ORIGINAL RESEARCH

A cognitive behavioural therapy smartphone app for adolescent depression and anxiety: co-design of ClearlyMe

S.H. Li[1]* , M.R. Achilles[2], S. Spanos[2], S. Habak[2], A. Werner-Seidler[2] and B. O'Dea[2]

[1]Black Dog Institute and School of Psychology, University of New South Wales, Sydney, New South Wales, Australia and
[2]Black Dog Institute, University of New South Wales, Sydney, New South Wales, Australia
*Corresponding author. Email: s.h.li@blackdog.org.au

Abstract

Adolescence is associated with heightened vulnerability to symptoms of depression and anxiety. In-person and computerised cognitive behavioural therapy (CBT) are effective treatment options, yet uptake and engagement remain low. Smartphone delivery of CBT offers an alternative, highly accessible method of delivering CBT. However, there is no freely available CBT smartphone application (app) specifically designed to reduce depression and anxiety symptoms in adolescents. The aim of this study was to design a new CBT smartphone app (ClearlyMe) that targets depressive and anxiety symptoms in adolescents. We engaged in a rigorous co-design process with adolescents ($n=36$), parents ($n=15$), and mental health professionals ($n=32$). Co-design involved: (1) discovery of users' needs, views and preferences by conducting focus groups, (2) defining app features through ideation workshops and user consultations, (3) designing therapeutic CBT content and visual features, and (4) testing prototypes. Users were involved at every step and the process was iterative, with findings carried forward to ensure continued refinement of concepts and features. We found a preference for vibrant, cheerful colours and illustrations and non-endorsement of gamification and chatbots, which contrasted with findings from other studies. Preferences were largely consistent between the three user groups. However, adolescents preferred an app that could be used autonomously without professional support, whereas mental health professionals desired a product for use as a therapy adjunct to support CBT skill development. The importance of co-design, and particularly the inclusion of all stakeholders throughout the entire co-design process, is discussed in relation to the design of ClearlyMe.

Key learning aims

(1) To understand the co-design process that underpins the development of a new CBT smartphone app for youth with elevated symptoms of depression and anxiety.
(2) To understand adolescent, parent and mental health professionals' key preferences regarding the features and functionality of a CBT smartphone app for adolescents with elevated symptoms of depression and anxiety.
(3) To understand how ClearlyMe has been designed as both a therapy adjunct and stand-alone program, and how it can be incorporated into day-to-day clinical practice.

Keywords: adolescent; anxiety; co-design; cognitive behavioural therapy; depression; smartphone application

Introduction

Adolescence is a key period of human development that corresponds with greater vulnerability to symptoms of depression and anxiety when compared with all other age groups (Weinberger *et al.*, 2018). Worldwide, the current prevalence rates of clinically elevated depressive and anxiety symptoms among adolescents are 25% and 20%, respectively (Racine *et al.*, 2021). In addition to emotional upheaval, symptoms of depression and anxiety reduce a young person's social and academic functioning, hindering their potential for a fulfilling and productive life (Lawrence *et al.*, 2015; McGorry and Goldstone, 2011; Patel *et al.*, 2007). Access to effective and high-quality early intervention and treatment is critical to reduce symptoms, prevent the exacerbation of illness, and expediate recovery. Cognitive behavioural therapy (CBT) is a structured, skills-based psychological intervention that alters the unhelpful patterns of thinking, feeling and behaving that characterise depression and anxiety (Southam-Gerow and Kendall, 2000). Traditionally delivered in-person by trained professionals, CBT is the gold-standard approach for symptom reduction for these illnesses and is supported by a significant evidence-base (Compton *et al.*, 2004; Curry, 2014; Southam-Gerow and Kendall, 2000). However, a full course (i.e. 12–18 sessions) of CBT is intensive and requires significant commitment (Barlow *et al.*, 2010; Zinbarg *et al.*, 2006). It has been estimated that more than 60% of youth with poor mental health are reluctant to engage with professional treatment (Mission Australia, 2014). Barriers related to accessibility, stigma, negative beliefs about treatment and a preference for autonomy significantly impact young people's abilities to seek help for their mental health (Aguirre Velasco *et al.*, 2020; Gulliver *et al.*, 2010; Radez *et al.*, 2021).

Due to increased computer ownership, in-person CBT has been adapted to computerised delivery to overcome many treatment barriers by providing accessible, anonymous, cost-effective, flexible, and less stigmatising access to treatment (Clarke *et al.*, 2015; Hollis *et al.*, 2020; Kauer *et al.*, 2014). Computerised CBT typically consists of automated, self-directed sessions on core therapeutic elements, such as psychoeducation, cognitive restructuring and behavioural activation, delivered sequentially via web-based programs at weekly intervals. Computerised CBT for symptoms of depression and anxiety in children and adolescents has been shown to be effective (Clarke *et al.*, 2015; Ebert *et al.*, 2015; Grist *et al.*, 2019; Hollis *et al.*, 2017), with clinical guidelines now recommending computerised CBT as a feasible first-line intervention for mild illness in this age group (Wise, 2019). However, widespread uptake of computerised CBT has been low. Premature disengagement and non-completion are common problems (Calear *et al.*, 2009; Lillevoll *et al.*, 2014), with many users unlikely to receive a sufficient therapeutic dose (Hollis *et al.*, 2017). While use supported by a parent, coach or clinician may benefit treatment adherence (Bennett *et al.*, 2019), computerised CBT remains under-utilised for addressing the worldwide treatment gaps in youth mental health.

Notably, poor engagement in computerised CBT does not appear to be due to insufficient motivation in young people to improve their mental wellbeing. Young people have indicated that many computerised CBT programs developed by academics do not reflect the same appeal as newer commercially developed products, such as smartphone applications (apps). Specifically, young people have described some of the existing evidence-based computerised CBT programs as boring and laborious, of low technical quality, unappealing aesthetically, lacking personalisation, and containing content that is not age-appropriate (Garrido *et al.*, 2019b). In contrast, commercially developed mental health smartphone apps attract millions of downloads and several thousand monthly active users (Carlo *et al.*, 2020). Users of two popular meditation apps, Headspace and Calm, account for more than half of all users of depression and anxiety apps (Wasil *et al.*, 2019). Although commercially developed apps appear to generate higher levels of uptake and use, most of these apps rarely contain all core elements of CBT, such as exposure and cognitive restructuring (Wasil *et al.*, 2019). Several of these apps also lack sufficient evidence of effectiveness, particularly in symptomatic youth

(Bry *et al.*, 2018; Grist *et al.*, 2017). A recent systematic review found only 12 studies that evaluated smartphone-based interventions for internalising disorders in adolescents. Only three of these interventions were based on CBT and none were apps for depression or anxiety disorders or symptoms (Buttazzoni *et al.*, 2021). Smartphones provide unceasing access to software, internet and multimedia functionality. This attribute, coupled with almost universal ownership (Anderson and Jiang, 2018) and increasing integration into daily life (Bhattacharya *et al.*, 2019) position smartphones as a promising, and largely unexplored, avenue to deliver CBT to adolescents.

The importance of co-design and co-creation in digital mental health

One method to promote the acceptability of new interventions is to engage users in the design process. Co-design aims to establish end-users' needs and preferences and ensures that intervention content, features and aesthetics align to these. For young people, this involves ensuring the intervention is appealing, age-appropriate, relatable and suitable to their lifestyle (Garrido *et al.*, 2019b; Liverpool *et al.*, 2020; Thabrew *et al.*, 2018). Co-design is common in commercial technology (Steen *et al.*, 2011) and is associated with greater end-user engagement in final products (e.g. WeClick and iBobbly; O'Dea *et al.*, 2018; Tighe *et al.*, 2017). However, a recent review indicated that more than 70% of preventative digital mental interventions for young people did not report on users' involvement in their design and development (Bergin *et al.*, 2020). Inadequate collaboration with youth and other end-users may produce inferior and less appealing products.

Interventions that have resulted from co-design processes show some degree of consistency regarding the needs and preferences of youth (Kenny *et al.*, 2016; Stoyanov *et al.*, 2021; Werner-Seidler *et al.*, 2017). Specifically, young people's feedback on digital mental health prototypes has consistently indicated that they endorse aspects such as trustworthy design and content, engaging and interactive features, gamification, ease of use, personalisation and customisability, security and privacy, ability to access and use independently, social interaction, and visual appeal (Kenny *et al.*, 2016; Stoyanov *et al.*, 2021; Werner-Seidler *et al.*, 2017). However, to capitalise on the potential of digital health interventions in addressing treatment gaps, it is critical to also include those supporting adolescent care in the co-design process. For example, in-person CBT programs commonly involve parents suggesting a CBT smartphone intervention may benefit from parental involvement (Cardy *et al.*, 2020). Furthermore, involving parents in the design of a smartphone app is particularly relevant for addressing concerns around excessive screen time and its potential negative impacts on mental health (Twenge and Campbell, 2019). It is also critical to include mental health professionals. While many mental health professionals do not consider computerised CBT to be a suitable replacement for in-person therapy, they have shown an increasingly positive attitude towards using technology as a therapy adjunct (Cliffe *et al.*, 2020). Smartphone apps are viewed as particularly beneficial to support and consolidate in-session learning and CBT skill development (Gindidis *et al.*, 2020). Yet, many mental health professionals are uncertain about the safety and reliability of digital interventions and lack the knowledge to effectively integrate them into their practice (Cliffe *et al.*, 2020; Donovan *et al.*, 2015). Involving mental health professionals in the co-design process may address these limitations and help to improve acceptability and uptake of digital interventions in clinical care for youth mental health. To this end, adolescents, parents and mental health professionals must all be involved in the co-design process.

A CBT smartphone app that is co-designed with all relevant end-users and of equivalent quality to commercial products may improve uptake and engagement in this gold-standard treatment and transform access to CBT in an increasingly digital world. However, we are unaware of such a product. Furthermore, while although many papers report that young people endorse
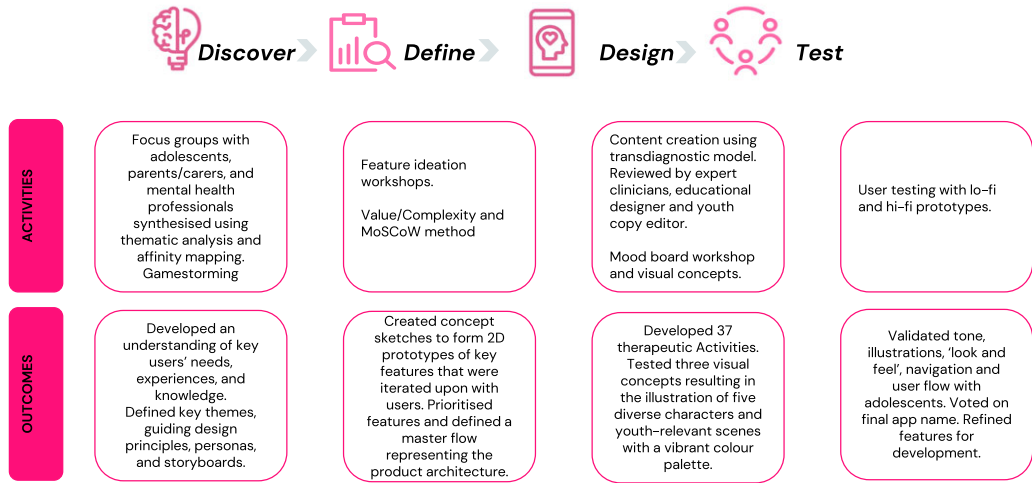
Figure 1. The four steps of the co-design process and their associated activities and outcomes.

interactivity in digital programs, there is little guidance or deeper exploration of what this means for intervention design and development. Given young people's ever-evolving digital needs and preferences, and the paucity of CBT smartphone apps developed for and evaluated among adolescents and other key stakeholders (Buttazzoni *et al.*, 2021; Grist *et al.*, 2019), we aimed to create a new smartphone app (called ClearlyMe) that delivers CBT to reduce elevated symptoms of depression and anxiety in adolescents aged 12 to 17 years.

Aims

The purpose of this paper is to outline the co-design process for the creation of ClearlyMe. Our approach was informed by the co-design literature (Bevan Jones *et al.*, 2018; Hagen *et al.*, 2012; Thabrew *et al.*, 2018). We incorporated methods employed routinely in digital product design while maintaining the over-arching objective of delivering CBT via one's smartphone. The outcomes of our co-design process will guide researchers and clinicians in the co-design of digital mental health interventions and provide CBT practitioners with insights into the rigorous process underlying the design of ClearlyMe.

Method

Research plan

Our approach adhered to the principles of co-design using recommendations and methodologies described by Thabrew *et al.* (2018) and Bevan Jones *et al.* (2018). The goal was to understand and accommodate the needs and preferences of users at every stage of the design process. This ensured an iterative design approach that continually modified the program according to the user group's ideas, preferences and feedback. Our approach consisted of four steps: (1) *Discover* – focus groups with adolescents, parents/guardiansand mental health professionals, (2) *Define* – feature development, feature prioritisation and site mapping, (3) *Design* – visual design and content design, and (4) *Test* – prototyping and user testing. Users were actively involved in each step. Figure 1 presents the co-design process and associated activities. The project team consisted of mental health researchers, mental health clinicians, user experience (UX) designers, visual and educational designers, an illustrator and a copy editor.

Participants

Adolescent participants included English-speaking youth aged between 12 and 17 years old with access to the internet. Parents or guardians included English-speaking primary carers of any young person aged 12–17 years, with access to the internet. No criteria related to current mental health status or treatment experience determined inclusion for adolescents or parents/guardians. While the intended users of ClearlyMe are young people with elevated symptoms, the co-design framework used in this study advises against restrictive recruitment to ensure that a broad range of potential user views contribute to the design process. As such, we recruited a community sample of adolescents and parents to ensure individuals with a range of lived experience were involved. This ensured we included adolescents who did not self-identify as having depressive or anxiety symptoms or a current need for mental healthcare (despite being potentially symptomatic) and adolescents and parents with indirect mental health experiences such as caring for siblings or friends experiencing symptoms. Mental health professionals included any registered, currently practising health professional supporting the mental health of young people aged 12–17 years, English speaking, with access to the internet, and no criteria related to their current or past use of digital mental health products or services.

A total of 66 adolescents, 43 parents/guardians and 40 mental health professionals consented to participate. Of these, 36 (55%) adolescents, 15 (35%) parents/guardians and 32 (80%) mental health professionals took part. A total of 47 participants failed to select a session (reasons not sought) and 19 did not attend their scheduled session due to a change of mind or unavailability. Table 1 outlines participant characteristics. There was a higher number of females than males in all participant groups. In the adolescent sample, the majority were 15 years or older with a current or previous diagnosis of a mental illness. Two-thirds had moderate to high levels of psychological distress.

Procedures

Participants were recruited from Australia between May and December 2020 using social media advertisements, the Black Dog Institute 'Participate in research' webpage, and by emailing recruitment notices to existing stakeholder networks, including youth and mental health professional organisations. Potential participants were invited to 'help us to design a digital mental health and wellbeing program' and instructed to visit the study webpage. The study webpage provided a summary of the study activities (i.e. completion of an online survey, focus groups, online sessions and prototype testing) and the inclusion criteria for the participant groups. Eligibility to participate and demographic information were assessed by an online Qualtrics survey. The Kessler 6 scale (K6), a validated measure of psychological distress in adolescent samples (Ferro, 2019) and predictor of probable mental illness (Kessler *et al.*, 2003), was also administered to adolescent participants. Participants selected their preferred session time from a list of options, which was confirmed by the research team via email. Email reminders were sent a day prior to the scheduled session and contained session information, teleconference instructions, and a guide to group etiquette. SMS reminders containing the teleconference link were sent one hour prior to the session. Consistent with co-design procedures (Hagen *et al.*, 2012; Thabrew *et al.*, 2018), it was intended that participants would complete all co-design sessions. However, due to attrition we instigated rolling recruitment to ensure that an adequate number of participants took part in each co-design session. As such, not all participants took part in every co-design activity. Participants were reimbursed 30AUD for each session attended.

Table 1. Participant characteristics

Demographic	Value
Young people (*n*=36)	
Age (years)	
Mean (*SD*; range)	14.94 (1.3; 12–16)
15 years and older, *n* (%)	25 (69.4)
Younger than 15 years, *n* (%)	11 (30.6)
Gender, *n* (%)	
Female	23 (63.9)
Non-binary	2 (5.6)
Born in Australia, *n* (%)	30 (83.3)
Aboriginal and/or Torres Strait Islander, *n* (%)	2 (5.6)
K6[a] score	
Mean (*SD*; range)	10.2 (5.5; 1–23)
High psychological distress, *n* (%)	12 (33.3)
Moderate psychological distress, *n* (%)	11 (30.6)
Low psychological distress, *n* (%)	13 (36.1)
Current or previous diagnosis of a mental illness, *n* (%)	22 (61.1)
Knew someone with a mental illness, *n* (%)	32 (88.9)
Cared for someone with a mental illness, *n* (%)	10 (27.8)
Employed casually or part-time, *n* (%)	10 (27.8)
Residential location, *n* (%)	
Major cities of Australia	21 (58.3)
Inner regional Australia	13 (36.1)
Outer regional Australia	1 (2.8)
Remote Australia	1 (2.8)
Owns a personal smartphone, *n* (%)	34 (94.4)
Time spent using the internet or smartphone apps, *n* (%)	
Less than 1 hour a day	3 (8.3)
Between 1 and 3 hours a day	8 (22.2)
Between 3 and 5 hours a day	11 (30.6)
More than 5 hours a day	14 (38.9)
Parents/guardian (*n*=15)	
Age (years)	
Mean (*SD*)	46.3 (4.0)
Range	40-52
Gender (female), *n* (%)	13 (86.7)
Born in Australia, *n* (%)	10 (66.7)
Residential location, *n* (%)	
Major cities of Australia	10 (66.7)
Inner regional Australia	4 (26.7)
Outer regional Australia	1 (6.7)
Number of children under 18 years	1.93 (1.0)
Has a child/children with a mental health condition/s, *n* (%)	12 (80.0)
Mental health professionals (*n*=32)	
Age (years)	
Mean (*SD*)	38.7 (10.4)
Range	22–62
Gender (female), *n* (%)	26 (81.3)
Born in Australia, *n* (%)	21 (65.6)
Residential location, *n* (%)	
Major cities of Australia	26 (81.3)
Inner regional Australia	5 (15.6)
Outer regional Australia	1 (3.1)
Employed full-time in current role, *n* (%)	19 (59.4)
Psychologist	10
General practitioner	10
Other (psychiatrist, dietician, play therapist, social worker, allied health, nurse)	12
Years of experience as health professional, mean (*SD*)	
Psychologist	5.7 (6.1)
General practitioner	19.7 (10.7)
Other	4.8 (5.4)
Trained in adolescent mental health, *n* (%)	20 (62.5)

[a]K6, Kessler 6 Psychological Distress.

Step 1: Discover

A series of focus groups was conducted to establish the foundations for the app development and test initial assumptions about the suitability of this approach for delivering CBT. All focus group sessions were conducted using Zoom videoconferencing software. Sessions were conducted separately for each participant group. Each session contained up to six participants, was 60–90 min in duration and facilitated by two team members, including one clinical psychologist (S.H.L.). When two or less participants attended, the session was attended by only one team member. A semi-structured focus group guide was developed collaboratively with the project team to ensure key research and design objectives were addressed (see Supplementary material, item 1). The interview schedule was dynamic and iterative such that feedback from initial focus groups informed the approach used in subsequent groups. The guide included prompts to elicit discussion about adolescents' general technology use, problem areas and mental health experiences, their health-related and mental health help-seeking behaviours, views and opinions regarding current mental health support options, and views on currently available digital mental health tools. Adolescents were specifically asked about their preferences regarding pathways to accessing mental health support, and digital mental health program preferences. Mental health professionals were specifically asked about digital tools currently used in the delivery of therapy, the limitations of these, and dissemination barriers. Audio was recorded and automatically transcribed by Zoom. A total of 23 concurrent focus groups were conducted, six with adolescents, nine with parents/guardian and eight with mental health professionals.

A thematic analysis approach was used to analyse the data (Braun and Clarke, 2006). This analysis was predominantly deductive as the interpretation was focused on understanding users' needs and preferences and was informed by the research team's previous research and related theoretical frameworks (Garrido *et al.*, 2019b; Jeminiwa *et al.*, 2019; O'Dea *et al.*, 2018; Werner-Seidler *et al.*, 2017). However, an inductive analysis was also employed to provide a richer analysis of the data (Braun and Clarke, 2006). Researchers (M.R.A. and S.S.) listened to the dataset of audio to perform an accuracy check of the transcripts. Incorrect words were marked and replaced on the transcript as the researchers listened to the audio. Transcript errors included misinterpreted words and grammar. These errors were influenced by poor quality audio, technical issues, misinterpretation of uncommon words, and participants speaking over each other. Changes were made to less than 5% of the transcripts. The accuracy check also contributed to the first phase of the thematic analysis as researchers began their familiarisation of the dataset and compiled initial ideas for themes and codes. In parallel to the thematic analysis, the UX designers analysed the entire audio dataset using an affinity diagram method (Dam and Siang, 2020). This method organised participants' responses into natural groupings and design ideas that could be translated into program features (Dam and Siang, 2020). Together, the team then discussed and generated a set of codes that represented the data. This collaborative approach helped support the validity of the analysis (Patton, 1999). The adolescent, parent, and mental health professional data were then coded systematically by one researcher (M.R.A.) who first applied the codes to the data extracts and then synthesised these into broader themes. Following this, two researchers (M.R.A. and S.S.) discussed and confirmed the high-level themes. To further support the coding reliability, 50% of the adolescent transcripts were independently double coded (S.S.). This process was repeated for the parent and mental health professional datasets (S.H.). For the parent data set, a deductive approach was used to triangulate the themes with those identified in the adolescent interviews and identify additional relevant themes. As such, the adolescent and parent results are reported together. Discrepancies were discussed (M.R.A., S.H.L., S.H. and S.S.) and final themes were confirmed. The themes were then used to generate design principles, personas and storyboards to guide the design process. Personas serve as examples of key end-users' behaviours, goals, motivations and attitudes, and help to ensure that

Figure 2. Crazy Eights activity during the concept ideation workshop.

end-users remain central in the design. Storyboards display users' experience with a product and are a tool that is used to highlight which features are most important.

To validate the identified themes and ensure new themes were not identified, additional sessions were conducted with adolescents using a set of UX activities called 'gamestorming'. Sessions were recorded and transcripts were reviewed applying the code generation in the initial thematic analysis. In the first activity, Product Pinocchio, adolescents were asked to personify the product by imagining it had come to life and had a fully formed character (Gray, 2011a). They were then asked to respond with adjectives and phrases to the following five questions in relation to the product's character: (1) what am I like?; (2) what are my values?; (3) what is my community?; (4) what makes me different?; and (5) what is my fight (i.e. mission and motivation)? In the second activity, Speedboat, adolescents were asked to identify obstacles to their wellbeing and barriers preventing goal attainment (Gray, 2011b).

Step 2: Define

The focus of this step was app feature development, prioritisation and site mapping. The gamestorming sessions were followed by a team ideation workshop that aimed to develop app features based on the insights from the focus groups and gamestorming activities. The Crazy Eights method (Levey, 2016) was used, whereby the team were asked to sketch eight distinct ideas in eight minutes (see Fig. 2). The goal was to generate a wide variety of features that were subsequently voted on by the project team. The most popular features within the team were developed into 2D concept sketches (or 'paper prototypes') that were presented to the co-design participants. The concept sketches were refined based on participant feedback. Following the feedback, two methods were used to prioritise features for further refinement and ultimately to determine the features selected for inclusion in the final product. The first was a comparison of the feature's value (i.e. contribution to achieving the objectives of the intervention) with the complexity of the feature's build, whereby features with higher value and lower complexity were prioritised. The MoSCoW method was then used to reach consensus. MoSCoW is an acronym for must-have, should-have, could-have, and will not-have right now, with each denoting a category of prioritisation (ProductPlan, n.d.). Prioritisation was determined based on the value and complexity of the feature, budgetary

constraints, and IT development capacity. These two prioritisation methods were also used in circumstances where a feature was endorsed by one user group but not another to either identify the need for feature refinement or to facilitate decision making regarding the inclusion or exclusion of that particular feature. A responsive sitemap (or 'master flow') was constructed to present the selected features. The master flow was refined throughout the remaining co-design activities.

Step 3: Design

The last step consisted of further refinement of the selected app features through the design and incorporation of the CBT content and the finalisation of the visual identity. Content was initially developed by the team's clinical psychologist (S.H.L.) based on Barlow's Unified protocol for the treatment of emotional disorders (Barlow *et al.*, 2010). A transdiagnostic treatment approach ensured that the program would be appropriate for a range of different emotional disorders and did not require the adolescent to have an established diagnosis or set of identified symptoms. A team workshop was then used to determine how to present the CBT content in a way that adhered to the established design principles. The content was then reviewed by a panel of experts and an educational designer to validate the therapeutic quality and ensure learning objectives were met. A copy editor also reviewed the content to ensure the tone was consistent with the design principles. To develop the visual identity, a mood-boarding workshop was held with the project team. Three visual concepts were then developed and presented to adolescents for feedback. The visual concepts were: (1) collaged, vibrant photography, (2) illustrative colourful portraits, and (3) calming, scenic illustrations. Based on feedback, one visual concept was selected to refine, with the illustrations presented to adolescents in a small survey to determine preferences and gain further feedback. A second small survey was conducted to select the product name. In the survey, users were presented with mock app images and short descriptions of the app's purpose. They were then asked to rank a short list of potential app names or suggest their own.

Step 4: Test

Finally, a low-fidelity clickable prototype was built. This simulated the final product and provided a visual representation of the app interface. It allowed for an assessment of the concept design, usability and intuitive navigation. The clickable prototype was then presented to adolescents for user testing. This involved individual interviews using a 'think out loud' approach. For the low-fidelity prototype, the goal was to identify non-intuitive UX/UI and assess the concept design. Feedback was used to iterate features, illustrations and content and were used to develop the high-fidelity prototype. The high-fidelity clickable prototype incorporated more detailed visual and interactive features. The same user testing processes were used to examine the high-fidelity prototype. Only adolescent participants took part in this final step as they were deemed to be the end-users of the product, with the content and functionality specifically designed for their individual use.

Results

Step 1: Discover

Adolescents and parents' thematic analysis outcomes

Overall, five key themes were identified from the focus group session. These included: (1) drivers of digital behaviours and attitudes, (2) online safety and risks, (3) program preferences, (4) support to use the program, and (5) help-seeking barrier and facilitators. The themes, subthemes and concepts, including exemplar quotes, and their implications on product design

are outlined in Table 2. The themes identified from the gamestorming activities were consistent with the themes identified from the focus groups. No new themes were identified during gamestorming.

Mental health professionals' thematic analysis outcomes

Overall, eight key themes were identified from the focus group sessions. These included: (1) the main issues facing young people, (2) barriers to help-seeking, (3) application design, (4) program preferences, (5) clinical content preferences, (6) support to use the program, (7) dissemination via mental health professionals, and (8) barriers to app use. These key themes and the subthemes that emerged from the interviews and groups, along with their implications for product design, are summarised in Table 3.

Key design principles

The key design principles devised by the design team are presented in Fig. 3.

Personas and story boarding

Two adolescent, two parent/carer and one mental health professional personas were created (Supplementary material, item 2). Two adolescent storyboards with potential app features were also created (Supplementary material, item 3). These represented two types of adolescent users that were identified during the focus groups: first, younger adolescents (12–13 years) who tended to have less experience with mental health concerns and services and who were more likely to seek help from parents or a trusted adult; second, older adolescents (16–17 years) who may have been experiencing deteriorating mental health for a longer period and preferred self-reliance and seeking help from friends rather than parents or adults.

Step 2: Define

The Crazy Eights activity and subsequent vote by the project team resulted in the following seven features being developed into 2D paper prototypes for testing: audio content and video tutorials, calming home screen graphics, swipe cards for questions and quizzes, an online mental health question and answer forum, a chatbot, and the ability to share content with a mental health professional. These can be viewed in Supplementary material item 4. Based on user feedback, the following features were validated: dashboard layout for app homepage, swipe cards for quizzes/questionnaires, using text, video and audio content to maintain attention, displaying the Black Dog Institute logo for credibility, personalisation of content to ensure relevance, mood tracking, and including relatable stories from other young people. The chatbot feature was not endorsed by adolescents, whereas the ability to directly contact a mental health professional was not endorsed by mental health professionals. Prioritisation of features resulted in the following master flow of key features: registration, onboarding, dashboard, upper navigation bar (including sections on how to Get Help, Information about the Black Dog Institute), and lower navigation bar (including navigation tabs to dashboard, mood check feature, full content library, progress, and personal profile).

Step 3: Design

Content development

The most frequently preferred product name in the short survey was ClearlyMe, which was selected as the app name. Based on the workshop, the transdiagnostic CBT content was adapted to be displayed using three templates: (1) quizzes, (2) multiple choice and (3) free

Table 2. Thematic analysis themes, example quotes and implications for design derived from the adolescent and parent focus groups

Theme and subthemes	Concepts	Examples	Implications for product design
1. Drivers of digital behaviours and attitudes			
Social connection and influence	Technology was beneficial for social interaction and connection. Choice of apps was influenced by peers, social media influencers and advertisements	'…the option to interact with people and talk…because they could be going through the exact same thing' YPVB86 '…you could type up some sort of issue … and get peer feedback and moderator feedback' PGRF35 '… I don't really know what it is, but my friend told me to download it' YPPL17 'If it's being advertised by like an influencer … then I'm just going to do it' YPIN41	• App may benefit from an interactive social feature but still enable passive consumption of content • Parents require professional moderation of content • Promotion campaigns should consider the role of influencers and peers • Include relatable stories or scenarios from other youth
Communication preferences	Use of techology for communication was dependent on who youth were communicating with, their mood and the subject matter	'I think…in a lot of cases, face-to-face conversations … can also be very, very awkward and that is avoided a lot in online' YPYG68 '… I feel like [online chats] … may not grasp your situation…lost in translation' YPTT62	• Guided support should align with youths' preferences for SMS and webchat
COVID-19	The global COVID-19 pandemic resulted in increased engagement in digital technology and brought youth mental health and digital support options into the spotlight	'. we're using technology more' YPBU15 'Everybody knows it's going to be tough post COVID for these kids; it's a whole new world' PGGV86 '…it's actually brought digital mental health to the fore' PGPY41	• Promotion campaigns could consider increased awareness of mental health concerns, and increasing digital technology use in young people • Reinforced the need for a digital program when face-to-face care is not possible
2. Online safety and risks			
Parents influence on digital use	Parents monitor and regulate technology use (e.g. smartphone ownership, permitting app downloads and usage restrictions), especially in younger adolescents. Smartphone ownership corresponded with increasing independence	'I can't download an app without my parents knowing about it… they can approve or disapprove it' YPBU15 'I had a few friends who held back giving their kids phones and stuff. And then they ended up being, you know, quite socially isolated' PGDK10	• Consider including information specifically for parents/guardians that reinforces the app's evidence-base and benefit

(*Continued*)

Table 2. (*Continued*)

Theme and subthemes	Concepts	Examples	Implications for product design
Concerns about technology use	Exposure to inappropriate/unreliable content, privacy violations, excessive screen time and its impact on sleep and mental health were concerns held by both adolescents and parents	'… there are safe resources to read, and there are blogs written by unqualified people' PGIE75 'Predators online and the impacts socially for young people' PGGV86 'It's just a habit and I kind of don't know how to get out of it, but I'm very conscious of the fact that it doesn't improve my quality of life' YPPC32	• Consider designing therapeutic content to be completed in time-limited, discrete modules with interactive content to circumvent excessive screentime • Professional moderation of user-generated content
Evaluating digital products and information	Credible products are those that are endorsed by credible sources, honest and transparent regarding their purpose, transparent about data collection and use, and ensure user privacy. Digital health tools are considered credible if they are also backed by science	'… being transparent, so people know what they're getting out of it' YPJA22 'If I feel like it's something that has been sponsored by a reputable organization, rather than The Mamma Mia website, then I'm going to feel better about it' PGIE75	• Consider demonstrating credibility by including the BDI logo and links to BDI website in the app • Ensure users can easily assess information to evaluate the program, including the apps primary purpuse, privacy policy, data collection and data usage
3. Program preferences – features, design, tone, content			

Flexible use and capacity for personalisation	Program use would depend on specific circumstances, such as mood, location, motivation or need for immediate support. A personalised experience and capacity to use autonomously is likely to facilitate use	'… having that personal experience makes you feel like valued as a person rather than you having to go seek help it's like someone wanting to help you' YPUL35	Consider:
			• Using inputted data to personalise the users experience
			• Modular rather than sequential delivery of content to allow self-navigation and exploration and content selection to suit individual needs and goals
			• Intuitive content delivery based on preferences or inputted data (mood rating)
			• Provide a sense of personalisation
			  o during onboarding by asking questions about what brings a user to the app
			  o linking lessons to other content (e.g. a lesson is recommended after a story is viewed, or moodcheck is completed)

Accessibility and functionality	Smartphone apps have important capabilities: accessible whenever and wherever, accessed	'having it there right then in the moment. It always helps a lot' YPIE58 'I do like apps that are not over complicated	• The program should be designed as a smartphone app, rather than computerised or webbased program to promote

(*Continued*)

Table 2. (*Continued*)

Theme and subtheme	Concepts	Examples	Implications for product design
	independently with confidence and a being easy to use and navigate	'... just like simple apps that are just really easy to access and use' YPBU15	accessibility • For ease of use, incorporate familiar interaction patterns commonly used in popular social media apps (e.g. swipe interactions)
Visual aspects and content delivery	Visual asthetics, content delivered in a variety of formats and novel, interactive content prevents boredom and encourages ongoing use and learning (and help-seeking)	'If the presentation of the app was really boring... [if] it was presented really poorly, I don't think anyone would want to download it' YPIY75 'I feel like a learn better when I'm getting taught by doing an activity, not just reading' YPAD90 'Daily updates and things like that make it more interesting and engaging' YPUL35	• Avoid excessive amounts of text • Use visual communication aids to suplement written information • Present content as text, audio tracks and videos • Include interactive activities and varied functionality to interact with content (e.g. swipe cards) • 'Release' novel content at prescribed intervals
Youth-friendly tone and relatable	A non-judgemental, conversational, youth friendly tone that presents relatable issues normalises adolescent experiences without trivialising them	'it makes you feel less bad if you can see that other people are going through the same thing, or they have the same exact questions' YPVB86 'Definitely hearing other people's stories, and seeing this has worked for other people' YPMB30	• App content reviewed by a youth copy editor to ensure a positive, conversation, youth friendly tone • Include scenarios and examples within the content that depict relatable situations • Continue to engage young people to provide feedback on the app validate the app's relatability • Ensure that the illustrated characters represent the diversity of young adolescents • Consider short messages with positive reinforcement on the loading screens, i.e. 'Great work!', 'Keep it up' and 'You're awesome' • The app can include 'stories' from other young people who have faced mental health challenges to normalise experiences and promote helpful strategies
Goals and tracking progress	Young people are motivated by programs that provide a sense of achievement through the completion of goal focussed activities and where progress is tracked	'you know you're progressing. It makes me feel like I've achieved something' YPIY75 'I want to win, the mentality that I want to try and do as best as I can' YPOJ40	• The app can show progress through the content by using a visual element to show completed content (e.g. greyed out, or check mark to indicate completion) • Instructions for app use can explicitly suggest goals for use duration and frequency

(*Continued*)

Table 2. (*Continued*)

Theme and subthemes	Concepts	Examples	Implications for product design
Content recommendations	Users want a mental health program that provides basic information about mental health symptoms and helps them maintain their wellbeing through practical coping strategies	'I think a big one is coping strategies on how to handle stuff' YPTT62 'practical aspects where people can actually do things to improve themselves' YPIE58 'how to find help, but also some really basic literature on what is depression and what is anxiety' PGIE75	• Goals for use can be supported by notifications and reminders to use the app • Content could include psychoeducation, practical strategies that can be implemented in the moment, stress relieving activities, and direct links to professional support • Including a variety of conent in the form of lessons and quick tips (i.e. mind hacks)
4. Support to use the program			
Clinician support and face-to-face integration	Therapist access to program inputs and progress would be beneficial to gain insights into the young persons mental state and for continuity of care but should be optional so privacy can be protected	'they can have a look and see if you're okay . . . if they have the time, they can contact us, or they can talk about it at the next session or something' YPLI30	• The app could include a feature where inputted data can be saved and shared • Implication for trial design – testing whether chat support is utilised and beneficial to a young person • Ability to see whether lessons have been completed • Include a library of content to allow clinicains to allocate lessons to suit their client's needs • Lessons can be liked or unliked which may facilitate conversation about where a client might need extra support to understand • Include a mood tracking feature if a young person wants to share with their therapist
Parents' involvement in a digital mental health program	Parents'/carers' involvement in a digital mental health program could be a barrier to the young person engaging in the program	'He would not want to do it if I was part of it. So, I think it's important that they [young people] know that it's confidential and your parents not involved in it because they won't open up' PGJQ70 'I would be quite happy for him to be looking at those things by himself' PGRF35	• Consider not including an active parent/ guardian treatment component in the app • Provide information about the app on a supplementary website so parents have information about how they might support their young person
5. Help-seeking barriers and facilitators			
Mental health stigma	Perceived mental health stigma prevents help seeking and engagement in mental health services	'I also feel like there's a lot of stigma around mental health … so young people would have trouble reaching out to get the help' YPOJ40	• Ensure app icon and name is not identifiable as a mental health product • Ensure notifications and reminders are not identifiable as mental health related

(*Continued*)

Table 2. (*Continued*)

Theme and subthemes	Concepts	Examples	Implications for product design
			• Validates the creation of a digital product that a young person can use autonomously and privately • Include content about where to seek help and ensure the tone is normalising • The app should maintain the young person's privacy with appropriate data management
Privacy, confidentiality, and anonymity	Digital programs afford privacy and anonymity mitigating concerns about being judged, feeling awkward or embarrassed	'Safe place in that you can bring up what you want … with some things it might just feel like it's easy to not bother someone with something that might be silly … or even something that you're just unsure of how they'll react to it' YPTT62	
Independent symptom management	Young people prefer to research online and try and understand how they can help themselves independently before reaching out to others. Professional help is only sought when others recognise their need for help, or symptoms become severe	'There's people, kind of like me, that bottle it up for a while and then realise that they needed help and needed to talk someone to someone' YPLI30 'I will definitely seek digital help first online and then if it's getting really bad then like professional help from psychologists and stuff like that' YPJM85 'I would try and fix it myself before I tell anyone else' YPOJ40	• The app should contain content that is comprehensive enough for effective mild/moderate symptom management • The app should contain information on accessing professional or mental health crisis support

Table 3. Thematic analysis themes, example quotes and implications for design derived from the mental health professional focus groups

Themes and subthemes	Concept	Examples	Implications for product design
1. Main issues affecting young people			
Mental health	Rates of anxiety and depression are rising in adolescents	'I'm certainly seeing a great deal more young people experiencing symptoms of anxiety and depression' MHPHX53 'I'm just seeing this massive anxiety in young people that I never saw a number of years ago' MHPPM78	• Therapeutic content should target depression and anxiety
Relationship difficulties	Family and friendship relationship difficulties are common in adolescents	'If you're working with young people [there's] lots of relationship issues with friends and family members' MHPOK92	• Consider including references to relationship difficulties and use as examples
School stressors	School-related stress, pressure to succeed and fear of failure have a significant impact on adolescents	'They're fearful they'll do bad in a test' MHPYU92 'their future depends on it, and all this, huge amounts of pressure being put on young people … year 5, year 6 and younger' MHPYG10	• Consider including references to school stress and use as examples
Identity and sexuality	Development of identity and confusion about their place in the world is important during adolescence	'A big part of that developmental stage is establishing your identity and that idea there's a bit of confusion of your place in the world and uncertainty. And what's my future going to look like … you know, what's the meaning of all of this. We often see that in the teenagers' MHPYU92	• Could represent diverse gender, cultural and abilities in illustrations • Incorporate content that relates to young people's desire to understand who they are – their developing sense of identity and values
2. Barriers to help seeking			
Shame and stigma	Smartphone apps that afford private use, will be beneficial to address perceived shame and stigma stemming from peers, family or cultural groups	'Culturally, some children don't want their parents to be involved because of the stigma around anxiety or depression' MHPNQ90	• Ensure the tone of the app is non-judgemental and normalises distress
Self-referral	Many young people choosing to disengage with mental health services, or to self-refer without the involvement of parents	'They quite often feel intimidated or scared to talk to their parents about what they are experiencing, which is a real concern' MHPNQ90	• Consider not including an active parent/guardian treatment component in the app. But could include information targeting parents that young people can share if desired (e.g. on the app website).
Falling through the cracks	Online interventions that are accessible to students who are not receiving professional	'I think there is a lot of kids that fall through the cracks … unless they come and tell you	• Consider a feature that allows user to share the app with friends as a means of reaching non-help seekers

(*Continued*)

Table 3. (*Continued*)

Themes and subthemes	Concept	Examples	Implications for product design
Financial barriers	advice are needed as many adolescents do not receive help in larger schools Cost of programs limits accessibility and potential for recommendation by mental health professionals	what's going on, you've really got no idea' MHPNQ90 'I don't know if they [young people] can afford to pay for apps or it just, it's really hard to convince somebody sometimes to pay for apps, especially when a service is free as well. So they come in, they get a free service and then we're saying, hey, it's been $20 not $20 but you know what I mean. I find that that's a big barrier' MHPNC61 'When you're recommending it if it's going to take a lot of time or they're going to need data or if there's a financial barrier to it. It's another hinderance to the young person accessing it' MHPOK92 'It's always difficult to fund these programs. And also, I guess, to get into the schools' MHPCQ85	• Ensure the app is free (or minimal cost)
3. Application design			
Aesthetic and accessibility	MHP would recommend programs that are easy, engaging and quick to use, with brief content and a colourful, modern and interactive design	'I think capitalizing just on what's current at the moment. So if Tik Tok is current… how can you incorporate that into the application' MHPPN44 'I've found [YouTube videos] can be quite helpful … just 30 seconds long to explain concepts can be easier than the different worksheets for some of the kids' MHPRX51	• Ensure app is easy to use, and the design is modern and aesthetically pleasing • Consider incorporating familiar interaction patterns commonly used in popular social media apps (e.g. swipe interactions) • Consider delivering content using interfaces and functionality from popular apps, e.g. of short videos
Difficulty	If the program contained content that was either too simplistic or too difficult, or provoked distress it would not be endorsed	'I don't want to give them something that I feel like it's going to be setting them up to fail…' MHPSU91 'Sometimes they [digital programs] can be a bit too simplistic. So kind of talking down to kids' MHPRX51	• Ensure content is age appropriate and adequate instructions are provided to support the completion of activities • Considering incorporating a guided approach where in-person support to use the program is available
4. Program preferences			
Visual components	Visual components, such as interactive videos that explained complex information, would assist young people in remaining engaged	'So I'm on YouTube, just finding whatever I can to illustrate a concept, and I like just having it to mix it up because they disengage so quickly' MHPYU92	• Consider including short, succinct and appealing visual components include videos • Consider including diagrams and illustrations/

(*Continued*)

Table 3. (*Continued*)

Themes and subthemes	Concept	Examples	Implications for product design
			illustrated scenarios throughout content to support learning • Consider including a feature where adolescents can interact with their peers
Peer connectedness and rapport	Encouraging social connectedness and interaction with peers is important	'I think especially for that age group, the 12 to 18, those peer relationships are really important' MHPSU91 'harness some of that peer-to-peer stuff it's in a way helpful' MHPPN44	
Parental involvement	Inclusion of a parental component may reinforce concepts at home for younger adolescents, but could also thwart engagement with the app as adolescents begin to want independence and freedom	'I'll talk about something I talked about two weeks ago and the young person won't remember at all. So anything that kind of reinforces the concept at home [helps]' MHPOK92	• Design program for mild/moderate symptom severity where parental involvement is less critical • Consider providing parents/guardians with information about what's included in the program and how they can support adolescents
Goal setting to promote use	Goal-setting features were considered as a staggered approach to achieving an intervention, with health professionals acknowledging that young people were more likely to complete an activity if it were framed as an achievable 'challenge'	'I would love something that set reminders to people and ties it with what the activity should be like... "remember, it's a 10-minute run, that was the goal"' MHPAH40	• Consider including a goal-setting feature that visualises progress/achievements
Notifications and reminders	Reminders and notifications that are embedded into the application was recommended as a useful tool to motivate young people in completing their daily goals and tasks	'Yeah [to have] functions on their phone so that they check off ... you know, certain goals and things like that, that can be helpful' MHPDF45	• Consider including reminders and notifications
5: Clinical content preferences			
Monitoring	The ability to observe the progress of their clients over time was desired	'if it had monitoring aspects, that would be useful...' MHPRT55	• Consider including a feature that tracks progress • Consider a feature that tracks mood or symptoms • Consider a feature that shows completed lessons
Engaging the body	Health professionals recommended clinical features that focused upon the importance of engaging the body in exercise to reduce sedentary behaviour	'I just think if something that could be created like Tik Tok, for example, where they are moving, you know, that's helping to regulate them as well' MHPCQ85	• Consider including content regarding physical activity

(*Continued*)

Table 3. (Continued)

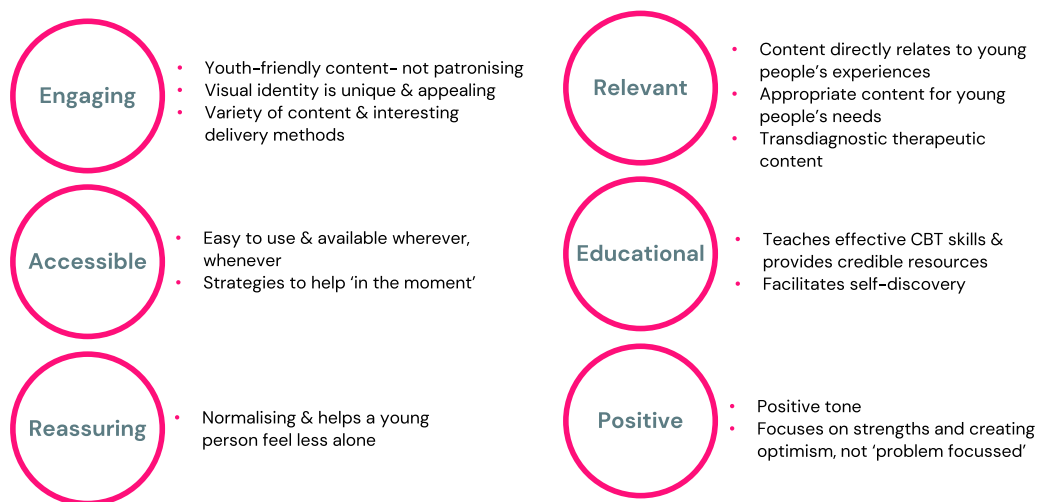| Themes and subthemes	Concept	Examples	Implications for product design
Mindfulness and meditations	Mindfulness meditation apps are commonly used as therapy adjunctions, however some adolescents do not like mindfulness meditation	'I'm getting good response from a meditation type of app' MHPIO21 'meditation is hard because some kids hate meditation' MHPYU92	• Consider including optimal mindfulness mediation audio tracks
Skill development	Clinicians emphasised the need for the program to support the development of skills through active engagement with the program, rather than being purely educational	'Could be quite useful for teens to be able to go away do a short module for home practice on a particular skill, Then in our session together we talk about applying that or working on some of the relational stuff that's not as easy to do through an app' MHPSU91	• Ensure CBT-based activities support skill learning and encourage practice and mastery of skills
Tip sheets	Easily accessible 'Tip sheets' or content summaries support consolidation of learning	'A one page tip sheet … and there can be links to other things … that would be quite useful. At times, especially when you're introducing them to a new resource to use and you can just sort of print it off and they can chuck it in their pocket or you can get them to put the link into the phone' MHPNQ90	• Consider including lesson summaries and easily accessible, pragmatic tips for 'in the moment' use
6. Support to use the program			
Application adjunct to therapy	An application that ran adjunct to therapy would be most beneficial for skill development, wellness plans and suicide safety planning	'The app would need to be something that compliments what we're doing, face to face' MHPSU91 'We could definitely use it [a digital program] as an adjunct especially if we're trying really hard to work on the family stuff' MHPPN44	• Ensure the app can be incorporated into a blended approach as a therapy adjunct • Ensure content can be completed in session with the MHP present • Ensure the program supports between session practice (homework) • Ensure entries and activities completed by the adolescent between sessions can be shared with the clinicians during the session
Direct client/clinician communication	A feature that facilitated direct client/clinician contact was not endorsed as it may encourage contact outside of designated session or work hours when the professional could not respond	'Maybe you could have a pop-up that says clinicians only check these messages when they're at work, so they [adolescents] aren't expecting an instant response back. It's good to the have the function to add something the next time you talk the clinician … so they don't have to remember it. But for them to expect it's getting shared and read, that's different … handy to have their feedback for when you are next reviewing it with them' MHPRT55	• Include functionality that allows users to save and favourite lessons to discuss with their clinician within session, rather than outside of office hours • If sharing function is included in future releases, ensure there is clear information about the purpose of sharing and when the messages are checked

Table 3. (*Continued*)

Themes and subthemes	Concept	Examples	Implications for product design
		'Let them [adolescents] send that stuff whenever it suits them, but they know I can't see that until I'm back in the office. I think it'd be poor boundaries around that. Otherwise, you just get inundated with crisis [messages]' MHPRX51 'If you can draw on that in the actual session. I don't know that I'd read it before session, but we maybe would like read it together' MHPOK92	
7. Dissemination via MHP			
Training on use	Before recommending a program to a young person, adequate information would need to be provided to assess the suitability and safety of the program for their client	'like a video that just explains "this is what it is. This is how it works." People would be more interested in either doing a workshop or [watching] the video' MHPRX51 'it's really important to know the research behind something… I like to know it's coming from a credible source and how the module is looking like to the young person' MHPNQ90	• Ensure app features are demonstrated on the app website and provide information regarding the science and research underpinning the application
8. Barriers to app use			
Parental involvement	Parental involvement in the program or accessing the app may benefit younger adolescents but could be a barrier to uptake	'Often the parents have got so much going on for their own mental health or physical health, that the students don't want to burden [them]' MHPNQ90	• Consider not including an active parent/ guardian treatment component in the app • Promotional campaign should be primarily directed towards the adolescent users and MHP, not parents
Ease of access	Limited data, and access to free Wi-Fi to download and use the application regularly may limit uptake, especially in regional and remote areas where access to the internet is limited	'It is becoming quite problematic that they cannot download the app and often their data is restricted, and they don't [have data] depending on the socioeconomic status of the family' MHPNQ90 'I guess maybe something is that if you were able to still use it while being offline… a lot about young people have limited data' MHPAH40	• Consider the cost of the app, the ability to use it offline, and its data storage requirements
	A program must be from a well-known, mental health organisation with security measures	'Just one thing that I always want to know with apps that I struggled to find out is, who owns	• Ensure information on privacy and data storage accessible on the app's webpage, as

(*Continued*)

Table 3. (*Continued*)

| Themes and subthemes	Concept	Examples	Implications for product design
Cyber safety, confidentiality and privacy	in place to secure young people's data to be endorsed	the data and, like, how is the patient's data protected and is that safe and is that private and things like that…' MHPRX51	well as within the app, so it is accessible to all users
Loss of interest	Adolescents disengage quickly in traditional methods of delivering therapy	'I'm just worried … will they really concentrate and take it in or like just have a quick look at and say, yes, I did that' MHPPN44	• Ensure content is delivered in small, manageable portions • Deliver content is a variety of formats (illustrations, text, audio, video) • Consider setting challenges and tracking progress as a motivator
Language and learning difficulties	Need to consider different levels of comprehension among young people and ensure content is accessible	'if kids have a learning need, or you know just language barriers … that's usually when I find that you might lose them' MHPNQ90	• Use youth copy editor to ensure reading level is appropriate • Deliver content in various ways to suit a range of learning styles (e.g. videos, audio etc.) • Consider multiple language options
Exacerbation of issues	MHP would not use a program that provokes or exacerbates the adolescents' symptoms, or that they don't have the capacity to use	'I don't want to give them something that … they actually don't have the resources or they're too stressed or too depressed to use it effectively I probably wouldn't recommend it' MHPSU91	• Include a Get Help section directing the adolescent to crisis services • Ensure activities within the app that identify symptom exacerbation can direct users to the Get Help section
Aesthetic	The aesthetics of an app can turn an adolescent or MHP away	'I feel like a lot of the ones that I've seen are really daggy like they just don't look really cool. They don't look super engaging and they've got a lot of jargon' MHPRX51	• Ensure app is easy to use, and the design is modern and aesthetically pleasing

Engaging
- Youth-friendly content- not patronising
- Visual identity is unique & appealing
- Variety of content & interesting delivery methods

Relevant
- Content directly relates to young people's experiences
- Appropriate content for young people's needs
- Transdiagnostic therapeutic content

Accessible
- Easy to use & available wherever, whenever
- Strategies to help 'in the moment'

Educational
- Teaches effective CBT skills & provides credible resources
- Facilitates self-discovery

Reassuring
- Normalising & helps a young person feel less alone

Positive
- Positive tone
- Focuses on strengths and creating optimism, not 'problem focussed'

Figure 3. The design principles generated from the focus group themes.

text activities. Each CBT skill was delivered via a single 'Activity' using one of the three templates. Activities were the smallest unit of content, designed to be completed within no more than 10 minutes. Users could provide feedback to the designers (like/dislike) at the end of each activity. Activities were then curated into nine separate 'Collections'. Collections contain three to five activities with a specific focus (e.g. targeting depression symptoms) and can be accessed via the Explore tab. To promote access to the therapeutic content, three pathways were added to the master flow. MindHacks are a series of quick tips and strategies that lead to single activity. MoodCheck is a mood tracking feature that allows users to rate their current mood and view mood fluctuations on a mood chart. Finally, Stories are a series of short TikTok-style videos created by young people with lived experience of mental health challenges presenting their experiences and mental health management strategies. MoodCheck and Stories lead to a specified collection. The following features were added to support use as a therapy adjunct: (1) a 'Saved' section, allowing activities to be marked for later completion (e.g. as between session homework), (2) activity summary pages at the end of each activity that can be shared with a clinician to show progress or as a talking point in the session, and (3) an 'Activities' tab, where activities categorised into Emotion, Thought and Behaviour modules and listed as to be easily viewed by the therapist and selected for client completion.

Visual identity

In relation to the app imagery, adolescents showed an equal preference for concepts 1 (collaged vibrant photography) and 2 (illustrative colour portraits) and unanimously preferred a vibrant colour palette. Due to adolescents' desire for the imagery to be relatable and be respectful of diverse representation, a suite of five characters were developed. Characters varied in cultural and gender identity and diverse abilities were represented. Three colour ways with variations in skin tone and fashion were developed: (1) vibrant, high-contrasting fashion with unnatural skin tone, (2) monochromatic fashion with unnatural skin tone, and (3) natural skin tones, vibrant clothing. The survey showed that adolescents preferred natural skin tones and endorsed the inclusivity of the proposed character illustrations, but reflected that a 'normal teenager' was missing. In response, the images were toned down.
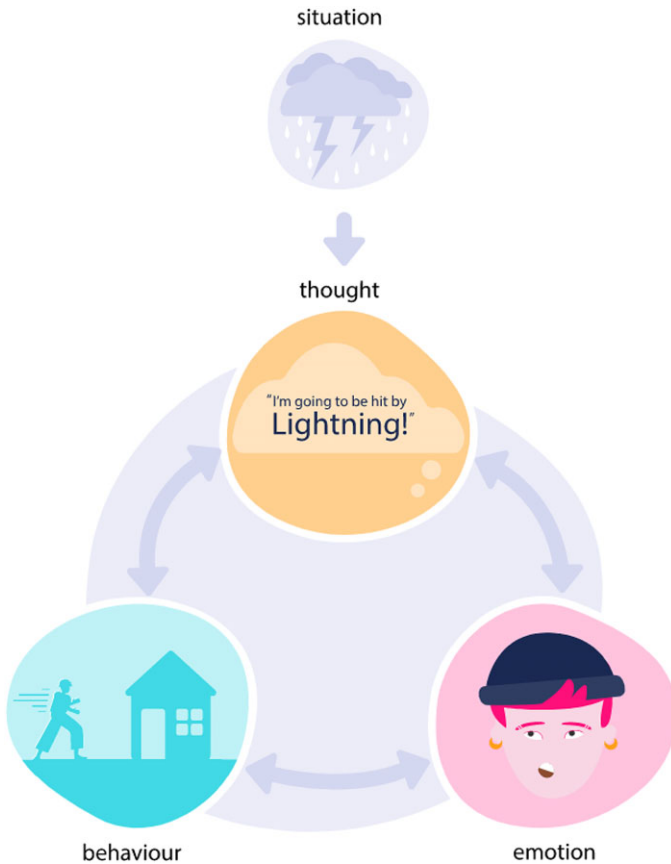
Figure 4. An example of an illustration matching the content to support learning.

Step 4: Test

Upon review of the low-fidelity prototype, adolescents endorsed the following features: onboarding, swipe functionality, MindHacks, videos and MoodCheck. Adolescents reflected that the usability of the explore feature (designed to navigate the content) was poor. Adolescents also requested a temporal visualisation of their response to the mood check. Upon review of the high-fidelity prototype, adolescents endorsed the app layout, colour palette, style and usability of the app. Character imagery was found to be relatable and appealing. The tone of the app was described by adolescents as empathic and relatable, and the variety of content was endorsed. More guidance was requested to complete activities, so instructional language and illustrations supporting the concepts were added (for an example, see Fig. 4). Adolescents also wanted to be able to revisit summary pages, so this functionality was added. They also wanted transparency on the purpose of feedback at the end of each activity, so copy was added to clarify how this.

Quotes from user testing:

'*Oooh that's cool … everything … the **stories spark interest immediately**'* (F, 16)

'*I think what's written there is really good, it's **short and sweet**. I like it … it's to the point and lets me know what I'm about to do*' (M, 16)

'*There's **big variety and lots of diversity**, which gives me a positive feeling*' (NB, 16)

Table 4. Summary of the features included in the final ClearlyMe design

Feature	Description
Onboarding	Onboarding contains several screens the user swipes through. It provides information regarding the purpose of the program, how to use it and an opportunity to customise
About	The About feature is accessed via the homepage. It provides links to the Black Dog Institute website containing information on the institute, its objectives and strategic goals. This feature allows users to independently assess the credibility of the app
Get Help	The Get Help feature is accessed via the homepage. It provides users with contact information (webpage, telephone number) for mental health emergency services. It contains two sub-features providing information on when and where to seek help, and how to help someone else
In progress	The In Progress feature is accessed via the homepage. It contains a list of activities that are currently in progress that can be revisited to complete
Explore	The Explore feature is one of the main components of the app. It supports autonomous users by promoting self-navigation and exploration of the content. It contains three sub-features. Stories contains TikTok-style videos created by young people with lived experience of mental illness relaying their experiences and what helped them manage. Each story contains a recommended collection corresponding with the challenge expressed during the story. Collections contain nine mini-treatment modules, each with a specific focus (e.g. Feeling Meh? contains strategies targeting depression symptoms). They support the adolescent to select relevant content while promoting core CBT elements. MindHacks contain quick tips to be implemented in the moment, including CBT strategies, physical activity recommendations and mindfulness meditations. They contain links to a corresponding activity to promote greater CBT skill development
Activities	The Activities feature contains a list of all the activities, divided into activities related to emotion, thought and behaviour management. It supports use as a therapy adjunct whereby clinicians can easily view and select specific activities for their client to complete
Saved	The Saved feature is accessed via the navigation bar. It contains a list of activities that have been saved by the user (or clinician). Saved activities are those that the user identified as useful and wish to return to, or activities allocated by the clinician to be completed
MoodCheck	The MoodCheck feature is accessed via the navigation bar. It contains three sub-features. Check My Mood allows users to rate how they are feeling to track their mood over time. A collection is recommended based on their current mood. MoodCheck reminders allow users to customise notifications reminding them to check their mood. Mood Graph provides a visual representation of changes in the users' mood over time
Settings	The settings feature is accessed via the navigation bar. It contains four sub-features. Notifications/reminders allow users to customise notifications reminding them to use the app. The other three sub-features contain information of the app's privacy policy, terms of use and data collection, promoting transparency and allowing users easy access to this information

Product features

The final selection of product features and a description of each are summarised in Table 4.

Discussion

Principal findings

This paper describes the comprehensive, rigorous co-design process employed to design ClearlyMe, a new CBT smartphone app that targets elevated symptoms of depression and anxiety among adolescents. Our co-design process adhered to recommendations from the co-design literature (Bevan Jones *et al.*, 2018; Hagen *et al.*, 2012; Thabrew *et al.*, 2018) and those arising from the field of digital mental health research (Bakker *et al.*, 2018; Garrido *et al.*, 2019a). The initial co-design sessions (Step 1) indicated that young people, parents and mental health professionals were supportive of a CBT smartphone app for adolescents with symptoms of depression and anxiety. However, the likelihood of uptake, use and adult endorsement was dependent on several factors. Specifically, this related to the credibility and

transparency of the app's purpose and privacy policy, ease of use, aesthetics, accessibility and capacity for social interaction. Youth participants wanted the app to contain interactive, readily accessible elements, be relatable and relevant to their current concerns and delivered in a youth-friendly and positive tone. Parents wanted an app that was from a credible source and acknowledged that parental involvement in the intervention may be a deterrent. Mental health professionals specifically required the app to be a 'safe' (i.e. not cause distress or exacerbate symptoms) adjunct to in-person treatment that promoted CBT skill acquisition.

The findings from our co-design process are largely consistent with what has been found by other research groups regarding youth design preferences (Jeminiwa *et al.*, 2019; Kenny *et al.*, 2016; Stoyanov *et al.*, 2021; Werner-Seidler *et al.*, 2017). However, in contrast to the design of other adolescent CBT interventions that utilise smartphone technology, such as Sleep Ninja (Werner-Seidler *et al.*, 2017) and Pesky gNATs (Chapman *et al.*, 2016), adolescents in the current study did not endorse gamification, a chatbot feature, or calming images and colours. Differences in sample characteristics may account for these contrasting findings. Youth preferences have been found to be influenced by age, mental health condition, symptom severity and gender (Fleming *et al.*, 2019). For example, younger, asymptomatic adolescents have been found to endorse 'fun' gamified interventions, whereas symptomatic, older adolescents have reported that such an approach trivialises their concerns and instead preferred content that was 'straight to the point' (Fleming *et al.*, 2019). Adolescent preferences also appear to change over time given the rapid evolution of technology (Munsch, 2021; Turner, 2015) and the diverse mental health needs of young people (Li *et al.*, 2021). As such, their design preferences are also likely to change. Most importantly, young people's initial preferences were not always endorsed during the subsequent steps in the co-design process. For example, the project team ideated a chatbot feature based on adolescents' initial preference for interactive features and relatability. However, adolescents almost unanimously invalidated this feature when presented with a 2D sketch (i.e. paper prototype). This highlights the importance of the iterative approach of our co-design process as it allowed for continual collaboration and refinement of ideas with end-users. Therefore, differences between our findings and past studies may be due to the degree of co-design employed by intervention developers. Our findings endorse a key recommendation from a recent review of digital mental health interventions – that end-users should be involved at all stages of design, from problem identification to evaluation to testing (Garrido *et al.*, 2019a).

Differences in preferences between adolescents, parents and mental health professionals

While preferences between the three user groups generally aligned, there were points of difference. One difference related to the level of support to use the app. Adolescents identified a preference for independent symptom management and self-reliance. While they were not opposed to clinician support, adolescent participants requested that this was optional. In contrast, mental health professionals were almost unanimous in their belief that a CBT smartphone app should be supported by a professional providing in-person treatment. These findings validate an existing body of literature showing that mental health professionals view technology as a tool to support in-person treatment rather than a replacement (Cliffe *et al.*, 2020; Donovan *et al.*, 2015; Gindidis *et al.*, 2020). A second point of difference was the nature of the therapeutic content. Adolescent participants preferred practical coping strategies that could be used in the moment when needed. However, mental health professionals emphasised the need for CBT skill development and mastery through practice. Some CBT skills, such as cognitive restructuring and exposure, are less appealing to individuals because these skills are more effortful and require significantly more practice to master when compared with strategies that provide immediate symptom relief (Wasil *et al.*, 2020). Differences in preferences for therapeutic content among our study participants suggest that there may be a disconnect between what mental

health practitioners aim to deliver and what adolescents hope to gain from an intervention. While there are indisputable benefits in prioritising the delivery of evidence-based practice, especially CBT skill development, over 'quick fixes' (Compton *et al.*, 2004), incorporating strategies that require less skill and provide rapid distress relief may improve adolescents' engagement with the ClearlyMe app and ultimately lead to greater treatment effects.

A final point of difference in user preferences was in relation to parental involvement. Parents and mental health professionals believed that involving parents in younger adolescents' use of the ClearlyMe app would be superior to self-directed use for CBT skill development. However, it was also acknowledged that parental involvement may inhibit use, particularly in older adolescents. Our youth participants concurred with this notion. While a recent meta-analysis was unable to determine whether parental involvement enhanced treatment outcomes for adolescent anxiety (Cardy *et al.*, 2020), parental supervision and support has been shown to significantly improve treatment adherence in youth (Wahlund *et al.*, 2021). In past interventions (Cardy *et al.*, 2020), parental involvement has ranged from individual treatment sessions for parents, parental participation in adolescent sessions, or hard copy workbooks for parental completion. To our knowledge, no studies have examined parental involvement in smartphone-delivered CBT interventions for adolescents. Based on the lack of evidence in the field and our inconclusive findings, it is not yet possible for this study to describe the optimal nature of parental involvement in ClearlyMe. We argue that an additional co-design process is required to explore this concept to ensure harmony between parental involvement, adolescent autonomy, and treatment effectiveness.

Comparison with other digital CBT programs

An obvious difference between ClearlyMe and computerised CBT is the device used for delivery. Smartphone delivery supports unrestricted access, wherever and whenever suitable, plus the inclusion of brief, interactive features designed to be completed *in vivo*. These aspects may improve treatment adherence, but this requires confirmation through appropriate empirical investigations. Another difference between the proposed design of ClearlyMe and many of the available computerised CBT programs (e.g. MoodGYM, Brave Online) is the modular, rather than sequential, nature of the therapeutic content. Adolescents expressed a strong preference for self-navigation that allowed them to select content most relevant to the situation without requiring the support of a professional. This is consistent with the literature showing that help-seeking hesitancy is related to concerns regarding the therapeutic relationship with professionals, particularly regarding confidentiality and trust (Radez *et al.*, 2021). However, a modular, self-guided CBT smartphone app that does not include professional input may be used inappropriately. For example, the modules a CBT practitioner would consider most relevant are not selected by the adolescent user. Such products could consider ways to provide subtle guidance through the content that does not impinge on the user's freedom to consume the content in any order they choose.

One defining feature that emerged through our co-design process was the need to accommodate the different ways that adolescents interact with smartphones. This process indicated that young people prefer an app that presents information in a variety of formats, keeps text to a minimum and relies heavily on illustrations to demonstrate concepts. Compared with existing smartphone apps designed for adults, ClearlyMe contains less text, uses illustrations to support learning and presents content in a variety of formats (video, audio, illustration and text) (Bakker *et al.*, 2018; Paul and Fleming, 2019). The co-design process also highlighted key differences in young people's perspectives of positive visual imagery and an interactive chatbot feature. Many of the current mental health apps use subtle pastel colours alongside scenery photographs (Paul and Fleming, 2019; Werner-Seidler *et al.*, 2017) and two popular CBT apps, Woebot and Wysa (Fitzpatrick *et al.*, 2017; Inkster *et al.*,

2018), use a chatbot feature to deliver content and interact with the user. In contrast, adolescents in the current study requested a vibrant and cheerful colour scheme and invalidated preferences for a chatbot feature. These preferences are reflected in the design of ClearlyMe. Finally, unlike other CBT apps (Werner-Seidler *et al.*, 2017), ClearlyMe incorporates features to specifically facilitate its use as an adjunct to in-person CBT. While ClearlyMe may have the potential to augment treatment outcomes, or even improve engagement and client retention, these possibilities require empirical investigation.

Next steps for ClearlyMe

The critical next step is to evaluate ClearlyMe. This includes determining the effectiveness of ClearlyMe in reducing symptoms of depression and anxiety in adolescents, but also whether our co-design process is associated with improved uptake and use of digital CBT. The measurement of engagement, or adherence, to ClearlyMe is an important consideration. To date, engagement in digital mental health interventions has been poorly defined and inconsistently measured (Ng *et al.*, 2019; Perski *et al.*, 2017). Engagement with ClearlyMe requires operationalisation to ensure a meaningful measure of the degree to which individuals' use aligns with how it was intended to be used can be devised. A fully powered randomised controlled trial (RCT) has been planned to determine the acceptability, engagement and effectiveness of ClearlyMe when used by adolescents with depressive symptoms autonomously or with non-clinical support. Future studies will also be required to examine the use and effectiveness of ClearlyMe when initiated entirely by mental health professionals (i.e. therapist-guided use), in contrast to self-directed uptake. These findings will be key to determining the optimal treatment recommendations for use of ClearlyMe among young people with elevated symptoms of depression and anxiety. These findings will be key to determining the optimal treatment recommendations for use of ClearlyMe among young people with elevated symptoms of depression and anxiety.

Several features that were popular with all user groups were not included in the final version of the app. These included an interactive social feature, an online mental health question and answer forum, intuitive tailoring of content based on previous preferences or inputs and novel content (e.g. similar to new content in social media feeds). These features were deprioritised based on feasibility. For example, inadequate resources were available to moderate a peer-interaction forum or the ongoing development of new content. Given the value of these features to users, they have been placed on the 'roadmap' and will be considered in future iterations of ClearlyMe, pending outcomes of the RCT. Finally, careful consideration is required regarding how the app will be disseminated and promoted. Adolescents reported that they prefer self-reliance, and while younger adolescents seek help from parents, many older adolescents will use friends or the internet to access help or information. The development of a marketing and communications plan, and dissemination strategy is currently underway taking these insights into consideration.

Limitations

The current study had several limitations that warrant mention. The use of social media for recruitment may have attracted participants with higher levels of openness towards smartphone apps when compared with samples recruited via other methods. Similarly, there was an over-representation of girls and older adolescents in our sample. Although this is consistent with other co-design studies in mental health (Bevan Jones *et al.*, 2018), it is also a pattern in studies using online recruitment (Whitaker *et al.*, 2017) and may be due to the higher prevalence of depression and anxiety in females and their positive attitudes to seeking

help (Riecher-Rössler, 2017). As such, the acceptability and effectiveness of ClearlyMe remains to be verified in a broad and representative sample of adolescents in a clinical trial. Future trials may need to adopt additional recruitment strategies to target male participants to ensure that the ClearlyMe app has not been designed with a gender bias. This is particularly important given the lower rates of help-seeking among adolescent males (Möller-Leimkühler, 2002). There was also an over-representation of female parents in this study. This is consistent with past research (Bevan Jones *et al.*, 2018) and likely reflective of the primary caregiver role of mothers. Future research would be strengthened by actively targeting fathers to measure their perceptions of smartphone-delivered mental healthcare and their likely endorsement for their children. The co-design process was labour and time intensive and the capacity to evaluate the value of the process is only achievable once the app build has been completed. However, the high cost of building digital products means there is less room for error. Engaging in a co-design process prior to development is both cost and time effective in comparison with extensive iteration and refinement of the product post-build. Additionally, future work would benefit from testing the clickable prototype or final product among parents or mental health professionals to measure their acceptability on the app content, features and functionality.

Conclusions

Symptoms of depression and anxiety during adolescence are highly prevalent and have a significant impact on functioning across social, emotional and academic domains. Our co-design process validated the need for a CBT smartphone app designed with and for adolescents that utilises the ubiquitous, 'in-the-pocket' nature of smartphones in the adolescent population. While some adolescent preferences and feedback were consistent with those found in previous studies, we also found some critical differences. Including parents and mental health professionals in the co-design process also resulted in novel insights that guided the design process, including ClearlyMe as a therapy adjunct to facilitate mastery of CBT skills. Despite being a time-consuming and resource-heavy process, co-design is more likely to produce an application that is relevant, engaging and suitable to the needs of all the product users. However, this requires be assessment by an appropriately powered RCT.

Key practice points

(1) CBT has been adapted to computerised delivery and been showed to be effective; however, engagement and uptake is suboptimal.

(2) The next stage in CBT delivery evolution is via mobile technology (smartphones), which allows access to *in vivo* strategies anywhere and anytime.

(3) During the co-design of ClearlyMe – a new CBT smartphone app – one major difference between stakeholders was that adolescents preferred a program that could be used autonomously with optional support from a professional, whereas mental health professionals desired a program that could be used alongside in-person treatment.

(4) We outline the co-design process of ClearlyMe to demonstrate how these divergent preferences were addressed to produce a product that has the flexibility to be used autonomously and as a therapy adjunct to augment CBT skill development in traditional in-person CBT.

(5) Future research is required to evaluate ClearlyMe in terms of effectiveness as a standalone CBT program and as a therapy adjunct.

Further reading

Co-design: **Thabrew, H., Fleming, T., Hetrick, S., & Merry, S.** (2018). Co-design of eHealth interventions with children and young people. *Frontiers in Psychiatry*, 9, 481–481. doi: 10.3389/fpsyt.2018.00481

Barriers to mental health help seeking: **Radez, J., Reardon, T., Creswell, C.** *et al.* (2021) Why do children and adolescents (not) seek and access professional help for their mental health problems? A systematic review of quantitative and qualitative studies. *European Child and Adolescent Psychiatry*, 30, 183–211. doi: 10.1007/s00787-019-01469-4

Mental health professional attitudes to smartphone CBT: **Gindidis, S., Stewart, S., & Roodenburg, J.** (2020). Psychologists' motivations for integrating apps into therapy with secondary school-aged young people. *Journal of Psychologists and Counsellors in Schools*, 30, 2–12. doi: 10.1017/jgc.2019.22

References

Aguirre Velasco, A., Cruz, I. S. S., Billings, J., Jimenez, M., & 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*, 20, 293. https://doi.org/10.1186/s12888-020-02659-0

Anderson, M., & Jiang, J. (2018). *Teens, Social Media, & Technology 2018*. Pew Research Center. https://www.pewinternet.org/2018/05/31/teens-social-media-technology-2018/

Bakker, D., Kazantzis, N., Rickwood, D., & Rickard, N. (2018). Development and pilot evaluation of smartphone-delivered cognitive behavior therapy strategies for mood- and anxiety-related problems: MoodMission. *Cognitive and Behavioral Practice*, 25, 496–514. https://doi.org/10.1016/j.cbpra.2018.07.002

Barlow, D. H., Farchione, T. J., Fairholme, C. P., Ellard, K. K., Boisseau, C. L., Allen, L. B., & May, J. T. E. (2010). *Unified Protocol for Transdiagnostic Treatment of Emotional Disorders: Therapist Guide*. Oxford University Press.

Bennett, S., Cuijpers, P., Ebert, D., Smith, M. M., Coughtrey, A., Heyman, I., Manzotti, G., & Shafran, R. (2019). Unguided and guided self-help interventions for common mental health disorders in children and adolescents: a systematic review and meta-analysis. *Journal of Child Psychology and Psychiatry*. https://doi.org/10.1111/jcpp.13010

Bergin, A. D., Vallejos, E. P., Davies, E. B., Daley, D., Ford, T., Harold, G., Hetrick, S., Kidner, M., Long, Y., Merry, S., Morriss, R., Sayal, K., Sonuga-Barke, E., Robinson, J., Torous, J., & Hollis, C. (2020). Preventive digital mental health interventions for children and young people: a review of the design and reporting of research. *npj Digital Medicine*, 3, 133. https://doi.org/10.1038/s41746-020-00339-7

Bevan Jones, R., Thapar, A., Rice, F., Beeching, H., Cichosz, R., Mars, B., Smith, D. J., Merry, S., Stallard, P., Jones, I., Thapar, A. K., & Simpson, S. A. (2018). A web-based psychoeducational intervention for adolescent depression: design and development of MoodHwb. *JMIR Mental Health*, 5, e13. https://doi.org/10.2196/mental.8894

Bhattacharya, S., Bashar, M. A., Srivastava, A., & Singh, A. (2019). NOMOPHOBIA: NO MObile PHone PhoBIA. *Journal of Family Medicine and Primary Care*, 8, 1297–1300. https://doi.org/10.4103/jfmpc.jfmpc_71_19

Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology*, 3, 77–101. https://doi.org/10.1191/1478088706qp063oa

Bry, L. J., Chou, T., Miguel, E., & Comer, J. S. (2018). Consumer smartphone apps marketed for child and adolescent anxiety: a systematic review and content analysis. *Behavior Therapy*, 49, 249–261. https://doi.org/10.1016/j.beth.2017.07.008

Buttazzoni, A., Brar, K., & Minaker, L. (2021). Smartphone-based interventions and internalizing disorders in youth: systematic review and meta-analysis. *Journal of Medical Internet Research*, 23, e16490. https://doi.org/10.2196/16490

Calear, A. L., Christensen, H., Mackinnon, A., Griffiths, K. M., & O'Kearney, R. (2009). The YouthMood Project: a cluster randomized controlled trial of an online cognitive behavioral program with adolescents. *Journal of Consulting and Clinical Psychology*, 77, 1021. https://doi.org/10.1037/a0017391

Cardy, J. L., Waite, P., Cocks, F., & Creswell, C. (2020). A systematic review of parental involvement in cognitive behavioural therapy for adolescent anxiety disorders. *Clinical Child and Family Psychology Review*, 23, 483–509. https://doi.org/10.1007/s10567-020-00324-2

Carlo, A. D., Ghomi, R. H., Renn, B. N., Strong, M. A., & Areán, P. A. (2020). Assessment of real-world use of behavioral health mobile applications by a novel stickiness metric. *JAMA Network Open*, 3, e2011978–e2011978. doi: 10.1001/jamanetworkopen.2020.11978

Chapman, R., Loades, M., O'Reilly, G., Coyle, D., Patterson, M., & Salkovskis, P. (2016). 'Pesky gNATs': investigating the feasibility of a novel computerized CBT intervention for adolescents with anxiety and/or depression in a Tier 3 CAMHS setting. *The Cognitive Behaviour Therapist*, 9, E35. doi: 10.1017/S1754470X16000222

Clarke, A. M., Kuosmanen, T., & Barry, M. M. (2015). A systematic review of online youth mental health promotion and prevention interventions. *Journal of Youth and Adolescence*, 44, 90–113. doi: 10.1007/s10964-014-0165-0

Cliffe, B., Croker, A., Denne, M., & Stallard, P. (2020). Clinicians' use of and attitudes towards technology to provide and support interventions in child and adolescent mental health services. *Child and Adolescent Mental Health*, 25, 95–101. doi: 10.1111/camh.12362

Compton, S. N., March, J. S., Brent, D., Albano, A. M., Weersing, V. R., & Curry, J. (2004). Cognitive-behavioral psychotherapy for anxiety and depressive disorders in children and adolescents: an evidence-based medicine review. *Journal of the American Academy of Child and Adolescent Psychiatry*, 43, 930–959. doi: 10.1097/01.chi.0000127589.57468.bf.

Curry, J. F. (2014). Future directions in research on psychotherapy for adolescent depression. *Journal of Clinical Child & Adolescent Psychology*, 43, 510–526. doi: 10.1080/15374416.2014.904233

Dam, R. F., & Siang, T. Y. (2020). *Affinity Diagrams – Learn How to Cluster and Bundle Ideas and Facts*. https://www.interaction-design.org/literature/article/affinity-diagrams-learn-how-to-cluster-and-bundle-ideas-and-facts

Donovan, C. L., Poole, C., Boyes, N., Redgate, J., & March, S. (2015). Australian mental health worker attitudes towards cCBT: what is the role of knowledge? Are there differences? Can we change them? *Internet Interventions*, 2, 372–381. doi: 10.1016/j.invent.2015.09.001

Ebert, D. D., Zarski, A.-C., Christensen, H., Stikkelbroek, Y., Cuijpers, P., Berking, M., & Riper, H. (2015). Internet and computer-based cognitive behavioral therapy for anxiety and depression in youth: a meta-analysis of randomized controlled outcome trials. *PloS One*, 10, e0119895. doi: 10.1371/journal.pone.0119895

Ferro, M. A. (2019). The psychometric properties of the Kessler Psychological Distress Scale (K6) in an epidemiological sample of Canadian youth. *Canadian Journal of Psychiatry*, 64, 647–657. doi: 10.1177/0706743718818414

Fitzpatrick, K. K., Darcy, A., & Vierhile, M. (2017). Delivering cognitive behavior therapy to young adults with symptoms of depression and anxiety using a fully automated conversational agent (Woebot): a randomized controlled trial. *JMIR Mental Health*, 4, e7785. doi: 10.2196/mental.7785.

Fleming, T., Merry, S., Stasiak, K., Hopkins, S., Patolo, T., Ruru, S., Latu, M., Shepherd, M., Christie, G., & Goodyear-Smith, F. (2019). The importance of user segmentation for designing digital therapy for adolescent mental health: findings from scoping processes. *JMIR Mental Health*, 6, e12656. doi: 10.2196/12656

Garrido, S., Cheers, D., Boydell, K., Nguyen, Q. V., Schubert, E., Dunne, L., & Meade, T. (2019a). Young people's response to six smartphone apps for anxiety and depression: focus group study. *JMIR Mental Health*, 6, e14385. doi: 10.2196/14385

Garrido, S., Millington, C., Cheers, D., Boydell, K., Schubert, E., Meade, T., & Nguyen, Q. V. (2019b). 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*, 10, 759. doi: 10.3389/fpsyt.2019.00759

Gindidis, S., Stewart, S. E., & Roodenburg, J. (2020). Psychologists' motivations for integrating apps into therapy with secondary school-aged young people. *Journal of Psychologists and Counsellors in Schools*, 30, 2–12. doi: 10.1017/jgc.2019.22

Gray, D. (2011a). *Product Pinocchio*. https://gamestorming.com/product-pinocchio/

Gray, D. (2011b). *Speed Boat*. https://gamestorming.com/speedboat/

Grist, R., Croker, A., Denne, M., & Stallard, P. (2019). Technology delivered interventions for depression and anxiety in children and adolescents: a systematic review and meta-analysis. *Clinical Child and Family Psychology Review*, 22, 147–171. doi: 10.1007/s10567-018-0271-8

Grist, R., Porter, J., & Stallard, P. (2017). Mental health mobile apps for preadolescents and adolescents: a systematic review. *Journal of Medical Internet Research*, 19, e176. doi: 10.2196/jmir.7332.

Gulliver, A., Griffiths, K. M., & Christensen, H. (2010). Perceived barriers and facilitators to mental health help-seeking in young people: a systematic review. *BMC Psychiatry*, 10, 113. doi: 10.1186/1471-244x-10-113

Hagen, P., Collin, P., Metcalf, A., Nicholas, M., Rahilly, K., & Swainston, N. (2012). *Participatory Design of Evidence-Based Online Youth Mental Health Promotion, Intervention and Treatment*. Melbourne, VIC: Young and Well Cooperative Research Centre.

Hollis, C., Falconer, C. J., Martin, J. L., Whittington, C., Stockton, S., Glazebrook, C., & 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*, 58, 474–503. doi: 10.1111/jcpp.12663.

Hollis, C., Livingstone, S., & Sonuga-Barke, E. (2020). The role of digital technology in children and young people's mental health–a triple-edged sword? *Journal of Child Psychology and Psychiatry*, 61(8), 837–841. doi: 10.1111/jcpp.13302

Inkster, B., Sarda, S., & Subramanian, V. (2018). An empathy-driven, conversational artificial intelligence agent (Wysa) for digital mental well-being: real-world data evaluation mixed-methods study. *JMIR mHealth and uHealth*, 6, e12106. doi: 10.2196/12106

Jeminiwa, R. N., Hohmann, N. S., & Fox, B. I. (2019). Developing a theoretical framework for evaluating the quality of mHealth apps for adolescent users: a systematic review. *Journal of Pediatric Pharmacology and Therapeutics*, 24, 254–269. doi: 10.5863/1551-6776-24.4.254

Kauer, S. D., Mangan, C., & Sanci, L. (2014). Do online mental health services improve help-seeking for young people? A systematic review. *Journal of Medical Internet Research*, 16, e66. doi: 10.2196/jmir.3103

Kenny, R., Dooley, B., & Fitzgerald, A. (2016). Developing mental health mobile apps: exploring adolescents' perspectives. *Health Informatics Journal*, 22, 265–275. doi: 10.1177/1460458214555041

Kessler, R. C., Barker, P. R., Colpe, L. J., Epstein, J. F., Gfroerer, J. C., Hiripi, E., Howes, M. J., Normand, S.-L. T., Manderscheid, R. W., & Walters, E. E. (2003). Screening for serious mental illness in the general population. *Archives of General Psychiatry*, 60, 184–189. doi: 10.1001/archpsyc.60.2.184

Lawrence, D., Johnson, S., Hafekost, J., Boterhoven de Haan, K., Sawyer, M., Ainley, J., & Zubrick, S. R. (2015). The mental health of children and adolescents: report on the second Australian child and adolescent survey of mental health and wellbeing.

Levey, Y. (2016). *How to run a Crazy Eights exercise to generate design ideas*. Retrieved from: https://www.iamnotmypixels.com/how-to-use-crazy-8s-to-generate-design-ideas/ (accessed 8 February 2022).

Li, S. H., Beames, J. R., Newby, J. M., Maston, K., Christensen, H., & Werner-Seidler, A. (2021). The impact of COVID-19 on the lives and mental health of Australian adolescents. *European Child & Adolescent Psychiatry*. doi: 10.1007/s00787-021-01790-x

Lillevoll, K. R., Vangberg, H. C. B., Griffiths, K. M., & Eisemann, M. R. (2014). Uptake and adherence of a self-directed internet-based mental health intervention with tailored e-mail reminders in senior high schools in Norway. *BMC Psychiatry*, 14, 1–11. doi: 10.1186/1471-244X-14-14

Liverpool, S., Mota, C. P., Sales, C. M. D., Čuš, A., Carletto, S., Hancheva, C., Sousa, S., Cerón, S. C., Moreno-Peral, P., Pietrabissa, G., Moltrecht, B., Ulberg, R., Ferreira, N., & Edbrooke-Childs, J. (2020). Engaging children and young people in digital mental health interventions: systematic review of modes of delivery, facilitators, and barriers. *Journal of Medical Internet Research*, 22, e16317. doi: 10.2196/16317

McGorry, P. D., & Goldstone, S. (2011). Is this normal? Assessing mental health in young people. *Australian Family Physician*, 40, 94–97. Retrieved from: https://pubmed.ncbi.nlm.nih.gov/21597507

Mission Australia (2014). *Youth Mental Health Report 2014* [Report]. Retrieved from: https://apo.org.au/node/40529

Möller-Leimkühler, A. M. (2002). Barriers to help-seeking by men: a review of sociocultural and clinical literature with particular reference to depression, *Journal of Affective Disorders*, 71, 1–9. doi: 10.1016/S0165-0327(01)00379-2.

Munsch, A. (2021). Millennial and generation Z digital marketing communication and advertising effectiveness: a qualitative exploration. *Journal of Global Scholars of Marketing Science*, 31, 10–29. doi: 10.1080/21639159.2020.1808812

Ng, M. M., Firth, J., Minen, M., & Torous, J. (2019). User engagement in mental health apps: a review of measurement, reporting, and validity. *Psychiatric Services*, 70, 538–544. doi: 10.1176/appi.ps.201800519

O'Dea, B., Achilles, M. R., Werner-Seidler, A., Batterham, P. J., Calear, A. L., Perry, Y., Shand, F., & Christensen, H. (2018). Adolescents' perspectives on a mobile app for relationships: cross-Sectional survey. *JMIR mhealth uhealth*, 6, e56. doi: 10.2196/mhealth.8831

Patel, V., Flisher, A. J., Hetrick, S., & McGorry, P. (2007). Mental health of young people: a global public-health challenge. *The Lancet*, 369, 1302–1313. doi: 10.1016/S0140-6736(07)60368-7

Patton, M. Q. (1999). Enhancing the quality and credibility of qualitative analysis. *Health Services Research*, 34, 1189–1208. Retrieved from: https://pubmed.ncbi.nlm.nih.gov/10591279

Paul, A. M., & Fleming, C. E. (2019). Anxiety management on campus: an evaluation of a mobile health intervention. *Journal of Technology in Behavioral Science*, 4, 58–61. doi: 10.1007/s41347-018-0074-2

Perski, O., Blandford, A., West, R., & Michie, S. (2017). Conceptualising engagement with digital behaviour change interventions: a systematic review using principles from critical interpretive synthesis. *Translational Behavioral Medicine*, 7, 254–267. doi: 10.1007/s13142-016-0453-1.

ProductPlan (n.d.). *MoSCoW Prioritization.* https://www.productplan.com/glossary/moscow-prioritization/

Racine, N., McArthur, B. A., Cooke, J. E., Eirich, R., Zhu, J., & Madigan, S. (2021). Global prevalence of depressive and anxiety symptoms in children and adolescents during COVID-19: a meta-analysis. *JAMA Pediatrics*, 175, 1142–1150. doi: 10.1001/jamapediatrics.2021.2482

Radez, J., Reardon, T., Creswell, C., Lawrence, P. J., Evdoka-Burton, G., & Waite, P. (2021). Why do children and adolescents (not) seek and access professional help for their mental health problems? A systematic review of quantitative and qualitative studies. *European Child & Adolescent Psychiatry*, 30, 183–211. doi: 10.1007/s00787-019-01469-4

Riecher-Rössler, A. (2017). Sex and gender differences in mental disorders. *The Lancet Psychiatry*, 4, 8–9. doi: 10.1016/S2215-0366(16)30348-0.

Southam-Gerow, M. A., & Kendall, P. C. (2000). Cognitive-behaviour therapy with youth: advances, challenges, and future directions. *Clinical Psychology & Psychotherapy*, 7, 343–366. doi: 10.1002/1099-0879(200011)

Steen, M., Manschot, M., & De Koning, N. (2011). Benefits of co-design in service design projects. *International Journal of Design*, 5, 53–60. Retrieved from: http://www.ijdesign.org/index.php/IJDesign/article/view/890/346

Stoyanov, S. R., Zelenko, O., Staneva, A., Kavanagh, D. J., Smith, C., Sade, G., Cheers, J., & Hides, L. (2021). Development of the Niggle app for supporting young people on their dynamic journey to well-being: co-design and qualitative research study. *JMIR mHealth and uHealth*, 9, e21085. doi: 10.2196/21085.

Thabrew, H., Fleming, T., Hetrick, S., & Merry, S. (2018). Co-design of eHealth interventions with children and young people. *Frontiers in Psychiatry*, 9, 481–481. doi: 10.3389/fpsyt.2018.00481

Tighe, J., Shand, F., Ridani, R., Mackinnon, A., De La Mata, N., & Christensen, H. (2017). Ibobbly mobile health intervention for suicide prevention in Australian Indigenous youth: a pilot randomised controlled trial. *BMJ Open*, 7, e013518. doi: 10.1136/bmjopen-2016-013518

Turner, A. (2015). Generation Z: technology and social interest. *Journal of Individual Psychology*, 71, 103–113. doi: 10.1353/jip.2015.0021.

Twenge, J. M., & Campbell, W. K. (2019). Media use is linked to lower psychological well-being: evidence from three datasets. *Psychiatric Quarterly*, 90, 311–331. doi: 10.1007/s11126-019-09630-7

Wahlund, T., Wallhem, M., Serlachius, E., & Engberg, H. (2021). Experiences of online exposure-based treatment with parental support for teenagers with excessive worry. *The Cognitive Behaviour Therapist*, 14, E6. doi: 10.1017/S1754470X21000027

Wasil, A. R., Gillespie, S., Patel, R., Petre, A., Venturo-Conerly, K. E., Shingleton, R. M., Weisz, J. R., & DeRubeis, R. J. (2020). Reassessing evidence-based content in popular smartphone apps for depression and anxiety: developing and applying user-adjusted analyses. *Journal of Consulting and Clinical Psychology*, 88, 983–993. doi: 10.1037/ccp0000604

Wasil, A. R., Venturo-Conerly, K. E., Shingleton, R. M., & Weisz, J. R. (2019). A review of popular smartphone apps for depression and anxiety: assessing the inclusion of evidence-based content. *Behaviour Research and Therapy*, 123, 103498. doi: 10.1016/j.brat.2019.103498

Weinberger, A. H., Gbedemah, M., Martinez, A. M., Nash, D., Galea, S., & Goodwin, R. D. (2018). Trends in depression prevalence in the USA from 2005 to 2015: widening disparities in vulnerable groups. *Psychological Medicine*, 48, 1308–1315. doi: 10.1017/S0033291717002781.

Werner-Seidler, A., O'Dea, B., Shand, F., Johnston, L., Frayne, A., Fogarty, A. S., & Christensen, H. (2017). A smartphone app for adolescents with sleep disturbance: development of the Sleep Ninja. *JMIR Mental Health*, 4, e28. doi: 10.2196/mental.7614

Whitaker, C., Stevelink, S., & Fear, N. (2017). The use of Facebook in recruiting participants for health research purposes: a systematic review. *Journal of Medical Internet Research*, 19, e290 doi: 10.2196/jmir.7071

Wise, J. (2019). Depression in children: offer digital CBT as first line treatment, says NICE. *BMJ*, 364, l364. doi: 10.1136/bmj.l364

Zinbarg, R. E., Craske, M. G., & Barlow, D. H. (2006). *Mastery of your Anxiety and Worry (MAW): Therapist Guide.* Oxford University Press.