisfaction (94%) with Walk-In Together (WIT) therapy, with 90% of adult family members finding

WIT helpful immediately post-intervention. At six weeks follow-up, 69% of family members indicated that the session had helped solve their issues. From post-intervention to six weeks follow-up, WIT remained as helpful or demonstrated some increase in perceived helpfulness for 44% of families (Hartley et al., 2023). Clients of Ziadni et al. (2021) found the information of an online Single-Session group intervention useful ($M = 8.37$, $SD = 1.79$, range 0–10).

Harris-Lane et al. (2023) reported that providers reached consensus on the acceptability and feasibility of implementing the Stepped Care 2.0 model, with average acceptability and feasibility scores of 4.36 and 4.10, respectively (out of 5).

Useable. Seven studies assessed the usability of DMHIs. McLean et al. (2023) found 87.8% of invited participants initiating the training and a completion rate of 91.9% amongst starters. Sung et al. (2023) reported commitment (87.8% of participants) to their intervention. Similarly, Ziadni et al. (2021) reported a 94% attendance rate in a Zoom-delivered Emotional Regulation intervention. Arevian et al. (2018) found that while more than a quarter of patients (28%) faced difficulties with audiovisual aspects of the consultation, the majority (88%) were satisfied with the delivery and 58% rated their experience as “above average” or “excellent”.

Arevian et al. (2018) further found that 71% of nurses providing the intervention were satisfied with the coordination and setup process. In Tarquinio et al. (2021), therapists noted similar level of distraction during remotely conducted EMDR therapy sessions as in-person sessions ($\chi^2 = 2.1$, $p > 0.05$). In the Stepped Care 2.0 (SC2.0) model, Harris-Lane et al. (2023) reported high professional-rated scores for the perceived appropriateness ($M = 5.83$; $SD = 0.94$ on a 7-point rating scale) and confidence in its adaptation ($M = 5.32$, $SD = 1.41$). Providers also indicated a high readiness to implement SC2.0 ($M_{Grand} = 5.64$, $SD = 0.84$), the highest scores being compatibility with clients and organization ($M = 6.00$, $SD = 0.83$) and short-term results ($M = 5.77$, $SD = 1.01$), but expressed concerns about staffing ($M = 4.55$, $SD = 1.70$) and communication challenges ($M = 4.80$, $SD = 1.71$).

In terms of service utilization patterns, MHCC (2019) reported differences across their 10-step intervention with 59% using higher-intensity services (Steps 6–10) and 41% engaging in lower-intensity services (Steps 1–5).

In summary, DMHIs included had high participation and completion rates. However, while provider readiness to adopt DMHIs was high, some challenges such as changing client perceptions and addressing staffing and training needs (Harris-Lane et al., 2023) needed consideration.

Value. Eleven studies reported on user satisfaction in relation to both processes and outcomes. Videoconferencing interventions were highly valued [72% rate of satisfaction (Arevian et al., 2018); 92% rate of satisfaction (Ziadni et al., 2021); 95% rate of perceived value (Krohner, 2022)]. Participants reported high satisfaction with the class material ($M = 6.02$, $SD = 1.45$; on a scale of 1–7) and comfort in engaging with other Zoom participants as well as the program facilitator ($M = 5.68$, $SD = 1.45$) (Ziadni et al., 2021). Similarly high satisfaction levels were found by McLean et al. (2023) in response to program components (e.g. language, examples, content) ($M_{Grand} = 4.17$, $SD = 0.74$). Harris-Lane et al. (2023) found over 90% of clients rating One-At-A-Time therapy effective in developing plans to address their primary concern. Tarquinio et al. (2021) found that participants were satisfied with the treatment quality ($\chi^2 = 16.8$, $p < 0.05$), while Wittenberg et al. (2018) reported caregiver satisfaction with telephone coaching (85%), leaving them prepared (100%) to successfully implementing their action plans (90%). In another study, most clients (67%) rated the quality of different e-mental health tools as either “good” or “excellent” (MHCC, 2019).

Therapeutic alliance and rapport were examined in two studies. [Tacca \(2022\)](#) found positive client reports for the depth of sessions and smoothness of the interaction. Both groups, Zoom and VR therapy, provided similar ratings demonstrating large effect sizes approaching statistical significance (Depth Cohen's $d = 0.669$, $p = 0.0786$, Smoothness Cohen's $d = -0.724$, $p = 0.059$). [Sung et al. \(2023\)](#) reported strong therapeutic alliance via telehealth on a seven-point rating scale ($M = 6.13$, $SD = 0.76$) and [Hawkins et al. \(2020\)](#) found that most clients felt their practitioner listened (61.5%), were respectful (79.4%), made them feel better (43.3%) and provided good quality advice (52.5%).

Credible. Two studies reported on the credibility or safety of their intervention. [Tarquinio et al. \(2021\)](#) found that clients felt safe even when the therapist was only digitally present ($\chi^2 = 13.29$, $p < 0.01$). [Rubin et al. \(2022\)](#) measured treatment validity and credibility across different groups rating highest for the mindfulness group ($M = 6.92$, $SD = 1.22$), followed by the group combining mindfulness and compassion ($M = 6.85$, $SD = 1.03$) and lowest for the waitlist ($M = 6.50$, $SD = 0.83$). Participants' rating in expected improvement were highest for the mindfulness and compassion group ($M = 32.10$; $SD = 11.98$ out of total score of 54), followed by the waitlist ($M = 27.95$, $SD = 15.79$). The mindfulness only group expected the lowest improvement ($M = 24.28$, $SD = 10.66$). The standard deviation was high for all groups, with the control group being remarkably higher indicating great variability in the expectations on improvement.

Accessible. Two studies reported on the accessibility of DHMIs. [Ziadni et al. \(2021\)](#) found that Zoom was used effectively for an Emotional Regulation intervention. All clients, previously unfamiliar with Zoom did not require training, indicating high accessibility and user-friendliness. [Arevian et al. \(2018\)](#) found that 64% (16 / 25) preferred face-to-face interaction with providers over videoconferencing.

User experience elements with indicated efficacy

The following provides a preliminary summary of elements of brief, (partially) guided DMHIs potentially impacting UX outcomes. Conversely, we will also identify any components that have no demonstrated impact yet and therefore may be ineffective or even contraindicated. We also report on DMHI elements that yielded inconsistent results (see Supplementary Table A4 for further details). Data on these elements and associated UX outcomes are detailed in Supplementary Table A5.

UX outcome results were separated into five categories: useful, usable, value, credible and accessible. An intervention element was deemed efficacious if it reported a significant effect (e.g. intervention compared to control) or moderate to high percentages (i.e. ≥ 50 –100% satisfaction rate) on the specific outcome under examination. An outcome was deemed ineffective if it either displayed low percentages (e.g. completion rate $\leq 49\%$), no significant difference in outcome, or no difference to a control condition. An element was flagged as inconsistent if at least two studies reported contradictory findings, or the evidence within a study was inconclusive. Elements are reported when they were observed in two or more studies. Of note, only four included studies were RCTs ([Krohner, 2022](#); [McLean et al., 2023](#); [Rubin et al., 2022](#); [Ziadni et al., 2021](#)).

Elements common to interventions with evidence of user experience efficacy. The following elements have been seen as *useful* or appear to enhance *usability* of DMHIs: Modularized interventions ([Krohner, 2022](#); [Sung et al., 2023](#); [Tacca, 2022](#)), flexibility in intervention access, including online and telephone-based appointments ([Harris-Lane et al., 2023](#); [MHCC, 2019](#); [Sung et al., 2023](#)), telephone-based interventions, including SMS and calls ([Williams et al., 2021](#); [Wittenberg et al., 2018](#)), as well as Web-based multimedia and

interactive components (e.g. video, audio, engaging sessions, practice tools, exercises) (McLean *et al.*, 2023; MHCC, 2019; Ziadni *et al.*, 2021), were perceived as useful.

The latter have also been seen as *valuable* (McLean *et al.*, 2023; MHCC, 2019; Ziadni *et al.*, 2021). Also seen as valuable were DMHI personalization, such as personal goal setting (Harris-Lane *et al.*, 2023; MHCC, 2019; Wittenberg *et al.*, 2018; Ziadni *et al.*, 2021), tailored language to the needs of the user (McLean *et al.*, 2023; Wittenberg *et al.*, 2018), individualized treatment and action planning (Wittenberg *et al.*, 2018; Ziadni *et al.*, 2021) and a stepped-care approach prioritizing user preferences and needs (Harris-Lane *et al.*, 2023; MHCC, 2019). Other highly *valued* elements included downloadable or printed resources (Wittenberg *et al.*, 2018; Ziadni *et al.*, 2021), exercises for skill acquisition (McLean *et al.*, 2023; Ziadni *et al.*, 2021) and the involvement of skilled, empathetic and respectful facilitators (Harris-Lane *et al.*, 2023; Hawkins *et al.*, 2020; Tarquinio *et al.*, 2021).

Elements common to interventions with poor or yet-established user experience efficacy. No brief (partially) guided DMHI elements were associated with poor or yet-established UX efficacy.

Elements common to interventions with inconsistent user experience efficacy. Videoconferencing was perceived as *credible* (Rubin *et al.*, 2022; Tarquinio *et al.*, 2021). However, the *utility* and *value* of these sessions varied with some studies supporting their *usefulness* (Krohner, 2022; Sung *et al.*, 2023; Tacca, 2022; Ziadni *et al.*, 2021), while others reported mixed evidence (Hartley *et al.*, 2023). Some studies found evidence of their *value* (Arevian *et al.*, 2018; Krohner, 2022; Ziadni *et al.*, 2021), while others indicated poor or yet-to-be-established evidence (Tacca, 2022; Tarquinio *et al.*, 2021).

Their *usability* presented mixed evidence, with poor or yet-to-be-established evidence (Arevian *et al.*, 2018; Tarquinio *et al.*, 2021) due to difficulties in hearing or seeing the consultant (Arevian *et al.*, 2018), while other studies found it to be effective (Ziadni *et al.*, 2021). There was limited evidence regarding its *accessibility* (Arevian *et al.*, 2018; Ziadni *et al.*, 2021).

The duration of the intervention yielded mixed results regarding its *value*. McLean *et al.* (2023) reported positive client feedback for an online single-session intervention lasting 40 min, while Harris-Lane *et al.* (2023) found that One-At-A-Time Therapy sessions lasting 30 min were inadequate, with some clients needing more time to talk (6.7%).

Developmentally appropriate digital mental health interventions

For older adults (>60 years), *usability* challenges were observed. Telehealth videoconferencing services, for instance, presented difficulties for older adults, particularly in terms of hearing or seeing the consultant, as noted in 28% of participants ($n = 7 / 25$; $M_{\text{age}} 65.4$) (Arevian *et al.*, 2018). This might explain the high preference for in-person contact in this demographic (64%). In the middle-aged cohort (40s-50s), telephone and videoconference support appeared to be *useful* (Krohner, 2022; Wittenberg *et al.*, 2018). In this age group, the *accessibility* and familiarity of videoconferencing platforms, such as Zoom, were superior, with minimal need for additional training even among new users (Ziadni *et al.*, 2021). For younger adults in their late 20 and 30s, videoconferencing platforms with built-in confidentiality and privacy features were seen as *credible* and safe (Tarquinio *et al.*, 2021; Rubin *et al.*, 2022). A narrative synthesis of other characteristics (e.g. guidance type, length, delivery method, theoretical framework, clinical modality/approach) and associated UX outcomes can be found in Supplementary Material 3.

Discussion

This systematic review synthesized the existing literature on user experience (UX) outcomes in brief, (partially) guided DMHIs designed for adults (≥ 25 years) and identified possible associations and trends with DMHI elements and outcomes. This study forms part of a two-part review.

Key findings

DMHIs are generally perceived as *useful, usable, valuable, credible* and *accessible*. Of significance, we found personalized, client-led interventions, language-tailored content and individualized treatment plans and action plans were associated with positive UX. Participants valued the person facilitating the digital intervention (namely their skill, empathy and respect), and the assurance of privacy and confidentiality. Key delivery elements associated with positive UX included modern, interactive delivery methods, modularized interventions and telephone-based interventions, such as SMS and calls, multimedia, skills acquisition exercises and downloadable resources. Flexibility of access to online and phone-based DMHIs enhanced usability. Mixed UX outcomes were observed for videoconference-based interventions and optimal session duration.

Digital mental health intervention elements

Personalization. Interventions with personalized DMHI content resulted in positive UX outcomes. More specifically, participants *valued* personalized stepped-care models prioritizing their needs and preferences. A personalized and client-driven stepped care model is poised to reduce the burden on existing mental health resources while increasing service accessibility and availability (King *et al.*, 2023; Richards, 2012). In recent years, this model has gained popularity in treating common mental health disorders (Mediavilla *et al.*, 2022) to address the gap between high demand and limited supply of health-care resources (Cornish *et al.*, 2017). Other research highlighted the benefits of a stepped care model in promoting DMHI engagement and adherence (Ruggiero *et al.*, 2020). Further, its tiered access to mental health-care resources has been shown to conserve professional and financial resources for those with the greatest need (Foundry, 2023).

Participants in DMHIs *valued* the inclusion of the following elements: individualized goal setting, action plans and the use of tailored language. These findings highlight that individuals wish to be acknowledged as unique, with distinct skills, experiences and challenges, emphasizing the need for tailored support. This criticizes the “one-size-fits-all” model, highlighting a critical need for interventions to be flexible and adaptable (Jardine *et al.*, 2024; van Orden *et al.*, 2022). This aligns with findings of previous systematic reviews in adult cohorts, highlighting that tailored DMHIs contribute to the perceived value of the intervention (Patel *et al.*, 2020); increased user engagement and adherence (Gan *et al.*, 2022); and greater perceived relevance of the DMHI, positively impacting participant motivation levels and sustaining engagement (Dodd *et al.*, 2017).

Anonymity. The presented findings revealed that interventions providing privacy and anonymity increased the perceived *credibility* of DMHIs. Prior research has found that anonymity reduced stigma associated with mental health issues (Lehtimäki *et al.*, 2021), enhanced engagement (Wei *et al.*, 2020), ensured privacy (Borghouts *et al.*, 2021) and encouraged participant openness and disclosure (Borghouts *et al.*, 2021; Lehtimäki *et al.*, 2021). A systematic review of DMHIs for adults found that anonymity was associated with reductions in psychological distress and enhanced knowledge and coping skills (Opie *et al.*, 2025). However, anonymity was only offered in a fifth of the studies considered in the present study. Known barriers to DMHI engagement include health-seeking stigma and

skepticism (Aguirre Velasco *et al.*, 2020; Peng *et al.*, 2024) and cybersecurity concerns (Dworschak *et al.*, 2024; Pywell *et al.*, 2020). Incorporating anonymity elements into DMHIs may effectively address these deterrents (Pywell *et al.*, 2020).

Digital mental health intervention providers. This review found that participants *valued* the engagement of skilled, empathetic and respectful DMHI providers. The importance and value of providers has been demonstrated previously. For instance, skilled and active providers helped to foster a positive client experience and facilitated the establishment of client-provider rapport (Hewitt *et al.*, 2022; Lal *et al.*, 2023). Similarly, a recent qualitative study identified skilled, trustworthy facilitators who listen to be a key aspect in enhancing client engagement and the socioemotional effectiveness of such interventions (Stern *et al.*, 2024).

Modularized digital mental health interventions. The adoption of a modularized approach, i.e. the sequential presentation of interrelated topics, concepts or techniques, was recognized as *useful* in enhancing outcomes. Modularized DMHIs have demonstrated high acceptability for common mental health disorders in both youth and young adults (≤ 25 years) (Santesteban-Echarri *et al.*, 2017; van Dalen *et al.*, 2022; Ho *et al.*, 2024) and adults aged over 25 years (Batterham *et al.*, 2021; Murray *et al.*, 2014).

Downloadable or printed resources. This review found DMHIs offering downloadable or printed resources to be *valued* by participants. This aligns with previous research, where downloadable DMHI materials, such as PDF worksheets and MP3 audio files, were highly favored as they helped users to retain information post intervention and support ongoing practice (e.g. Boggs *et al.*, 2014). Materials designed to facilitate skill acquisition produce high satisfaction in Web-based interventions (Hadjistavropoulos *et al.*, 2020). As poor internet access can be seen as a barrier to DMHI engagement, particularly for those in regional areas (Broomfield *et al.*, 2021), downloadable content can help to promote engagement and assist accessibility (Broomfield *et al.*, 2021) mitigating the impact of internet connectivity issues (Powell *et al.*, 2019).

Skill acquisition exercises and practice opportunities. Participants *valued* skill acquisition exercises and practice opportunities, such as daily practice routines. This is unsurprising as past research has demonstrated the merits of providing participants with opportunities to put their knowledge into practice, supporting sustained user engagement (Moskowitz *et al.*, 2021). Furthermore, these exercises can reinforce and consolidate participants' learning, helping to maintain long-term progress (e.g. K  chler *et al.*, 2023). Including practice opportunities in DMHIs has been shown to enhance the *acceptability* and potential DMHI benefits (Abi Ramia *et al.*, 2024) and skill acquisition exercises were identified as a key facilitator to men's use of a DMHI for anxiety and depression (Opozda *et al.*, 2024).

Digital mental health intervention interactivity. The present review found that adults *valued* the inclusion of interactivity elements, such as exercises and materials (e.g. mood tracker, journaling and screening assessments). This aligns with findings that static online content (e.g. an informational Web page) has been associated with a poor UX for DMHIs (Opie *et al.*, 2024b) and consistent with prior reviews in young people (≤ 25 years) (Garrido *et al.*, 2019; Grist *et al.*, 2017) as well as empirical studies in adults over 18 years old (Smail-Crevier *et al.*, 2019; Hunter-Jones *et al.*, 2019).

Designers of DMHIs need to consider the level of interactivity content (Wright *et al.*, 2019), given that those with milder symptoms might have greater capacity to engage in various interactive components, whereas those with more severe or complex symptoms might need simpler activities requiring less cognitive load (Gan *et al.*, 2021). In addition,

users are more likely to disengage from technology-mediated interventions when the interactive process is too confusing or requires multiple iterations to grasp (Wei *et al.*, 2020).

Multimedia. Findings revealed that adults *valued* the inclusion of multimedia (e.g. videos, audios), a finding supported by previous research (Nitsch *et al.*, 2016; Morrison *et al.*, 2012; Wahle *et al.*, 2017; Zahiri Esfahani *et al.*, 2020). Studies revealed a strong preference for multimedia content, such as a combination of text, videos and images in youth-specific DMHIs (Ho *et al.*, 2024; Opie *et al.*, 2024b), or interventions targeting chronic diseases and unhealthy behaviors (e.g. alcohol use, smoking) in adults (Wei *et al.*, 2020). Multimedia content has the potential to enhance the online therapeutic experience (Wright *et al.*, 2019) and has been associated with greater user engagement (Borghouts *et al.*, 2021; Ho *et al.*, 2024; Opozda *et al.*, 2024; Wei *et al.*, 2020).

Access flexibility. Flexible access to interventions, including both online platforms and telephone-based (call/text) appointments, enhanced DMHI *usability and usefulness*. This finding aligns with a previous systematic review stressing the necessity of various access options to meet diverse user preferences and needs (Borghouts *et al.*, 2021). Empirical papers support the importance of access flexibility (Dhesi *et al.*, 2022; Kuso *et al.*, 2021).

Videoconferencing. Despite showing *credibility*, this review found inconsistent evidence regarding the *usefulness, usability and value* of videoconferencing in DMHIs. Given the increasing reliance on videoconferencing in the delivery of mental health services, particularly in response to the COVID-19 pandemic (Simpson *et al.*, 2021), this finding needs further exploration. It underscores the importance of careful consideration regarding the modalities used in DMHIs and the need to align them with user needs and preferences. While videoconferencing may offer some advantages to phone or text interactions, e.g. ability to communicate non-verbally and simulate face-to-face interactions (Liu *et al.*, 2016), it may not be universally suitable for all users or mental health concerns (Hersh *et al.*, 2024; Muir *et al.*, 2020).

Developmentally appropriate digital mental health interventions

One study (Arevian *et al.*, 2018) faced specific challenges in adult engagement with DMHIs resulting in poor UX outcomes. They found that telehealth videoconferencing posed difficulties for some (28%) older adults in terms of adequately hearing or seeing the consultant and highlighted a strong preference for in-person interactions (64%). Although based on a singular study, this underscores the need for tailored DMHIs to addressing unique needs and preferences of older adults (Dworschak *et al.*, 2024; Riadi *et al.*, 2022). While research found a closing gap in digital literacy across age groups, many older adults still struggle with access and confidence in using digital tools (Elena-Bucea *et al.*, 2021; Rasche *et al.*, 2018; Seifert *et al.*, 2019). Furthermore, many DMHIs, notably mobile health apps, overlook the needs of older users, who display lower technical literacy and trust in digital platforms (Lattie *et al.*, 2022; Pywell *et al.*, 2020). Training and support alongside trust building measures can help to overcome these barriers and make DMHIs more accessible and acceptable for older adults.

The present review also identified modality preferences in early adulthood and middle-aged participants (i.e. telephone and videoconferencing) (Krohner, 2022; Rubin *et al.*, 2022; Tarquinio *et al.*, 2021; Wittenberg *et al.*, 2018). Thus, while certain DMHI modalities and contents may be effective across various age groups, the design and implementation of mental health interventions needs to consider specific needs and characteristics of different demographic groups.

Standardized user experience measures

Results revealed a lack of standardized UX scales, with most studies relying on non-validated UX measures, a finding in line with previous studies (Opie *et al.*, 2024b; Welsh *et al.*, 2023; Ganapathy *et al.*, 2023). The lack of standardized, psychometrically validated UX measures results in heterogeneity, making meaningful comparison across studies difficult. Additionally, and in line with prior research (Hrynyschyn *et al.*, 2022; Inal *et al.*, 2020), we found that when reported, UX measures, both validated and study specific, were often summarized, providing an overall assessment rather than detailed evaluations that could inform the advancement and redesign of interventions (e.g. Cho *et al.*, 2022). The use of both open-ended qualitative feedback and user feedback on specific key indicators would allow for UX outcomes to be compared across different interventions.

User experience and socioemotional outcomes

While UX outcomes are not the primary target of DMHIs, they are essential preconditions for achieving the desired socioemotional changes (Blanchard, 2023; Pitkänen and Pitkäranta, 2016). Without positive UX outcomes, the intended improvements in the primary socioemotional outcomes are unlikely to occur (Gan *et al.*, 2021). As interventions currently fail to adequately report or overlook UX outcomes (Balcombe and De Leo, 2023; Borghouts *et al.*, 2021), it is important to recognize that the effectiveness of DMHIs is not solely determined by socioemotional outcomes (Brunette *et al.*, 2020; Brunette *et al.*, 2018; Opie *et al.*, 2024b). The synergy between socioemotional and UX outcomes is vital, as they appear to collectively contribute to the overall effectiveness of DMHIs (Blanchard, 2023; Gan *et al.*, 2021; Pitkänen and Pitkäranta, 2016).

The thoughtful design, implementation and refinement of DMHIs is key to providing a positive UX. A well-considered UX design accounting for specific user requirements and preferences is critical for the success of DMHIs for adults (Lipschitz *et al.*, 2023; Mayer *et al.*, 2022) ensuring high levels of participant engagement both initially and ongoingly (Lattie *et al.*, 2019). This involves understanding the experiences and perspectives of various stakeholders, including end users, health-care providers and designers. By gathering these insights, areas for improvement can be identified, and researchers and DMHI developers can create interventions that are engaging, user-friendly and tailored.

Study strengths

This systematic review has been co-designed with Beyond Blue, Australia's leading mental health organization, with the aim of enhancing practice innovations through dialogue with the contemporary evidence base. The insights gained have already made their impact, notably shaping the 2024 revision of Beyond Blue's Digital Mental Health Model of Care. Additionally, the review benefits from the leadership of a consumer academic (JO), embedding a lived experience lens into every phase of the review process. This emphasizes commitment to incorporating lived experience insights into the research, further enriching the study's depth and applicability. A further strength was the study's methodology with its comprehensive search strategy, quality appraisal of included studies and inclusion of gray literature from varied sources.

Study limitations

Limitations of the currently available data. Several limitations need to be considered when interpreting the findings of this review. First, results are drawn from only 14 studies, some with small sample sizes and some inconsistency in outcomes. Second, no outcomes were found for two of the seven domains (i.e. findability and desirability). This confirms the

emerging nature of this field. Third, the heterogeneity in study design and the intervention itself (e.g. level of guidance, underpinning theory, length, delivery methods) restricts our ability to form solid conclusions about the DMHIs' effectiveness in adult samples. The heterogeneity in UX measurement instruments across studies as well as the reliance on non-validated UX measures further complicated the interpretation and comparison of results. The relative effectiveness of DMHIs compared to traditional in-person interventions cannot be commented on, given none of the included studies featured a direct face-to-face comparator. This highlights a research gap for future work.

A lack of diversity in the study samples, which were predominantly White and female, and in participant ages, with a notable gap for adults aged 65 years and older, underscores the need to assess the UX across diverse populations to ensure their generalizability to socio-economic, life-course and cultural contexts. Until then, the potential benefits and limitations of DMHIs remain largely unknown.

Within study limitations. To reduce heterogeneity, qualitative research has been excluded from this study, which may have led to the omission of potentially relevant data. Also, despite efforts to identify unpublished literature through the employed gray search strategy, some unpublished studies may have not been captured. Likewise, the decision to restrict the search to contemporary literature, specifically publications from 2018 to 2024, may have resulted in the exclusion of potentially relevant data.

Based on the presented findings the following recommendations can be made to enrich UX in brief partially guided DMHIs for adults.

Enriching user experience: recommendations

Policy and practice. Our findings suggest that brief (partially) guided DMHIs for adults need to:

- Be co-developed with end-user clients and other stakeholders (e.g. health-care providers, DMHI designers) to adequately address their specific needs through design and technology.
- Prioritize personalization to provide individualized care by offering client-specific content that is unique and relevant to their mental health challenges. Consider implementing a stepped-care DMHI model to allow greater tailoring to users' needs and preferences.
- Enhance UX by combining complementary elements in both content and design, such as multimedia, interactivity, skill acquisition exercises and downloadable and printed materials.
- Ensure equitable access and improve user ratings of usefulness and usability by offering flexible delivery options (e.g. phone calls, text messages, online platforms).
- Prioritize privacy and anonymity for adults in online spaces to maintain credibility and trust.
- Prioritize the implementation of features that allow end-users to personalize the content and approach to meet their needs and ensure flexible access to DMHI content across different devices or via different pathways.
- Provide referrals to longer-term support, reengagement options and access to refresher and/or follow-up content to assist with the longer-term consolidation of outcomes.
- Ensure user-friendly and easy-to-use interfaces, especially for older adults who may face technical challenges and difficulties.

Research. Further research is needed to:

- Examine optimal DMHI design, duration and delivery of DMHIs for specific populations and mental health concerns, including the relative importance of the influence of synchronicity guidance type (asynchronous vs synchronous) and the impact of guidance level (fully vs partially guided) on DMHI effectiveness.
- Investigate the relevance of developmental stages within adulthood to provide developmentally nuanced interventions that address user needs and preferences.
- Develop and validate standardized UX assessment tools. In particular, the absence of outcomes related to 'findability' and 'desirability' in DMHIs may reflect limitations in how these domains are currently defined and measured in DMHI research, highlighting a need for future studies to develop more specific tools.
- Conduct direct comparisons between DMHIs and traditional face-to-face interventions using rigorous research designs (e.g. randomized controlled trials).
- Study UX in diverse populations and underrepresented groups in mental health contexts (e.g. non-white, sexual and gender diverse, culturally and linguistically diverse and older cohorts) to reduce access barriers and improve the generalizability of results of DMHI development and evaluation.
- Adopt a user-centered approach to aid in DMHI evaluation, including ongoing co-design and iterative improvements based on user feedback and preferences.
- Investigate attrition patterns across DMHIs and factors contributing to greater engagement and retention.
- Examine the impact of UX factors on DMHI development through meta-analytic studies, which depend on generating more homogeneous data.
- *Explore modern digital technologies.*
- *Contemporary digital tools* like smartphone apps are seldom used in brief, guided DMHIs for adults. This is in stark contrast to findings from a comparable youth-focused review on brief, guided DMHIs (Opie *et al.*, 2024a). Investigating the usefulness of these technologies among adults could boost engagement and effectiveness by tapping into the latest technological advancements.
- *User experience and socioemotional outcomes:* The synergy between socioemotional and UX outcomes is vital, as they collectively contribute to the overall effectiveness of DMHIs. For instance, if potential participants are deterred from joining a DMHI due to accessibility issues, the intervention's potential socioemotional benefits become moot. It appears that UX outcomes and socioemotional outcomes are two sides of the same coin and both sides should be evaluated in research.

Conclusion

The present study provides important insights into user experience outcomes associated with effective brief (partially) guided DMHIs for adults. Our findings represent the current state of knowledge in this emerging intervention format. Looking ahead, the optimal type and intensity of guidance likely depend on a confluence of elements working synergistically, including the nature of the mental health concern, user preferences and needs and intervention design.

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Author contributions

Conception or design of the work: JO, JM; Methodology: JO, AV; Screening: JO, AV, SK; Data analysis: JO, AV, SK; Data synthesis: JO, AV, SK; Manuscript drafting: JO, AV, SK, JM; Final version approval: All authors; Joint first authors: JO and AV contributed equally as first authors of this work.

Data availability

All data reported and analyzed in this study are included in this published study and the supplementary materials.

References

- Abi Ramia, J., Abi Hana, R., Noun, P., Cuijpers, P., Carswell, K., Van't Hof, E., Heim, E., Zoghbi, E., Sijbrandij, M. and El Chammay, R. (2024), "Feasibility and uptake of a digital mental health intervention for depression among Lebanese and Syrian displaced people in Lebanon: a qualitative study", *Frontiers in Public Health*, Vol. 11.
- Aguirre Velasco, A., Cruz, I.S.S., Billings, J., Jimenez, M. and Rowe, S. (2020), "What are the barriers, facilitators and interventions targeting help-seeking behaviours for common mental health problems in adolescents? A systematic review", *BMC Psychiatry*, Vol. 20 No. 1, p. 293.
- Alqahtani, F. and Orji, R. (2019), "Usability issues in mental health applications", *Adjunct Publication of the 27th Conference on User Modeling, Adaptation and Personalization*, Association for Computing Machinery, Larnaca.
- Amone-P'olak, K., Kakinda, A.I., Kibedi, H. and Omech, B. (2023), "Barriers to treatment and care for depression among the youth in Uganda: the role of mental health literacy", *Frontiers in Public Health*, Vol. 11, p. 1054918.
- Andrews, G., Basu, A., Cuijpers, P., Craske, M.G., Mcevoy, P., English, C.L. and Newby, J.M. (2018), "Computer therapy for the anxiety and depression disorders is effective, acceptable and practical health care: an updated meta-analysis", *Journal of Anxiety Disorders*, Vol. 55, pp. 70-78.
- Arevian, A.C., Jeffrey, J., Young, A.S. and Ong, M.K. (2018), "Opportunities for flexible, on-demand care delivery through telemedicine", *Psychiatric Services*, Vol. 69 No. 1, pp. 5-8.
- Attkisson, C.C. and Zwick, R. (2000), "The client satisfaction questionnaire: psychometric properties and correlations with service utilization and psychotherapy outcome", *Evaluation and Program Planning*, Vol. 5 No. 3.
- Balcombe, L. and De Leo, D. (2023), "Evaluation of the use of digital mental health platforms and interventions: scoping review", *International Journal of Environmental Research and Public Health* [Online], Vol. 20 No. 1.
- Batterham, P.J., Calear, A.L., Farrer, L., Gulliver, A. and Kurz, E. (2021), "Efficacy of a transdiagnostic self-help internet intervention for reducing depression, anxiety, and suicidal ideation in adults: randomized controlled trial", *Journal of Medical Internet Research*, Vol. 23 No. 1, p. e22698.

- Bisby, M.A., Balakumar, T., Scott, A.J., Titov, N. and Dear, B.F. (2024), "An online therapist-guided ultra-brief treatment for depression and anxiety: a randomized controlled trial", *Psychological Medicine*, Vol. 54 No. 5, pp. 902-913.
- Blanchard, M. (2023), "User experience research in the development of digital health products: research letter", *Health Policy and Technology*, Vol. 12 No. 2, p. 100753.
- Boggs, J.M., Beck, A., Felder, J.N., Dimidjian, S., Metcalf, C.A. and Segal, Z.V. (2014), "Web-based intervention in mindfulness meditation for reducing residual depressive symptoms and relapse prophylaxis: a qualitative study", *Journal of Medical Internet Research*, Vol. 16 No. 3, p. e87.
- Borghouts, J., Eikey, E., Mark, G., De Leon, C., Schueller, S.M., Schneider, M., ... Sorkin, D.H. (2021), "Barriers to and facilitators of user engagement with digital mental health interventions: systematic review", *Journal of Medical Internet Research*, Vol. 23 No. 3, p. e24387.
- Broomfield, G., Wade, C. and Yap, M.B.H. (2021), "Engaging parents of lower-socioeconomic positions in internet- and mobile-based interventions for youth mental health: a qualitative investigation", *International Journal of Environmental Research and Public Health [Online]*, Vol. 18 No. 17.
- Brunette, M.F., Ferron, J.C., McGurk, S.R., Williams, J.M., Harrington, A., Devitt, T. and Xie, H. (2020), "Brief, web-based interventions to motivate smokers with schizophrenia: randomized trial", *JMIR Mental Health*, Vol. 7 No. 2, p. e16524.
- Brunette, M.F., Ferron, J.C., Robinson, D., Coletti, D., Geiger, P., Devitt, T., Klodnick, V., Gottlieb, J., Xie, H., Greene, M.A., Ziedonis, D., Drake, R.E. and Mchugo, G.J. (2018), "Brief web-based interventions for young adult smokers with severe mental illnesses: a randomized, controlled pilot study", *Nicotine and Tobacco Research*, Vol. 20 No. 10, pp. 1206-1214.
- Chen, A.T., Wu, S., Tomasino, K.N., Lattie, E.G. and Mohr, D.C. (2019), "A multi-faceted approach to characterizing user behavior and experience in a digital mental health intervention", *Journal of Biomedical Informatics*, Vol. 94, p. 103187.
- Cho, M.-H., Chang, Y., Lee, D.H. and Kim, Y. (2022), "Development of a mental health application: a formative evaluation", *Sage Open*, Vol. 12 No. 4, p. 21582440221140372.
- Choi, S.L., Hites, L., Bolland, A.C., Lee, J., Payne-Foster, P. and Bissell, K. (2024), "Telehealth uptake among Middle-aged and older Americans during COVID-19: chronic conditions, social media communication, and race/ethnicity", *Aging and Mental Health*, Vol. 28 No. 1, pp. 160-168.
- Conley, C.S., Durlak, J.A., Shapiro, J.B., Kirsch, A.C. and Zahniser, E. (2016), "A meta-analysis of the impact of universal and indicated preventive technology-delivered interventions for higher education students", *Prevention Science*, Vol. 17 No. 6, pp. 659-678.
- Cornish, P.A., Berry, G., Benton, S., Barros-Gomes, P., Johnson, D., Ginsburg, R., Whelan, B., Fawcett, E. and Romano, V. (2017), "Meeting the mental health needs of today's college student", *Psychological Services*, Vol. 14 No. 4, pp. 428-442.
- Cowan, K.E., McKean, A.J., Gentry, M.T. and Hilty, D.M. (2019), "Barriers to use of telepsychiatry: clinicians as gatekeepers", *Mayo Clinic Proceedings*, Vol. 94 No. 12, pp. 2510-2523.
- Dawkins, B., Renwick, C., Ensor, T., Shinkins, B., Jayne, D. and Meads, D. (2021), "What factors affect patients' ability to access healthcare? An overview of systematic reviews", *Tropical Medicine and International Health*, Vol. 26 No. 10, pp. 1177-1188.
- Deville, G.J. and Borkovec, T.D. (2000), "Psychometric properties of the credibility/expectancy questionnaire", *Journal of Behavior Therapy and Experimental Psychiatry*, Vol. 31 No. 2, p. 73.
- Dhesi, M., Sefi, A., Donati, M., Hayes, J. and Cooper, M. (2022), "Helpful and unhelpful elements of synchronous text-based therapy: a thematic analysis", *Counselling and Psychotherapy Research*, Vol. 22 No. 1, pp. 157-165.
- Dodd, A.L., Mallinson, S., Griffiths, M., Morriss, R., Jones, S.H. and Lobban, F. (2017), "Users' experiences of an online intervention for bipolar disorder: important lessons for design and evaluation", *Evidence Based Mental Health*, Vol. 20 No. 4, p. 133.

- Domhardt, M., Schröder, A., Geirhos, A., Steubl, L. and Baumeister, H. (2021), "Efficacy of digital health interventions in youth with chronic medical conditions: a meta-analysis", *Internet Interventions*, Vol. 24, p. 100373.
- Dworschak, C., Heim, E., Kuhn, N., Schwager, J., Tröster, A. and Maercker, A. (2024), "User-centered development of an internet-based CBT intervention for the treatment of loneliness in older individuals", *Internet Interventions*, Vol. 35, p. 100720.
- Elena-Bucea, A., Cruz Jesus, F., Oliveira, T. and Coelho, P. (2021), "Assessing the role of age, education, gender and income on the digital divide: evidence for the European Union", *Information Systems Frontiers*, Vol. 23 No. 4.
- Fairburn, C.G. and Patel, V. (2017), "The impact of digital technology on psychological treatments and their dissemination", *Behaviour Research and Therapy*, Vol. 88, pp. 19-25.
- Foundry, L. (2023), "Integrated stepped care model overview. Providence health care society, d.b.a".
- Gan, D.Z.Q., McGillivray, L., Han, J., Christensen, H. and Torok, M. (2021), "Effect of engagement with digital interventions on mental health outcomes: a systematic review and meta-analysis", *Frontiers in Digital Health*, Vol. 3
- Gan, D.Z.Q., McGillivray, L., Larsen, M.E., Christensen, H. and Torok, M. (2022), "Technology-supported strategies for promoting user engagement with digital mental health interventions: a systematic review", *Digit Health*, Vol. 8, p. 20552076221098268.
- Ganapathy, A., Casey, L.M., Rowland, D.P., Grady, A.B., Veale Sothoren, K. and Clough, B.A. (2023), "Methodological approaches in investigating barriers to digital mental health interventions use: a scoping review", *Advances in Mental Health*, Vol. 22 No. 3, pp. 1-85.
- Garrido, S., Millington, C., Cheers, D., Boydell, K., Schubert, E., Meade, T. and Nguyen, Q.V. (2019), "What works and what doesn't work? A systematic review of digital mental health interventions for depression and anxiety in young people", *Frontiers in Psychiatry*, Vol. 10.
- Grist, R., Porter, J. and Stallard, P. (2017), "Mental health mobile apps for preadolescents and adolescents: a systematic review", *Journal of Medical Internet Research*, Vol. 19 No. 5, p. e176.
- Hadjistavropoulos, H.D., Peynenburg, V., Nugent, M., Karin, E., Titov, N. and Dear, B.F. (2020), "Transdiagnostic internet-delivered cognitive behaviour therapy with therapist support offered once-weekly or once-weekly supplemented with therapist support within one-business-day: pragmatic randomized controlled trial", *Internet Interventions*, Vol. 22, p. 100347.
- Hadler, N.L., Bu, P., Winkler, A. and Alexander, A.W. (2021), "College student perspectives of telemental health: a review of the recent literature", *Current Psychiatry Reports*, Vol. 23 No. 2, p. 6.
- Harris-Lane, L.M., Keeler-Villa, N.R., Bol, A., Burke, K., Churchill, A., Cornish, P., Fitzgerald, S.F., Goguen, B., Gordon, K., Jauich, A., Lang, R., Michaud, M., Mahon, K.N. and Rash, J.A. (2023), "Implementing one-at-a-time therapy in community addiction and mental health centres: a retrospective exploration of the implementation process and initial outcomes", *BMC Health Services Research*, Vol. 23 No. 1, p. 982.
- Hartig, T., Korpela, K., Evans, G.W. and Gärling, T. (1997), "A measure of restorative quality in environments", *Scandinavian Housing and Planning Research*, Vol. 14 No. 4, pp. 175-194.
- Hartley, E., Moore, L., Knuckey, A., Von Doussa, H., Painter, F., Story, K., Barrington, N., Young, J. and McIntosh, J. (2023), "Walk-in together: a pilot study of a walk-in online family therapy intervention", *Australian and New Zealand Journal of Family Therapy*, Vol. 44 No. 2, pp. 127-144.
- Hatcher, R.L. and Gillaspay, J.A. (2006), "Development and validation of a revised short version of the working alliance inventory", *Psychotherapy Research*, Vol. 16 No. 1, pp. 12-25.
- Hawkins, A., Odgers, J., Reeves, A. and McCoy, A. (2020), "Evaluating telephone and online psychological support and referral", *Evaluation Journal of Australasia*, Vol. 20 No. 3, pp. 157-175.

- Hersh, M., Leporini, B. and Buzzi, M. (2024), *A Comparative Study of Disabled People's Experiences with the Video Conferencing Tools Zoom, MS Teams, Google Meet and Skype*, Behaviour and Information Technology, pp. 1-20.
- Hewitt, R.M., Ploszajski, M., Purcell, C., Pattinson, R., Jones, B., Wren, G.H., Hughes, O., Ridd, M.J., Thompson, A.R. and Bundy, C. (2022), "A mixed methods systematic review of digital interventions to support the psychological health and well-being of people living with dermatological conditions", *Frontiers in Medicine*, Vol. 9.
- Ho, T.Q.A., Le, L.K.-D., Engel, L., Le, N., Melvin, G., Le, H.N.D. and Mihalopoulos, C. (2024), "Barriers to and facilitators of user engagement with web-based mental health interventions in young people: a systematic review", *European Child and Adolescent Psychiatry*, Vol. 34 No. 1.
- Hollis, C., Falconer, C.J., Martin, J.L., Whittington, C., Stockton, S., Glazebrook, C. and Davies, E.B. (2017), "Annual research review: digital health interventions for children and young people with mental health problems – a systematic and meta-review", *Journal of Child Psychology and Psychiatry*, Vol. 58 No. 4, pp. 474-503.
- Holt, D.T., Armenakis, A.A., Feild, H.S. and Harris, S.G. (2007), "Readiness for organizational change: the systematic development of a scale", *The Journal of Applied Behavioral Science*, Vol. 43 No. 2, pp. 232-255.
- Hoyt, M.F., Bobele, M., Slive, A., Young, J. and Talmon, M. (2018), *Single-Session Therapy by Walk-in or Appointment: Administrative, Clinical, and Supervisory Aspects of One-at-a-Time Services*, Routledge.
- Hoyt, M.F., Young, J. and Rycroft, P. (2021), *Single-Session Thinking and Practice in Global, Cultural, and Familial Contexts: expanding Applications*, Routledge, New York, NY, London.
- Hrynyszyn, R., Prediger, C., Stock, C. and Helmer, S.M. (2022), "Evaluation methods applied to digital health interventions: what is being used beyond randomised controlled trials?-a scoping review", *Int J Environ Res Public Health*, Vol. 19.
- Hunter-Jones, J.J., Gilliam, S.M., Carswell, A.L. and Hansen, N.B. (2019), "Assessing the acceptability of a mindfulness-based cognitive therapy intervention for African-American women living with HIV/AIDS", *Journal of Racial and Ethnic Health Disparities*, Vol. 6 No. 6, pp. 1157-1166.
- Inal, Y., Wake, J.D., Guribye, F. and Nordgreen, T. (2020), "Usability evaluations of mobile mental health technologies: systematic review", *Journal of Medical Internet Research*, Vol. 22 No. 1, p. e15337.
- Jardine, J., Nadal, C., Robinson, S., Enrique, A., Hanratty, M. and Doherty, G. (2024), "Between rhetoric and reality: real-world barriers to uptake and early engagement in digital mental health interventions", *ACM Transactions on Computer-Human Interaction*, Vol. 31 No. 2, p. 27.
- Jiménez-Molina, Á., Franco, P., Martínez, V., Martínez, P., Rojas, G. and Araya, R. (2019), "Internet-based interventions for the prevention and treatment of mental disorders in Latin America: a scoping review", *Frontiers in Psychiatry*, Vol. 10, p. 664.
- Johnson, J.A., Sanghvi, P. and Mehrotra, S. (2022b), "Technology-based interventions to improve help-seeking for mental health concerns: a systematic review", *Indian Journal of Psychological Medicine*, Vol. 44 No. 4, pp. 332-340.
- Johnson, P.J., Mentzer, K.M., Jou, J. and Upchurch, D.M. (2022a), "Unmet healthcare needs among midlife adults with mental distress and multiple chronic conditions", *Aging and Mental Health*, Vol. 26 No. 4, pp. 775-783.
- Kim, J., Ryu, N. and Chibanda, D. (2023), "Effectiveness of single-session therapy for adult common mental disorders: a systematic review", *BMC Psychology*, Vol. 11 No. 1, p. 373.
- King, A., Harris-Lane, L.M., Bérubé, S., Burke, K., Churchill, A., Cornish, P., Goguen, B., Jaouich, A. and Rash, J.A. (2023), "Provider perceptions of the anticipated benefits, barriers, and facilitators associated with implementing a stepped care model for the delivery of addiction and mental health services in New Brunswick: a mixed-methods observational implementation study", *International Journal of Mental Health Systems*, Vol. 17 No. 1, p. 40.

- Kodish, T., Schueller, S.M. and Lau, A.S. (2023), "Barriers and strategies to improve digital mental health intervention uptake among college students of color: a modified delphi study", *Journal of Behavioral and Cognitive Therapy*, Vol. 33 No. 1, pp. 10-23.
- Konduri, N., Bastos, L.G.V., Sawyer, K. and Reciolino, L.F.A. (2017), "User experience analysis of an eHealth system for tuberculosis in resource-constrained settings: a nine-country comparison", *International Journal of Medical Informatics*, Vol. 102, pp. 118-129.
- Krohner, S. (2022), "Single-session psychodynamic interview for people with chronic musculoskeletal pain and childhood adversity: a randomized controlled trial".
- Krzyzaniak, N., Greenwood, H., Scott, A.M., Peiris, R., Cardona, M., Clark, J. and Glasziou, P. (2021), "The effectiveness of telehealth versus face-to face interventions for anxiety disorders: a systematic review and meta-analysis", *Journal of Telemedicine and Telecare*, Vol. 30 No. 2, pp. 250-261.
- Küchler, A.M., Schultchen, D., Dretzler, T., Moshagen, M., Ebert, D.D. and Baumeister, H. (2023), "A three-armed randomized controlled trial to evaluate the effectiveness, acceptance, and negative effects of studicare mindfulness, an internet- and mobile-based intervention for college students with no and 'on demand' guidance", *International Journal of Environmental Research and Public Health, Electronic Resource*, Vol. 20, p. 11.
- Kuso, S., Nitsch, M., Zeiler, M., Simek, M., Adamcik, T., Dey, M., Berger, T., Krieger, T., Weisel, K.K., Zarski, A.C., Ebert, D.D., Schaub, M.P., Moser, C.T., Botella, C., Baños, R., Herrero, R., Etchemendy, E., Nacke, B., Beintner, I., Vollert, B., Schmidt-Hantke, J., Hütter, K., Jacobi, C. and Waldherr, K. (2021), "Stakeholders' views on online interventions to prevent common mental health disorders in adults implemented into existing healthcare systems in Europe", *European Journal of Public Health*, Vol. 31 No. Supplement_1, pp. i55-i63.
- Lal, S., Tobin, R., Tremblay, S., Gleeson, J.F.M., D'alfonso, S., Etienne, G., Joobor, R., Lepage, M. and Alvarez-Jimenez, M. (2023), "Experiences of a digital mental health intervention from the perspectives of young people recovering from First-Episode psychosis: a focus group study", *Int J Environ Res Public Health*, Vol. 20 No. 9.
- Lancaster, K., Abuzour, A., Khaira, M., Mathers, A., Chan, A., Bui, V., Lok, A., Thabane, L. and Dolovich, L. (2018), "The use and effects of electronic health tools for patient self-monitoring and reporting of outcomes following medication use: systematic review", *Journal of Medical Internet Research*, Vol. 20 No. 12, p. e294.
- Lattie, E.G., Stiles-Shields, C. and Graham, A.K. (2022), "An overview of and recommendations for more accessible digital mental health services", *Nature Reviews Psychology*, Vol. 1 No. 2, pp. 87-100.
- Lattie, E.G., Adkins, E.C., Winquist, N., Stiles-Shields, C., Wafford, Q.E. and Graham, A.K. (2019), "Digital mental health interventions for depression, anxiety, and enhancement of psychological well-being among college students: systematic review", *Journal of Medical Internet Research*, Vol. 21 No. 7, p. e12869.
- Lehtimäki, S., Martic, J., Wahl, B., Foster, K.T. and Schwalbe, N. (2021), "Evidence on digital mental health interventions for adolescents and young people: systematic overview", *JMIR Mental Health*, Vol. 8 No. 4, p. e25847.
- Lipschitz, J.M., Pike, C.K., Hogan, T.P., Murphy, S.A. and Burdick, K.E. (2023), "The engagement problem: a review of engagement with digital mental health interventions and recommendations for a path forward", *Current Treatment Options in Psychiatry*, Vol. 10 No. 3, pp. 119-135.
- Liu, C., Scott, K.M., Lim, R.L., Taylor, S. and Calvo, R.A. (2016), "EQClinic: a platform for learning communication skills in clinical consultations", *Medical Education Online*, Vol. 21, p. 31801.
- Mcgorry, P.D., Mei, C., Chanen, A., Hodges, C., Alvarez-Jimenez, M. and Killackey, E. (2022), "Designing and scaling up integrated youth mental health care", *World Psychiatry*, Vol. 21 No. 1, pp. 61-76.

- McClean, C.L., Ruork, A.K., Ramaiya, M.K. and Fruzzetti, A.E. (2023), "Feasibility and initial impact of single-session internet-delivered acceptance vs change skills for emotions for stress- and trauma-related problems: a randomized controlled trial", *Behavioural and Cognitive Psychotherapy*, Vol. 51 No. 5, pp. 443-458.
- Maity, A., Wang, A.W., Dreier, M.J., Wallace, V., Orchard, F., Schleider, J.L., Loades, M.E. and Hamilton, J.L. (2023), "How do adolescents experience a newly developed online single session sleep intervention? A Think-Aloud study", *Clinical Child Psychology and Psychiatry*, Vol. 29 No. 3.
- Marshall, P., Booth, M., Coole, M., Fothergill, L., Glossop, Z., Haines, J., Harding, A., Johnston, R., Jones, S., Lodge, C., Machin, K., Meacock, R., Nielson, K., Puddephatt, J.-A., Rakic, T., Rayson, P., Robinson, H., Rycroft-Malone, J., Shryane, N., Swithenbank, Z., Wise, S. and Lobban, F. (2024), "Understanding the impacts of online mental health peer support forums: realist synthesis", *JMIR Mental Health*, Vol. 11, p. e55750.
- Mayer, G., Hummel, S., Oetjen, N., Gronewold, N., Bubolz, S., Blankenhagel, K., Slawik, M., Zarnekow, R., Hilbel, T. and Schultz, J.H. (2022), "User experience and acceptance of patients and healthy adults testing a personalized self-management app for depression: a non-randomized mixed-methods feasibility study", *Digital Health*, Vol. 8, p. 20552076221091353.
- Mediavilla, R., Mcgreevy, K.R., Felez-Nobrega, M., Monistrol-Mula, A., Bravo-Ortiz, M.F., Bayón, C., Rodríguez-Vega, B., Nicaise, P., Delaire, A., Sijbrandij, M., Witteveen, A.B., Purgato, M., Barbui, C., Tedeschi, F., Melchior, M., Van Der Waerden, J., Mcdaid, D., Park, A.L., Kalisch, R., Petri-Romão, P., Underhill, J., Bryant, R.A., Haro, J.M. and Ayuso-Mateos, J.L. (2022), "Effectiveness of a stepped-care programme of internet-based psychological interventions for healthcare workers with psychological distress: Study protocol for the RESPOND healthcare workers randomised controlled trial", *Digital Health*, Vol. 8, p. 20552076221129084.
- Mental Health Network Nhs Confederation (2023), "Maximising the potential of digital in mental health".
- Mhcc (2019), *Mental Health Commission of Canada. Newfoundland And Labrador Stepped Care 2.0 e-Mental Health Demonstration Project*, Ottawa.
- Morrison, L.G., Yardley, L., Powell, J. and Michie, S. (2012), "What design features are used in effective e-health interventions? A review using techniques from critical interpretive synthesis", *Telemedicine and e-Health*, Vol. 18 No. 2, pp. 137-144.
- Morville, P. (2014), "User experience design", available at: http://semanticstudios.com/user_experience_design/ (accessed 16 December 2023).
- Moshe, I., Terhorst, Y., Philippi, P., Domhardt, M., Cuijpers, P., Cristea, I., Pulkki-Råback, L., Baumeister, H. and Sander, L.B. (2021), "Digital interventions for the treatment of depression: a meta-analytic review", *Psychological Bulletin*, Vol. 147 No. 8, pp. 749-786.
- Moskowitz, J.T., Addington, E.L., Shiu, E., Bassett, S.M., Schuette, S., Kwok, I., Freedman, M.E., Leykin, Y., Saslow, L.R., Cohn, M.A. and Cheung, E.O. (2021), "Facilitator contact, discussion boards, and virtual badges as adherence enhancements to a web-based, self-guided, positive psychological intervention for depression: randomized controlled trial", *Journal of Medical Internet Research*, Vol. 23 No. 9, p. e25922.
- Muir, S.D., De Boer, K., Nedeljkovic, M. and Meyer, D. (2020), "Barriers and facilitators of videoconferencing psychotherapy implementation in veteran mental health care environments: a systematic review", *BMC Health Services Research*, Vol. 20 No. 1, p. 999.
- Murray, L.K., Dorsey, S., Haroz, E., Lee, C., Alsiahy, M.M., Haydary, A., Weiss, W.M. and Bolton, P. (2014), "A common elements treatment approach for adult mental health problems in low- and middle-income countries", *Cognitive and Behavioral Practice*, Vol. 21 No. 2, pp. 111-123.
- Nitsch, M., Dimopoulos, C.N., Flaschberger, E., Saffran, K., Kruger, J.F., Garlock, L., Wilfley, D.E., Taylor, C.B. and Jones, M. (2016), "A guided online and mobile Self-Help program for

- individuals with eating disorders: an iterative engagement and usability study”, *Journal of Medical Internet Research*, Vol. 18 No. 1, p. e7.
- O’Brien, H.L., Cairns, P. and Hall, M. (2018), “A practical approach to measuring user engagement with the refined user engagement scale (UES) and new UES short form”, *International Journal of Human-Computer Studies*, Vol. 112, pp. 28-39.
- Opie, J.E., Vuong, A., Pearce, N., McIntosh, J. and Kuntsche, S. (2025), “Brief digital interventions for adults with emerging mental health concerns: a systematic review reporting on socioemotional outcomes”, *Mental Health and Digital Technologies*.
- Opie, J.E., Vuong, A., Welsh, E.T., Timothy, B.E., Khan, U.R. and Khalil, H. (2024b), “Outcomes of best-practice guided digital mental health interventions for youth and young adults with emerging symptoms: part II. A systematic review of user experience outcomes”, *Clinical Child and Family Psychology Review*, Vol. 27 No. 2.
- Opie, J.E., Vuong, A., Welsh, E.T., Gray, R., Pearce, N., Marchionda, S., Mutch, R. and Khalil, H. (2024a), “Outcomes of best-practice guided digital mental health interventions for youth and young adults with emerging symptoms: part I. A systematic review of socioemotional outcomes and recommendations”, *Clinical Child and Family Psychology Review*, Vol. 27 No. 2.
- Opozda, M.J., Oxlad, M., Turnbull, D., Gupta, H., Smith, J.A., Ziesing, S., Nankivell, M.E. and Wittert, G. (2024), “Facilitators of, barriers to, and preferences for e-mental health interventions for depression and anxiety in men: metasynthesis and recommendations”, *Journal of Affective Disorders*, Vol. 346, pp. 75-87.
- O’Sullivan, S., Van Berkel, N., Kostakos, V., Schmaal, L., D’Alfonso, S., Valentine, L., Bendall, S., Nelson, B., Gleeson, J.F. and Alvarez-Jimenez, M. (2023), “Understanding what drives long-term engagement in digital mental health interventions: secondary causal analysis of the relationship between social networking and therapy engagement”, *JMIR Mental Health*, Vol. 10, p. e44812.
- Patel, S., Akhtar, A., Malins, S., Wright, N., Rowley, E., Young, E., Sampson, S. and Morriss, R. (2020), “The acceptability and usability of digital health interventions for adults with depression, anxiety, and somatoform disorders: qualitative systematic review and meta-synthesis”, *J Med Internet Res*, Vol. 22 No. 7, p. e16228.
- Peng, R., Li, X., Guo, Y., Ning, H., Huang, J., Jiang, D., Feng, H. and Liu, Q. (2024), “Barriers and facilitators to acceptance and implementation of eMental-health intervention among older adults: a qualitative systematic review”, *Digital Health*, Vol. 10, p. 20552076241234628.
- Philippe, T.J., Sikder, N., Jackson, A., Koblanski, M.E., Liow, E., Pilarinos, A. and Vasarhelyi, K. (2022), “Digital health interventions for delivery of mental health care: systematic and comprehensive meta-review”, *JMIR Mental Health*, Vol. 9 No. 5, p. e35159.
- Pineda, B.S., Mejia, R., Qin, Y., Martinez, J., Delgadillo, L.G. and Muñoz, R.F. (2023), *Updated Taxonomy of Digital Mental Health Interventions: A Conceptual Framework*, Mhealth, 9, p. 28.
- Pitkänen, J. and Pitkäranta, M. (2016), “Improving meaningful use and user experience of healthcare information systems towards better clinical outcomes”, *Finnish Journal of eHealth and eWelfare*, Vol. 8, pp. 98-106.
- Popay, J., Roberts, H.M., Sowden, A.J., Petticrew, M., Arai, L., Rodgers, M. and Britten, N. (2006), “Guidance on the conduct of narrative synthesis in systematic reviews”, *A Product from the ESRC Methods Programme. Version*, Vol. 1.
- Potts, C., Kealy, C., McNulty, J.M., Madrid-Cagigal, A., Wilson, T., Mulvenna, M.D., O’neill, S., Donohoe, G. and Barry, M.M. (2025), “Digital mental health interventions for young people aged 16-25 years: scoping review”, *Journal of Medical Internet Research*, Vol. 27, p. e72892.
- Powell, L., Parker, J., Harpin, V. and Mawson, S. (2019), “Guideline development for technological interventions for children and young people to self-manage attention deficit hyperactivity disorder: Realist evaluation”, *Journal of Medical Internet Research*, Vol. 21 No. 4, p. e12831.

- Prescott, J., Hanley, T. and Ujhelyi Gomez, K. (2019), "Why do young people use online forums for mental health and emotional support? Benefits and challenges", *British Journal of Guidance and Counselling*, Vol. 47 No. 3, pp. 317-327.
- Pywell, J., Vijaykumar, S., Dodd, A. and Coventry, L. (2020), "Barriers to older adults' uptake of mobile-based mental health interventions", *Digital Health*, Vol. 6, p. 2055207620905422.
- Rajgopal, A., Li, C.R., Shah, S. and Sundar Budhathoki, S. (2021), "The use of telehealth to overcome barriers to mental health services faced by young people from Afro-Caribbean backgrounds in England during the COVID-19 pandemic", *Journal of Global Health*, Vol. 11, p. 3040.
- Ramos, G., Montoya, A.K., Hammons, H.R., Smith, D., Chavira, D.A. and Rith-Najarian, L.R. (2023), "Digital intervention barriers scale-7 (DIBS-7): development, evaluation, and preliminary validation", *JMIR Form Res*, Vol. 7, p. e40509.
- Rasche, P., Wille, M., Bröhl, C., Theis, S., Schäfer, K., Knobe, M. and Mertens, A. (2018), "Prevalence of health app use among older adults in Germany: national survey", *JMIR mHealth and uHealth*, Vol. 6 No. 1, p. e26.
- Rens, E., Dom, G., Remmen, R., Michielsens, J. and Van Den Broeck, K. (2020), "Unmet mental health needs in the general population: perspectives of belgian health and social care professionals", *International Journal for Equity in Health*, Vol. 19 No. 1, p. 169.
- Riadi, I., Kervin, L., Dhillon, S., Teo, K., Churchill, R., Card, K.G., Sixsmith, A., Moreno, S., Fortuna, K.L., Torous, J. and Cosco, T.D. (2022), "Digital interventions for depression and anxiety in older adults: a systematic review of randomised controlled trials", *The Lancet Healthy Longevity*, Vol. 3 No. 8, pp. e558-e571.
- 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. and 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*, Vol. 20, p. 100323.
- Richards, D.A. (2012), "Stepped care: a method to deliver increased access to psychological therapies", *The Canadian Journal of Psychiatry*, Vol. 57 No. 4, pp. 210-215.
- Rodríguez-Rivas, M.E., Cangas, A.J., Cariola, L.A., Varela, J.J. and Valdebenito, S. (2022), "Innovative technology-based interventions to reduce stigma toward people with mental illness: systematic review and meta-analysis", *JMIR Serious Games*, Vol. 10 No. 2, p. e35099.
- Rubin, M., Fischer, C. and Telch, M.J. (2022), "Efficacy of a single session mindfulness based intervention ", (*PrePrint*).
- Ruggiero, K.J., Davidson, T.M., Anton, M.T., Bunnell, B., Winkelmann, J., Ridings, L.E., Bravoco, O., Crookes, B., Mcelligott, J. and Fakhry, S.M. (2020), "Patient engagement in a technology-enhanced, Stepped-Care intervention to address the mental health needs of trauma center patients", *Journal of the American College of Surgeons*, Vol. 231 No. 2, pp. 223-230.
- Rusch, A., Carley, I., Badola, P., Liebrecht, C., Mcinnis, M., Ryan, K.A. and Smith, S.N. (2022), "Digital mental health interventions for chronic serious mental illness: findings from a qualitative study on usability and scale-up of the life goals app for bipolar disorder", *Frontiers in Digital Health*, Vol. 4.
- Saleem, M., Kühne, L., De Santis, K.K., Christianson, L., Brand, T. and Busse, H. (2021), "Understanding engagement strategies in digital interventions for mental health promotion: scoping review", *JMIR Mental Health*, Vol. 8 No. 12, p. e30000.
- Santesteban-Echarri, O., Rice, S., Wadley, G., Lederman, R., D'alfonso, S., Russon, P., Chambers, R., Miles, C.J., Gilbertson, T., Gleeson, J.F., McGorry, P.D. and Álvarez-Jiménez, M. (2017), "A next-generation social media-based relapse prevention intervention for youth depression: qualitative data on user experience outcomes for social networking, safety, and clinical benefit", *Internet Interventions*, Vol. 9, pp. 65-73.

- Schleider, J.L. and Weisz, J.R. (2017), "Can less be more? The promise (and perils) of single-session youth mental health interventions", *The Behavior Therapist*, Vol. 40, pp. 256-261.
- Schleider, J.L., Dobias, M.L., Sung, J.Y. and Mullarkey, M.C. (2020), "Future directions in single-session youth mental health interventions", *Journal of Clinical Child and Adolescent Psychology*, Vol. 49 No. 2, pp. 264-278.
- Schueller, S.M., Tomasino, K.N. and Mohr, D.C. (2017), "Integrating human support into behavioral intervention technologies: the efficiency model of support", *Clinical Psychology: Science and Practice*, Vol. 24 No. 1, pp. 27-45.
- Scott, V.C., Kenworthy, T., Godly-Reynolds, E., Bastien, G., Scaccia, J., McMickens, C., Rachel, S., Cooper, S., Wrenn, G. and Wandersman, A. (2017), "The readiness for integrated care questionnaire (RICQ): an instrument to assess readiness to integrate behavioral health and primary care", *American Journal of Orthopsychiatry*, Vol. 87 No. 5, pp. 520-530.
- Seifert, A., Hofer, M. and Rössel, J. (2019), "Older adults' perceived sense of social exclusion from the digital world", *Educational Gerontology*, Vol. 44 No. 12.
- Shen, N., Sequeira, L., Silver, M.P., Carter-Langford, A., Strauss, J. and Wiljer, D. (2019), "Patient privacy perspectives on health information exchange in a mental health context: qualitative study", *JMIR Mental Health*, Vol. 6 No. 11, p. e13306.
- Siek, M. and Fariz, F.H. (2023), "Analysis of user experience on short video services: Instagram reels and Tiktok comparison", *2023 International Conference on Information Management and Technology (ICIMTech)*, pp. 819-824.
- Simblett, S., Greer, B., Matcham, F., Curtis, H., Polhemus, A., Ferrão, J., Gamble, P. and Wykes, T. (2018), "Barriers to and facilitators of engagement with remote measurement technology for managing health: Systematic review and content analysis of findings", *Journal of Medical Internet Research*, Vol. 20 No. 7, p. e10480.
- Simpson, S., Richardson, L., Pietrabissa, G., Castelnuovo, G. and Reid, C. (2021), "Videotherapy and therapeutic alliance in the age of COVID-19", *Clinical Psychology and Psychotherapy*, Vol. 28 No. 2, pp. 409-421.
- Smail-Crevier, R., Powers, G., Noel, C. and Wang, J. (2019), "Health-Related internet usage and design feature preference for E-Mental health programs among men and women", *Journal of Medical Internet Research*, Vol. 21 No. 3, p. e11224.
- Stawarz, K., Preist, C. and Coyle, D. (2019), "Use of smartphone apps, social media, and web-based resources to support mental health and well-being: online survey", *JMIR Ment Health*, Vol. 6 No. 7, p. e12546.
- Stern, E., Breton, Z., Alexaline, M., Geoffroy, P.A. and Bungener, C. (2024), *Redefining the Relationship in Digital Care: A Qualitative Study of the Digital Therapeutic Alliance*, L'Encéphale.
- Stiles, W.B., Reynolds, S., Hardy, G.E., Rees, A., Barkham, M. and Shapiro, D.A. (1994), "Evaluation and description of psychotherapy sessions by clients using the session evaluation questionnaire and the session impacts scale", *Journal of Counseling Psychology*, Vol. 41 No. 2, pp. 175-185.
- Sung, J.Y., Bugatti, M., Vivian, D. and Schleider, J.L. (2023), "Evaluating a telehealth single-session consultation service for clients on psychotherapy wait-lists", *Practice Innovations*, Vol. 8 No. 2, pp. 141-161.
- Tacca, C. (2022), *The Development of a Common Factors Based Virtual Reality Therapy System for Remote Psychotherapy Applications*, B.S, Bucknell University, Lewisburg, PA.
- Tarquinio, C., Brennstuhl, M.-J., Rydberg, J.A., Bassan, F., Peter, L., Tarquinio, C.L., Auxemery, Y., Rotonda, C. and Tarquinio, P. (2021), "EMDR in telemental health counseling for healthcare workers caring for COVID-19 patients: a pilot study", *Issues in Mental Health Nursing*, Vol. 42 No. 1, pp. 3-14.

- Van Dalen, M., Pasmans, S.G.M.A., Aendekerk, E.W.C., Mathijssen, I.M.J., Koudstaal, M.J., Williamson, H., Hillegers, M.H.J., Utens, E.M.W.J. and Okkerse, J.M.E. (2022), "Acceptability and feasibility of an online psychosocial intervention for Dutch adolescents with a visible difference: a mixed-methods study", *Body Image*, Vol. 41, pp. 298-307.
- Van Doorn, M., Nijhuis, L.A., Egeler, M.D., Daams, J.G., Popma, A., Van Amelsvoort, T., Mcenery, C., Gleeson, J.F., Öry, F.G., Avis, K.A., Ruigt, E., Jaspers, M.W.M., Alvarez-Jimenez, M. and Nieman, D.H. (2021), "Online indicated preventive mental health interventions for youth: a scoping review", *Frontiers in Psychiatry*, Vol. 12.
- Van Gaans, D. and Dent, E. (2018), "Issues of accessibility to health services by older Australians: a review", *Public Health Reviews*, Vol. 39 No. 1, p. 20.
- Van Orden, M.L., Kraaijeveld, J.C., Spijker, A.T., Silven, A.V., Bonten, T.N., Chavannes, N.H. and Van Dijke, A. (2022), "Preliminary effects of a digital mental health intervention for depression and anxiety", *Clinical eHealth*, Vol. 5, pp. 44-51.
- Villarreal-Zegarra, D., Alarcon-Ruiz, C.A., Melendez-Torres, G.J., Torres-Puente, R., Navarro-Flores, A., Cavero, V., Ambrosio-Melgarejo, J., Rojas-Vargas, J., Almeida, G., Albitres-Flores, L., Romero-Cabrera, A.B. and Huarcaya-Victoria, J. (2022), "Development of a framework for the implementation of synchronous digital mental health: realist synthesis of systematic reviews", *JMIR Mental Health*, Vol. 9 No. 3, p. e34760.
- Wahle, F., Bollhalder, L., Kowatsch, T. and Fleisch, E. (2017), "Toward the design of Evidence-Based mental health information systems for people with depression: a systematic literature review and Meta-Analysis", *Journal of Medical Internet Research*, Vol. 19 No. 5, p. e191.
- Walker, E.M. (2021), "Single-session growth mindset intervention as a precursor to school mental health services for rural youth: a pilot study", Doctoral dissertation, Appalachian State University.
- Wei, Y., Zheng, P., Deng, H., Wang, X., Li, X. and Fu, H. (2020), "Design features for improving mobile health intervention user engagement: systematic review and thematic analysis", *Journal of Medical Internet Research*, Vol. 22 No. 12, p. e21687.
- Weiner, B.J., Lewis, C.C., Stanick, C., Powell, B.J., Dorsey, C.N., Clary, A.S., Boynton, M.H. and Halko, H. (2017), "Psychometric assessment of three newly developed implementation outcome measures", *Implementation Science*, Vol. 12 No. 1, p. 108.
- Welsh, E.T., McIntosh, J.E., Vuong, A., Cloud, Z.G., Hartley, E. and Boyd, J. (2023), "Digital mental health platforms for family member co-completion: how do they work? A scoping review", *Journal of Medical Internet Research*.
- Williams, K., Fildes, D., Kobel, C., Grootemaat, P., Bradford, S. and Gordon, R. (2021), "Evaluation of outcomes for help seekers accessing a pilot SMS-based crisis intervention service in Australia", *Crisis*, Vol. 42 No. 1, pp. 32-39.
- Witmer, B.G., Jerome, C.J. and Singer, M.J. (2005), "The factor structure of the presence questionnaire", *Presence: Teleoperators and Virtual Environments*, Vol. 14 No. 3, pp. 298-312.
- Wittenberg, E., Ferrell, B., Koczywas, M., Del Ferraro, C. and Ruel, N.H. (2018), "Pilot study of a communication coaching telephone intervention for lung cancer caregivers", *Cancer Nursing*, Vol. 41 No. 6, pp. 506-512.
- World Health Organization (2023), "The world health report 2001: mental disorders affect one in four people", available at: www.who.int/news/item/28-09-2001-the-world-health-report-2001-mental-disorders-affect-one-in-four-people (accessed 31 December 2023).
- Wright, J.H., Owen, J.J., Richards, D., Eells, T.D., Richardson, T., Brown, G.K., Barrett, M., Rasku, M. A., Polser, G. and Thase, M.E. (2019), "Computer-assisted cognitive-behavior therapy for depression: a systematic review and meta-analysis", *The Journal of Clinical Psychiatry*, Vol. 80 No. 2.
- Yardley, L., Spring, B.J., Riper, H., Morrison, L.G., Crane, D.H., Curtis, K., Merchant, G.C., Naughton, F. and Blandford, A. (2016), "Understanding and promoting effective engagement with digital

- behavior change interventions”, *American Journal of Preventive Medicine*, Vol. 51 No. 5, pp. 833-842.
- Zahiri Esfahani, M., Ahmadi, M. and Dehnad, A. (2020), “Design of psycho-educational web-based interventions for people with mental disorders: a systematic review”, *Journal of Technology in Behavioral Science*, Vol. 5 No. 4, pp. 345-356.
- Zheng, J., Gresham, M., Phillipson, L., Hall, D., Jeon, Y.-H., Brodaty, H. and Low, L.-F. (2024), “Exploring the usability, user experience and usefulness of a supportive website for people with dementia and carers”, *Disability and Rehabilitation: Assistive Technology*, Vol. 19 No. 4, pp. 1369-1381.
- Zhou, X., Edirippulige, S., Bai, X. and Bambling, M. (2021), “Are online mental health interventions for youth effective? A systematic review”, *Journal of Telemedicine and Telecare*, Vol. 27 No. 10, pp. 638-666.
- Zhu, S., Tse, S., Chan, K.L., Lee, P., Cheng, Q. and Sun, J. (2023), “Examination of web-based single-session growth mindset interventions for reducing adolescent anxiety: study protocol of a 3-arm cluster randomized controlled trial”, *JMIR Research Protocols*, Vol. 12, p. e41758.
- Ziadni, M.S., Anderson, S.R., Gonzalez-Castro, L. and Darnall, B.D. (2021), “Comparative efficacy of a single-session ‘empowered relief’ videoconference-delivered group intervention for chronic pain: study protocol for a randomized controlled trial”, *Trials*, Vol. 22 No. 1, pp. 1-10.

Supplementary material

The supplementary material for this article can be found online.

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