Contents lists available at ScienceDirect

International Journal of Human - Computer Studies

Designing personalized mental health interventions for anxiety: CBT therapists' perspective

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ARTICLE INFO

ABSTRACT

Anxiety disorders are the most common mental health problem, and cognitive-behavioral therapy is one of the most widely used, evidence-based treatments. While several mobile apps for anxiety that integrate cognitive-behavioral therapy (CBT) techniques exist, major challenges remain concerning uptake and engagement. Personalization is one strategy that can be used to improve client engagement, and integrating therapist input is one mechanism for such personalization. This study aims to understand therapist practices and identify new possibilities for delivering intervention content between face-to-face CBT therapy sessions. It comprised semi-structured interviews, followed by a series of ideation activities, and thematic analysis of the data. The results showed the central role of clients in shaping the content of therapy sessions, their challenges with homework practice, and therapists' diverse practices. Analysis of the ideation activities elaborated the potential role of therapists in the personalization of apps for anxiety. We conclude with takeaways for designers of personalized mental health mobile applications.

1. Introduction

Mental health disorders are among the leading causes of disability, and anxiety disorders are the most common type of mental health problem. Mental health problems will affect one-third of the population during their lifetime (Altwaijri et al., 2020), anxiety disorders alone affecting 264 million adults worldwide (Saloni Dattani and Roser, 2021). Anxiety disorders impact daily functioning, leading to avoidance behaviors, excessive worry, fear, and various physical symptoms like sweating and increased heart rate (Rector et al., 2016). These disorders involve intense emotional responses to real, perceived, or anticipated threats, along with associated behavioral disruptions such as avoidance (Joyce-Beaulieu and Sulkowski, 2016). Symptoms and presentations vary somewhat across anxiety disorders but the most important difference is what triggers the anxiety, worry, and avoidance such as specific objects in situations in specific phobias or social situations and judgments in social anxiety disorder, or free-floating and general triggers in generalized anxiety disorders (Szuhany and Simon, 2022). Most anxiety disorders begin early in life and left untreated can lead to lasting and

persistent impacts in functioning (Wehry et al., 2015). Frontline treatments include both pharmacological and psychosocial options with effective psychosocial treatments based on cognitive-behavioral and exposure techniques (Szuhany and Simon, 2022).

The most evidence-supported treatments for anxiety disorders are those based on cognitive-behavioral therapy (Otte, 2022). Cognitive-behavioral therapy (CBT) is a skills-based treatment that attempts to educate clients about the link between their thoughts, actions, and emotions and to provide skills to break this link. It is delivered most commonly in a clinical environment where the client and therapist collaborate together to develop and apply certain skills. Homework is an important component of CBT and allows clients to practice and reinforce the skills learned in therapy sessions in real life. In CBT, homework can be defined as "specific, structured, therapeutic activities that are routinely discussed in session, to be completed between sessions" (Kazantzis et al., 2010). Sessions usually follow a structured format, starting with agenda setting, followed by reviewing homework assignments, discussing current issues, introducing new skills or techniques, and setting new homework tasks. This organization helps clients to

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systematically apply CBT principles and techniques to their daily lives, fostering lasting positive changes (Kennerley, 2016).

Technology advances have created new opportunities for the delivery of CBT treatment online via desktop computers, laptops, tablets, or with the use of mobile apps to help patients build core CBT knowledge and skills (Wright and Mishkind, 2020; Wright et al., 2019). These interventions can be used as a partial replacement for face-to-face therapy, as an independent intervention involving some support from a professional, or as unguided self-help (Gellatly et al., 2007). Despite the potential benefits of using such technologies, apps are not always optimized to support clinical use and benefit (Torous et al., 2018). The majority fail to gain traction (Wasil et al., 2020), the attrition rates of people using them are high (Huckvale et al., 2020; Becker et al., 2014), and sustained use is even rarer (Baumel et al., 2019; Baumel and Kane, 2018). Recent work on the real-world reach of these apps shows that few are actually used for a long period of time (Wasil et al., 2020; Baumel et al., 2019).

Many of today's mental health technologies require some human support from a coach or therapist to sustain engagement (Mohr et al., 2017). To make app-based mental health tools sustainable in real-world clinical settings, there is therefore a need to consider the human component of the service, and to develop service and implementation plans alongside the technology, before simultaneously evaluating both the technology and its implementation, a concept referred to as "Technology Enabled Services" (TES) (Huckvale et al., 2020). This offers the opportunity to develop blended care models that complement face-to-face treatment, supported by technologies. Prior research reveals that one of the main reasons for disengagement from mental health apps is the lack of personalization and customization options (Salehi et al., 2019; Oyebode et al., 2020; Alqahtani and Orji, 2020; Alqahtani et al., 2019; Thach, 2018; Borghouts et al., 2021; Vo et al., 2019; Goodwin et al., 2016). Currently available technology-based interventions typically are not tailored to account for variability in individual characteristics (Wright and Mishkind, 2020). Intervention content could be tailored to individual users and should continue to adapt to their changing needs (Oyebode et al., 2020). In these situations, the efficacy of technology-supported therapy may be bolstered by inviting therapists to contribute to the tailoring of apps based on their own circumstances and needs.

It is well established among therapists that treatment should be tailored to the individual client and the uniqueness of their context. This means not only matching therapy to the diagnosed disorder but also considering the individual characteristics of the client (Norcross and Wampold, 2011, 2018). Previous studies have discussed the possibilities of enhancing treatment effectiveness by tailoring therapy to the individual and his or her singular situation based on multiple transdiagnostic characteristics. Such personalization factors include attachment style, culture, coping style, therapy preferences, reactance level, religion and spirituality, and stages of change (Norcross and Wampold, 2011, 2018; Aparicio and Méndez, 2020). Despite the expected advantages of involving therapists in the tailoring of treatment, we currently know little as to how CBT therapists' input might be best integrated into the personalization of mobile technologies, how therapists view this possibility, and which features and content are perceived as worth shaping.

Previous studies have shown that personalized health interventions are more effective than those employing a one-size-fits-all approach in depressive and anxiety disorders (Carlbring et al., 2011; Silfvernagel et al., 2012). Systems that are adaptable and tailored to users' needs can deliver more pertinent information, thus enhancing user engagement and clinical efficacy (Hawkins et al., 2008; Kreuter et al., 2013). Hence, we need to understand how the content in mental health apps can be tailored from the viewpoint of therapists to suit individual needs.

The objective of this study is to understand CBT therapists' perspectives on the delivery of tailored intervention content to users of mental health mobile technologies for anxiety management. More specifically, we seek to understand current therapy practices and strategies employed by therapists for the engagement of clients with therapy (if any) by employing semi-structured interviews. We then conduct ideation sessions to explore how tailoring can be offered in different stages of treatment, and what tailoring needs should be taken into consideration. Through this understanding, we seek to uncover a greater range of possibilities for the design of personalized mobile applications for therapist-supported CBT.

2. Background

2.1. Previous work on personalizing digital mental health technologies

Blom and Monk define personalization as "a process that changes the functional- ity, interface, information content, or distinctiveness of a system to increase its personal relevance to the individual" (Blom and Monk, 2003). Despite prior research revealing the need to deliver more personalized technologies, there are only a few studies that have explored the delivery of such interventions. Previous studies have been conducted on tailored internet-based treatment for anxiety disorders with comorbid anxiety and depression (Carlbring et al., 2011; Andersson et al., 2011) and to treat symptoms of anxiety and depressive symptoms in the presence of panic attacks (Silfvernagel et al., 2012). These studies explored the delivery of personalized content by therapists based on interview data using the Structured Clinical Interview (SCID) (Carlbring et al., 2011; Silfvernagel et al., 2012) or based on participants' preferences after being given brief descriptions of the modules (Andersson et al., 2011). The conclusion drawn from these results is that tailoring an Internet-based therapy can be a feasible approach in the treat- ment of anxiety-related disorders. A recent study explored both users' preferences as well as how their engagement with an app are impacted by different ways of providing person- alized recommendations. Results revealed an asymmetry between what users declared as their preference for autonomy (versus guidance) and how they used the app in reality (Pieritz et al., 2021).

Cognitive Behavioral Therapy (CBT) apps designed for anxiety management integrate a variety of evidence-based techniques to provide support to users. These apps often integrate psychoeducation, offering insights into anxiety by providing definitions, descriptions of reinforcement cycles, and outlining different symptoms. They also educate users on the cognitive behavioral model, helping them to understand the interplay between thoughts, feelings, and behaviors. Self-monitoring features allow users to track their emotions and behaviours, fostering greater self-awareness. Cognitive techniques aid users in identifying negative thought patterns and applying cognitive restructuring to challenge and modify them. In addition, behavioral techniques such as behavioral activation and experimentation encourage users to test new behaviors and overcome avoidance patterns. Moreover, relaxation skills are often integrated through mindfulness exercises, progressive muscle relaxation, and breathing exercises, empowering users through tools to manage anxiety more effectively. In addition to offering therapeutic techniques, these apps facilitate reflection on collected data, foster peer support through integrated discussion and chat groups covering various topics related to mental health, and provide links to external support services and hotlines (Balaskas et al., 2021b).

Several studies have attempted to personalize interventions by collecting data through apps themselves. Such data can be collected automatically with the use of sensors, based on responses to ecological momentary assessment (EMA) questionnaires, or manually by research staff and therapists (Balaskas et al., 2021a). Therapists can tailor intervention content through the use of a portal or by selecting intervention content between face-to- face therapy sessions (Balaskas et al., 2021a). Existing mobile apps tailor intervention content by allowing users to select the challenges or goals they want to work on during first use or suggest intervention strategies based on users' self-monitoring data (Balaskas et al., 2021b; Wu et al., 2021). However, the adoption of these

tools remains relatively low, with users frequently expressing dissatisfaction due to the lack of personalization, which is a significant factor leading to disengagement from these applications (Huckvale et al., 2020; Baumel et al., 2019). At the same time, face-to-face psychotherapy plays a crucial role in delivering effective care, and while the exploration of digital tools to complement this traditional approach garners significant interest, it remains relatively underexplored. By blending smartphone apps with treatment, there is potential to boost both uptake and engagement levels with these tools (Mordecai et al., 2021). The exploration of such services necessitates collaboration with clinicians and service users to ensure that the content provided is relevant to clients. It also entails reevaluating app design to effectively address user needs and taking into account the delivery setting (Balaskas et al., 2023). However, the precise factors supporting effective personalization remain unclear due in part to a lack of insight into CBT therapists' perspectives with regard to technological tailoring; limiting what we know about the effective design of these mechanisms in support of care.

2.2. Understanding users' perception of personalizing mental health technologies

A small number of studies have examined users' perceptions of personalized mental health technologies. A systematic review was carried out of qualitative studies of users' perceptions of mobile health apps (Vo et al., 2019). Users requested the capacity to customize an app's interface, reminders, or treatment elements (e.g. the number of symptoms reported, the frequency of health tips) as a means of achieving greater personalization. In addition, they have suggested that apps should support more interactivity, and allow altering of the type of language used (i.e. changing language that felt patron- izing) (Vo et al., 2019). A systematic review of digital mental health interventions and their effectiveness in addressing anxiety and depression in young people identified, among other objectives, factors associated with engagement with digital mental health interven- tions for young people. Users believe that mental health apps should tailor modules to one's own needs, and provide the ability to opt-in or opt-out of features, social features, or notifications (Garrido et al., 2019). Another study aimed to gain the viewpoint of service users from a local mental health service in developing a mental health app. A significant theme surfaced by this study came in the form of the desire to personalize apps by customizing different app functions (Goodwin et al., 2016).

While previous research has explored users' suggestions, to the best of the authors' knowledge, no study has to date explored CBT therapists' perceptions of personalization, or worked with therapists to identify possible ways in which such personalization could operate. Thus, the aim of this study is to uncover the different possibilities for the design of personalized mobile applications for therapist-supported CBT. We investigate the utilization of technology as a supplementary tool, and as a means to reinforce skills acquired during face-to-face sessions. This approach enhances client engagement and support without over-shadowing the therapeutic relationship, as therapists integrate technology to extend the benefits of therapy beyond traditional session times, supporting clients whenever needed.

3. Method

This paper presents findings from interviews and ideation activities conducted with CBT therapists. These methods were chosen to actively encourage therapists to make suggestions with regard to the potential design and tailoring possibilities of mental health apps for anxiety. Our study has a two-fold purpose: (1) to understand therapists' current therapy practices in regard to facilitating client engagement with therapy (semi-structured interviews) and (2) to identify new possibilities for tailoring intervention content in between face-to-face CBT therapy sessions with therapists' input, through ideation activities conducted through design workshops.

3.1. Participants

Recruitment was via social media, noticeboards, and the researchers' personal and professional networks. Interview participants were not required to participate in ideation sessions. We recruited 19 therapists in total - 10 of whom took part in semi-structured interviews, and 10 in ideation sessions. One therapist participated in both the interview and ideation studies. The study included two samples to capture a broader range of practices and perspectives, facilitating the identification of various ideas for therapists' involvement in personalizing mental health apps. A therapist was considered for recruitment if they were proficient in English, and were experienced with providing CBT treatment to people with anxiety disorders (i.e. treatment that is delivered to people with anxiety disorders, face-to-face or online). Each participant was compensated for their time and effort with a €20 voucher. The study was approved by the SCSS Research Ethics Committee (REC) at Trinity College of Dublin.

3.2. Procedures

3.2.1. Semi-structured interviews

We conducted 10 online semi-structured interviews. The interviews lasted approxi- mately 40 min and were conducted by the first author, who has previous experience in qualitative research. Therapists were asked to complete a short questionnaire covering sociodemographic characteristics, and professional experience. The primary focus of this study was to understand current therapy practices and possibilities for the use of technology more broadly. Each interview started with questions about therapists' current therapy practices, clients' engagement with therapy, and their use of technology. There- after, the researcher explored therapists' perspectives on technology-supported therapy and different possibilities for delivering intervention content with the use of mobile apps. The interviews were audio recorded and transcribed by an external transcription service. The semi-structured interview guide is available in Appendix 1, however in accordance with best practices in qualitative research, the interviewer would follow up initial questions provided in the guide with probes and follow-ups as necessary.

3.2.2. Ideation activities

We next conducted 7 ideation sessions with 10 therapists —each participating in a single session. Ideation sessions are held to generate creative ideas and solutions to a specific problem or challenge and generate a large volume of ideas in a short period of time. Ideation sessions can take many forms, from structured brainstorming exercises to more open-ended discussions. During an ideation session, participants are encouraged to freely express their thoughts and explore ideas to identify new opportunities (Tschimmel, 2012; Maaravi et al., 2021; Kelley, 2001). The sessions were facilitated by the first author, informed by their background in design research for mental health and prior experience conducting similar ideation sessions, coupled with industrial expertise as a user experience designer. Each session lasted 1.5 h and was attended by 1 to 3 therapists, plus a facilitator. Design sessions with multiple therapists enabled dialogue and discussion, but were challenging to schedule; sessions with individual therapists allowed us to explore individual practices and opportunities for support, which was in line with our research objectives. The focus of the ideation activities was to gain insight into therapists' perspectives on the delivery of tailored intervention content to users of mobile mental health technologies for anxiety management. The aim was to understand which aspects of a digitally delivered intervention might most effectively be tailored and how. All ideation sessions started with a brief description of the goal of the session. The facilitator presented previous examples of CBT apps showing different app functionalities and current strategies employed for the tailoring of intervention content. The set of presented apps was taken from a recent review of anxiety apps which examined how cognitive behavioral elements are delivered, and their functionalities to

support user engagement and tailoring based on user needs (Balaskas et al., 2021b). The facilitator aimed to provide a broad perspective on the range of available app functionalities. As a result, screenshots were displayed, and app features were detailed, highlighting the variety of functions instead of focusing on particular apps. The therapists had the opportunity to ask questions regarding this material. After the presentation, the facilitator presented a workflow exercise and two scenarios to enable therapists to generate ideas for tailoring intervention content. The workflow exercise represented a therapy timeline that was used to facilitate discussion for each scenario (Fig. 1). Therapists were asked to use sticky notes in collaboration with the facilitator to generate ideas and talk about current therapy structure and homework practices, how a mobile app could support their work in different stages of treatment, which content could be tailored, and which tailoring needs should be taken into consideration. All ideation activities were audio recorded and transcribed by an external transcription service.

3.3. Materials

We used two scenarios to serve as prompts during the ideation design sessions representing people with anxiety disorders (one with generalized anxiety disorder and another with panic disorder) to illustrate diverse motivations for treatment, as well as additional information about the different possible contexts of use. Scenarios were derived from case studies published on the American Psychological Association, Division 12: Society for Clinical Psychology website, which contain specific symptoms, and relate to anxiety disorder diagnoses. We selected these scenarios to illustrate cases of the two most common anxiety disorders, associated with significant healthcare expenses and a high burden of illness (Bandelow and Michaelis, 2015). We used scenarios as a starting point to facilitate discussion and identify possibilities of tailoring at different stages of treatment. The scenarios and questions asked to facilitate discussion are available in Appendix 2. Table 1 illustrates the stages of the therapy timeline and the corresponding discussion facilitation questions for each scenario.

3.4. Data analysis

The interviews and design sessions were analyzed inductively following a thematic analysis approach (Braun and Clarke, 2006). This recursive and iterative process entailed successive readings of the transcripts and familiarisation with the data, complete coding of the data, pattern identification and analysis, definition of themes, and

Table 1

Therapy Timeline and Discussion Facilitation Questions for Ideation Sessions.

Stages of therapy sessions used during the Workflow exercise	Questions asked to facilitate the discussion for each stage in both scenarios
Therapy starts - Session 1 Week 2 - Session 2 Following weeks - Middle sessions Therapy ends	How will the session be structured? What homework will you suggest [NAME] practice? How could a mobile application support your work in different stages of treatment? How would you adapt app content to increase its relevance to this client (CLIENT NAME)? What are [NAME] characteristics that you may take into consideration when deciding on the homework material?

reporting of findings. For the interviews, one researcher read the same transcripts and conducted open coding. The researcher coded the entire data set without any predefined codes. After all the transcripts had been coded, a second researcher familiarised themselves with the dataset and the two researchers discussed and started collating these into themes. This led to the establishment of an initial set of themes. For the ideation sessions, we copied the interactive sticky notes generated during the ideation sessions onto a virtual board (Lee, 2019), where one researcher conducted open coding and grouped them into clusters of similar codes and rearranged them as the analysis progressed to identify key themes. We acknowledge that the unique backgrounds, perspectives, and experiences of each of the authors may have influenced our interpretation of this data. Both authors, whom conducted the analysis collaboratively, have a background in human-computer interaction and are experienced working in a participatory fashion, and conducting qualitative analyses of data gathered from mental health patients and professionals. Collaborative discussion between researchers strove to surface these individual perspectives, as permit reflection on their implications for the analysis.

4. Results — interviews

Inductive thematic analysis of these 10 interviews provided insight into CBT therapists' current therapy practices, client engagement with therapy, and understanding of current and future uses of technology for delivering intervention content between therapy sessions with the use of mobile apps. Table 2 shows the demographic characteristics of participants.

Fig. 1. Example of a part of the workflow exercise.

Table 2
Demographic characteristics of interview participants.

Attribute	Range	Participants
Interviews		
	Female	6
Gender	Male	4
	Non-binary/ third gender	0
	25–34	1
Age	35–44	1
	45–54	5
	55–64	3
	0–2	0
	2–5	3
Years of Experience	5–10	1
	10–15	2
	15–20	3
	more than 20 years	1
	Fundamental awareness (basic experience)	0
Experience with technology	Novice (some limited experience)	1
	Intermediate (experience of using tech in practice)	8
	Advanced (experience using tech in complex projects)	1
	Expert (others come to you to ask about your experience)	0

Table 3
Themes and Sub-themes of the Interview Results.

Theme	Subtheme	Description
Therapists' Therapy Practices	Understanding Individuality in Therapy Practices	The interviews revealed the diverse approaches therapists take to initiate therapy and set goals with their clients.
	Clients' Central Role in Shaping the Content of Therapy Sessions	Clients play a significant role in shaping the content and direction of therapy sessions.
	Supporting Client Engagement with Therapy	Building a therapeutic alliance is crucial for enhancing client engagement.
	Understanding Individuality in Homework Practices	Homework assignments are tailored to meet individual client needs and challenges.
	Understanding Different Considerations for Assigning Homework	Therapists balance task-setting with client autonomy when assigning homework.
Understanding the Role of Technology to Support Clinical Practice	Therapists' Perspectives on Integrating Technology	Therapists express optimism About integrating technology into clinical practice to enhance therapy delivery.
	Challenges When Integrating Technology	Despite enthusiasm for technology integration, therapists acknowledge challenges related to client receptivity, technology literacy, affordability, and data privacy.

4.1. Therapists' therapy practices

One of the primary aims of the interviews was to understand therapy practices and client engagement with therapy. Findings from the interviews highlighted key differences between therapists' practices and clients' needs (Fig. 2). The results offer an understanding of (i) individuality in therapy practices, (ii) clients' central role in shaping the content of therapy sessions, (iii) supporting client engagement with therapy, (iv) understanding individuality in homework practices, (v) and understanding different factors in and for assigning homework. Table 3 summarizes the themes and sub-themes from the semi-structured interviews.

4.1.1. Understanding individuality in therapy practices

In order to understand how the personalization of digital CBT might best be designed in practice, we needed to first ensure a good understanding of the practice of therapy over time from clinicians' perspectives. Therapy sessions are held to work out problematic behaviors, beliefs, feelings, relationship issues, and/or somatic responses. The success of therapy, whether conducted online or in-person, rests to a

significant extent on the first session, as these interviews revealed. Many therapists shared individual practices to enable a good beginning to this process. The aim of the first session for the therapist is to understand the client's presenting issues, past experience with therapy, and expectations for the therapy sessions. This allows therapists to decide on the therapeutic approach to be applied since different types of clients require different treatments. Therapists spoke of the first session as a way to co-create goals with the clients and provide psychoeducation around anxiety or CBT depending on the approach that is applied,

> "*So that would be looking at triggers for anxiety, for example, and how is it impacting on their life? And if our time together was to be successful,*
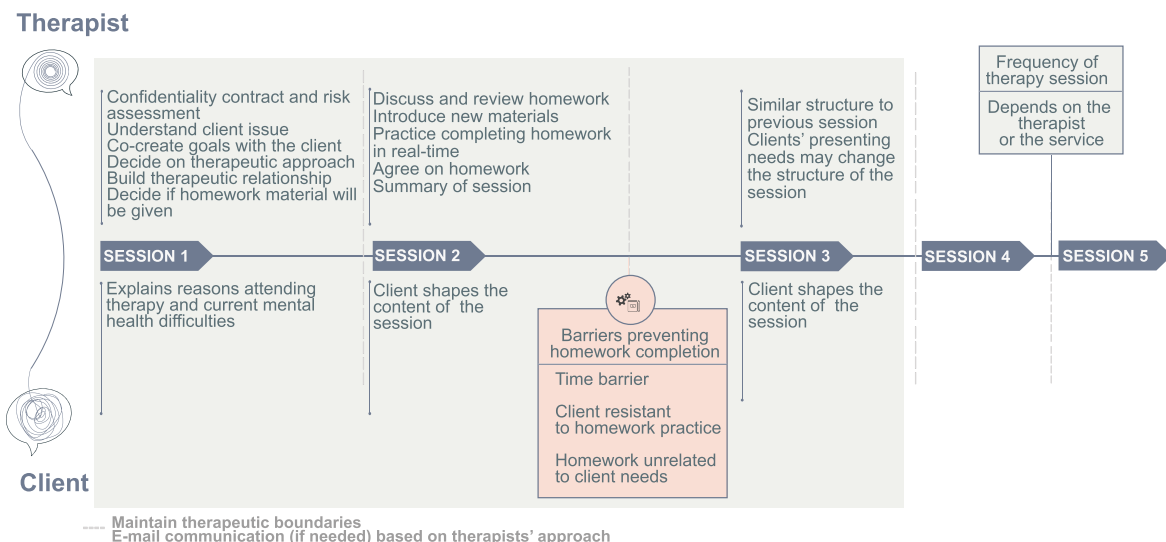

Fig. 2. Example therapy flow showing different activities and barriers to homework practices.

what would have changed at the end of six sessions? So my process there is trying to support and help the clients to explore the concrete changes. That means their anxiety is having less of an impact on their life." (P8)

One therapist referred to applying a probing approach during the first session with clients,

"And then after that, I suppose for the first session, I say maybe we cover two things. Tell me, of course, about what issues you have, but also maybe we'll try to spend a little bit of time towards the end on the flip side, I always ask that question, if you didn't have that issue in your life, what sort of things would you be doing that you're not doing?" (P2).

The tasks of the therapists are to take notes during the session and review those notes before each session. Other tasks may include therapist research for a specific issue that a client may bring up during the session,

"If there's something I'm not really sure about, I might research it. If there's an issue, if something is going on in their life, which I don't really fully understand, I'd read up about it." (P1).

Therapists end a session by summarizing takeaways, by using scales to assess clients' feelings, or using questionnaires to assess client progress and review their progress after six weeks,

"Generally, every six sessions, I'll do a review, and I make this known to the client at the beginning that's just to see are they getting something from us do they feel they're progressing, and if they'd like to make any changes to their therapy as well." (P6).

4.1.2. Clients' central role in shaping the content of therapy sessions

Clients have a central role in filling in the structure of therapy sessions. The linear plans of treatment manuals usually do not fit the reality of everyday treatment. Even though therapists at the beginning of each session have a topic on their mind or ask for client feedback on homework to guide the session, clients' may encounter life events and challenges that disrupt the prescribed sequence of sessions,

"I think as a therapist is hugely valuable to be able to respond in session to what a client brings, which may be quite different to the presenting issue. So what I would find is that people present with anxiety, but other issues come up and that could be a real curve ball.. And I think it's hugely important that I'm able to respond in the moment about that client need." (P8).

Therapists need to remain flexible in order to effectively respond to clients' presenting needs during the session. One participating CBT therapist described how they work to prioritize the topics presented by clients during sessions;

"I would try and not have them go into too much detail on what they want to bring in and to give me a sense of the kind of top headings of what they want to bring.. And I would normally say something like, normally the one we start with is going to be the one we'll spend most time on. So which one is priority for you?" (P9)

Therapists need to engage with clients' interpersonal stances in all their forms and create responsive psychotherapy for each distinctive client. Therapists spoke about new information disclosed by clients during treatment which may change the picture of what the core problems actually are,

"You might apply sort of a CBT approach that initially, or at least I would because of the way I work, and you might see pretty good results quite quickly. But then other things come up and things which are maybe a root cause of the anxiety maybe, or other issues that weren't discussed in a couple of sessions, and then the approach is likely to change. There might be things that aren't really suited to a CBT approach and they might just want the opportunity to talk." (P1) Thus, as new understanding of

client difficulties arise during treatment, the treatment approach may broaden beyond that initially envisioned.

4.1.3. Supporting client engagement with therapy

Client engagement within and outside of sessions is undoubtedly a driver of clinical change. Participating therapists noted that building a therapeutic relationship from the first session is an important component of enhancing engagement with the therapy process since it allows clients to open up about their issues,

"And then you might find that after a while of being maybe more person sensitive, they get to a point where they maybe trust you a bit more, and it's possible to be a bit more challenging and change the approach a bit and be a bit more directive, whereas that might not have worked from day one, but maybe in the tenth session or something like that, the trust is there, and maybe you've got a bit of a relationship and it's possible to ask questions" (P1).

Nine out of ten therapists do not provide support in-between therapy sessions unless a client is considered high-risk since therapeutic boundaries are important to maintaining the professional relationship. Only one of the therapists we interviewed allowed some sort of communication with the clients in-between therapy sessions to support their engagement, while boundaries were still maintained,

"I have one client that does reach out more and I say I only respond to emails once, maybe twice a week. Know that. And we started this all at the beginning. But they find great comfort in reaching out to me and sending a quick thing." (P10).

Therapists discussed enhancing therapeutic efficacy and homework completion by explaining to the clients the importance of working by themselves and doing the homework outside of therapy sessions,

"for CBT you make it very clear from the beginning this is part of the therapy. These exercises, you have to do the work basically, and you have to complete these exercises in order to get the full effectiveness." (P5).

P4 mentioned using homework as a way to understand the barriers and improve therapeutic practice by assigning more relevant homework,

"And we sort of figure out what the barriers are sometimes to putting into action some of the things we talk about. And that's really useful, to be honest, because most people know what to do, but they don't do it"

4.1.4. Understanding individuality in homework practices

Homework is an important component of cognitive behavior therapy (CBT) and other evidence-based treatments that have been built off CBT. Therapists assign and practice homework with clients during therapy sessions. Each therapist has a library with their own resources that they use depending on clients' mental states and needs. These resources include material from worksheets, websites, books or book chapters, podcasts, or Youtube videos. Two of the therapists spoke of recommending *"apps for anxiety management because Mindfulness and CBT are the top two treatments"* (P10). Examples of such homework activities include maintaining a journal to monitor thoughts and emotions, filling out worksheets to recognize and counteract negative thought patterns, practising relaxation methods like deep breathing, gradually confronting feared situations through exposure exercises, and conducting behavioral experiments to assess new behaviors or beliefs.

The responsibility of therapists to respond to clients' needs during the session affects the way that CBT is delivered and the exercises assigned to each client. The way that CBT is used in practice differs among therapists; three therapists described using CBT practices in therapy sessions by assigning verbal homework, while the rest described sending worksheets for clients to practice in-between therapy sessions. For example, P2 discussed using CBT during the therapy sessions and

verbally assigning homework material,

"I sometimes use CBT, particularly with anxious conditions, and then, for instance, a little bit about, again, the thoughts, the feelings, the actions. So certainly some obvious things in relation to some CBT stuff is that if they identify coarse triggers that start their anxiety or that get their phobia going" (P2). The same therapist sometimes mentioned that they occasionally suggest mindfulness and journaling techniques to clients depending on their presenting needs.

4.1.5. Understanding different considerations for assigning homework

Homework provision requires a dedicated balance between task setting and client autonomy. The decision to assign homework, and of what kind, was revealed to depend most often on clients' intersecting needs. Five therapists described assigning homework based on clients' past experience, based on the results of anxiety scale scores, or based on receptiveness to specific homework material. For example, P5 mentioned,

"Again, I figure out what the client likes. Do they like being on their phone? Do they like being on apps? Do they want to be journaling or things like that, or do they need more recommendations for maybe physical movement or things like that?".

Another factor to consider when setting homework is the frequency of the therapy sessions. While other therapists hold a weekly practice with their clients, P7 prefers to space out meetings and to allow clients to absorb and practice the material,

"And then I tend to space out the meetings. So maybe the fourth meeting might be in a fortnight and the fifth meeting might be in another three weeks. So the six sessions, it's not always just six weeks. It might be over two or three months because some of the material takes a little bit of time to absorb or to practice."

An understanding of clients' challenges in completing the homework exercises developed collaboratively during therapy sessions could then inform and influence the delivery of personalized content. Therapists referred to time as a common barrier for preventing homework completion,

"I think the number one barrier would be I'm meeting people who are extremely busy. So I'm thinking of professionals who have a full time job... They would say to me, oh, yeah, I just couldn't open that email. I know you send me stuff I didn't have time to." (P8). Another reason for clients' irregular homework completion practice was described as homework not relevant to clients' needs,

"So I think most people are pretty committed to doing the homework and will explain if they haven't, they'll also be happy to tell you 'I didn't find that relevant' or 'I'm not sure why you were sending out to me', but is useful when we sort of go through it." (P4). Thus, the therapists saw value in discussion and understanding the reasons for non-completion.

4.2. Understanding the role of technology to support clinical practice

Therapists discussed also the possibilities for using technology to support their current practices including the features that mobile technologies could have and that would benefit therapy practices.

Eight therapists were positive about the use of technology in their clinical practice and proposed different activities that could be integrated into mobile apps. Such activities usually included psychoeducation, journaling, self-monitoring, thought challenging, identifying cognitive distortions, and some guidance on how to use such techniques. These activities could make clients aware of how they are thinking and help them identify patterns. Other techniques included mindfulness, grounding techniques, and graphical feedback of clients'

data entries. Other therapists were interested in integrating worksheets, or specific techniques they use in their practice, derived from sources such as books and websites, for example, P9 mentioned,

"some things like the Johari Window are very good, but it's often hard to kind of get someone to fill in the worksheets and send them on an email and then they have to send them back with it written on and they've got to scan them and all the rest".

Integrating homework practices with the use of technology requires an understanding of the diversity of clients with anxiety disorders. P1 referred to the importance of assigning distinct homework exercises which meet individual clients' needs and challenges, *"Well, the thing with, the problem is that the activities are often individually tailored to the clients. For anxiety disorders, yes. We just talk about what triggers their anxiety and maybe some of the things that make them particularly anxious."* P1 mentioned that treatment decisions related to homework should be the result of a conversation with the client,

"It's a collaborative thing. We're working out something between clients and therapists about what would be useful and maybe a way of logging on an app that they've done it and when they've done it." Collaboration between the therapist and the client is key yet there is more to be done to understand what shape this might take.

Four therapists mentioned that integrating such techniques into an app would help them identify themes or understand the situations that challenged the clients during the week; information that can be used to guide therapy sessions,

"So it would be helpful if I could get some before the session, get some examples of what they struggled with, because then that would help me to be prepared and to be able to tailor the session maybe towards some of those specific things." (P7) The use of technology in-between sessions could help to refresh learning of material introduced during the sessions,

"It like a little something they can lean on in between sessions. Again, it might refresh the content of their learning, particularly with CBT, because with CBT, there is actually a lot of you're learning how you think and how your thought processes, how they go for you." (P5) Such material would have to reflect the topics actually covered in the session.

4.2.1. Challenges when integrating technology into therapy practices

Therapists acknowledge that clients who are not receptive to using their phones, and clients with lower technology literacy would not benefit from such a solution. In addition, they mentioned that price affordability, data privacy and security, and internet connectivity could enhance app use. Even though eight of the therapists were positive towards the use of an app to support their clinical practice, therapists were concerned that apps may cause clients to overthink their issues. For example, P1 stated,

"But if there's the examples we gave like if an emotional kind of a diary, just logging what's happening and being fairly factual about it and keeping track of activities that they've done, but maybe being fairly cautious to that, not to have them disappear down the rabbit hole. Why is this happening? Why am I thinking this? So just being careful that it's not counseling or it's just a way of logging things to be dealt with at a later stage. I feel like that would be important."

P8 wanted technology to ensure not to dehumanize people through technology, an act antithetical to therapy,

"They know if they talk to a human therapist, they're getting a tailored therapeutic approach to them. And it's acknowledging maybe their uniqueness as human beings and also why we have much in common as human beings. And if we take anxiety, it's a symptom. And that's one of our struggles we will share commonalities with a lot of others that struggle with anxiety, but the contextual piece is always unique."

4.2.2. Summary of interview results

These interview results revealed diverse therapy practices, the active role of clients in shaping the content of therapy sessions, and challenges with the delivery of personalized intervention content through the use of mobile apps. Understanding the importance of individualizing therapy to meet client needs raises questions about the characteristics that could enable effective tailoring of mobile app content.

5. Results — ideation sessions

We next conducted ideation sessions with 10 therapists to further explore the possibilities for tailoring intervention content in between face-to-face CBT therapy sessions with the use of technology and to understand the client characteristics that should be taken into consideration for that purpose. Each session was audio recorded, totaling over 8 h of audio. These recordings were anonymized and fully transcribed. Findings from the ideation sessions highlighted the need for a modular approach to the tailoring of content and the central role that therapists should have in personalizing mental health apps. In addition, they provided an understanding of the different characteristics that need to be taken into consideration when designing personalized technology-based interventions. Table 4 shows the demographics of participants across the ideation sessions.

5.1. Using technology to support clinical practice

Echoing the results of our interviews concerning the use of technology to support clinical practice, therapists spoke more directly about the integration of technological features into the design of personalized technologies depending on clients' unique presentations. Feedback was revealed as an important aspect of a personalized system to benefit both therapists and clients. A personalized system should also provide some sort of visual feedback to therapists to better understand clients' progress.

In addition, client feedback on homework practices was considered important by therapists to guide their homework practices,

> *"You know everyone is different but it might be possible and I think as well somewhere where the client is able then to maybe rate their progress or something that they're kind of rating therapy and their progress but as part of the treatment. So you might get a weekly feedback."* (P18)

Feedback should also be provided to the clients to show progress

Table 4
Demographic characteristics of design sessions participants.

Attribute	Range	Participants
Ideation sess		
	Female	8
Gender	Male	2
	Non-binary/ third gender	0
	25–34	2
Age	35–44	3
	45–54	2
	55–64	3
	0–2	1
	2–5	2
Years of Experience	5–10	1
	10–15	0
	15–20	2
	more than 20 years	4
	Fundamental awareness (basic experience)	0
Experience with technology	Novice (some limited experience)	2
	Intermediate (experience of using tech in practice)	7
	Advanced (experience using tech in complex projects)	1
	Expert (others come to you to ask about your experience)	0

during therapy sessions and provide encouragement. The focus of the ideation sessions was to understand therapists' perspectives on the tailoring of mobile anxiety applications and what form they aspire for this to take as the next sections focus on.

5.2. Using a modular approach for the personalization of mental health apps for anxiety management

The ideation sessions highlighted that therapists' would like to have a central role in the personalization of mental health applications. Therapists requested the need for a modular approach in which they can use information gathered from clients to tailor the design of an app for delivering personalized intervention content. The individuality of clients and the collaborative nature of homework assignments require the design of a flexible and modifiable system for clinicians to use. As P14 stated,

> *'there's no point in assigning homework if they're not going to do it. So you agree a homework package."*

Therapists requested the use of a dashboard that could be used to assign homework relevant to client needs at the end of each session. Fig. 3 illustrates the main ideas envisaged by therapists for the delivery of personalized interventions.

It is critical for therapists to be able to access a system post-session with several options to suit clients with different characteristics and needs. As P11 envisaged,

> *"Well, as a clinician, it would be nice to have my end of the app where I could push things to Phil which are relevant to things that we spoke about in session."* and *"it would be great to be able to say, okay, so Phil is telling me that he has a problem with self criticism and that I have got perhaps in the app or perhaps I can pull it into the app, I can copy and paste it or something that I can signpost him to other resources that might be relevant."*

P12 envisaged a post-session system that builds up over time with resources and recommendations created by the therapist. Similarly, P6 envisioned selecting and providing unique intervention content from a pool of different exercises that would be tailored to each client's presentation and needs. As P16 stated,

> *"Because if you just give them an app with loads of stuff on it, that doesn't really mean that you've really thought and understood what this person needs. So for him, it might be psychoeducation on panic. It might be information on safety behaviors… But his toolbox is different to somebody else's toolbox because of the interaction you've had with him and how you understand his difficulties and how he understands what's going to help him manage this into the future because this will always be an issue around stressful situations…"*

P18 envisaged the use of profiles for each client and the selection of a suite of exercises based on the client's presentation,

> *"I suppose to make it relevant if you're going to individualize it or tailor it for your client if there was a function where you could maybe do a profile of their challenges or something, so I'm just trying to think if I have three, four clients they all have anxiety but that anxiety is going to be present very differently so if I was able to maybe profile and that then might link to the exercises or something or a suite of exercises that then you choose for that kind of profile of clients or something. I know with CBT exercises they are very individualized and that's why you don't do the same thing."*

In addition to the development of a system for use in between face-to-face CBT therapy sessions for the tailoring of intervention content, P19 envisioned the use of a synchronous app that could be used during the therapeutic session to push specific customizable assignments to clients based on their indirect feedback provided through the app. Thus, P19 envisioned the use of technological capabilities such as natural language processing, AI, and accumulated data to predict decisions on
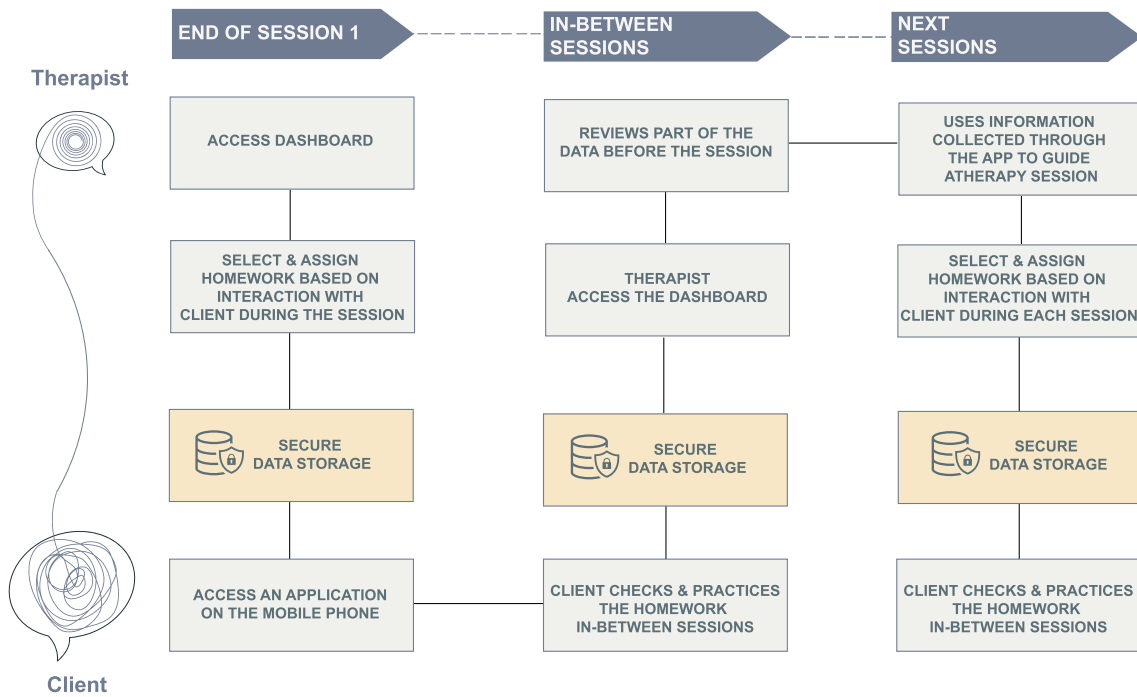
Fig. 3. Process to personalize mental health technologies for anxiety.

the therapist's behalf and to predict the therapeutic trajectory over time. P19 referred to the importance of even using just individual algorithms *"to know what your expected trajectory would be on the basis of detailed scientific measurement would be huge."*

5.3. Identifying the key characteristics for the tailoring of mental health app content

The ideation activities revealed many different client characteristics and therapists' preferences meriting consideration in the tailoring of intervention content. The therapist's main goal is to identify what is helpful for the client. Therapists acknowledge that the individuality of clients' needs affects the content of homework that is assigned to them. Client feedback on intervention strategies practiced during the session is further- more critical when deciding on the tailoring of intervention content. In order to provide homework relevant to clients' needs, therapists need to understand the client, select the appropriate strategies for each client, and modify/adapt such strategies based on the client's needs. Fig. 4 summarizes the identified key characteristics for the tailoring of mental health content.

5.3.1. Understanding the client

People presenting for treatment are not always motivated to engage in the process nor to make changes in their lives. A leading cause of

Fig. 4. Tailoring Characteristics.

treatment dropout and low adherence is therefore a lack of motivation (Jardine et al., 2022). Therapists should understand clients' motivations for change in order to make possible the effective tailoring of intervention content. As P11 stated,

"Well, again, overall kind of readiness for change because he may be so panicked and so anxious that he might struggle to get into sessions at first. He may be a sporadic attender if he's very panicked and doesn't want to leave the house."

P16 requested the ability for the client to rate their readiness for change as a characteristic that would affect the delivery of intervention content with the use of technology,

"Well, is he going to, number one I suppose feel able and number two be motivated. So actually something like a measure of readiness for change might be good for someone like Dave, where he can rate his readiness to actually make a change and do something, take on the task or whatever."

In order to identify which intervention strategies are likely to benefit each client, determining whether or not a client is receptive to specific intervention strategies is another characteristic that should be taken into consideration in regards to the tailoring of intervention content. For example, P13 mentioned that

"if you have a very anxious client proposing a grounding exercise where they will be by themselves with their thoughts can have the opposite outcome of what you were hoping so I would most probably try and exercise with him in the room to see how he's reacting a little bit of a breathing maybe just a body scan to be able to leave his mind and go into his body."

Therapists practice different intervention strategies during the session to inform the homework assignment.

P19 referred to clients' level of awareness of their situation as a factor that would alter the sequence of homework delivery. As P19 stated,

"And this is the point where like something like panic that you may actually alter the sequence somewhat. If somebody comes in and they already thoroughly understand how their thoughts are perpetuating their symptoms, you might jump straight to exposure, but if they don't want or they're not even on the page to understand what a thought is, you probably have very different work that you might want to do."

Similarly, clients' past experiences with therapy can influence decisions about the delivery of intervention strategies. As P15 stated,

"also want to know maybe his level of CBT so maybe he's going back for the 8th time to have CBT again but maybe it's his first time."

Understanding clients' routines and availability are important for the delivery of notifications at times when they are able to interact with an app. As P13 stated,

"I couldn't have a notification at, let's say, nine in the morning when he's at work to do a specific exercise that can take ten minutes. I wouldn't recommend that.", and P12 *"It's a notification that only he will take according to his presenting issues and again his routine and his way of life living basically."*

5.3.2. Selecting/matching intervention strategies

At a high level, different intervention strategies could be presented in a system controlled by therapists based on the type of anxiety disorder. As P18 stated,

"once you go into your main presenting issue, anxiety, and then that will bring up maybe a tier of options. And then within that, you can go and look at different activities or different kind of tasks, work tasks, cognitive tasks, behavioral tasks, physical tasks, whatever."

Another characteristic flagged by participants as important to take

into consideration when deciding on the intervention strategies assigned is the severity of anxiety symptoms for each client. Assessing the severity of clients' symptoms would allow for the selection of tailored intervention strategies for each client. As P14 mentioned,

"So that you have your different packages there that you can call on, different resources there that you can depending on severity", and P14 *"I suppose if the therapist had access to all of the different tools and could tick certain tools for the client, particular client rather than giving a client everything and overwhelming them".*

5.3.3. Modifying/adapting the intervention content

Therapists furthermore expressed a desire to assess a few client characteristics in order to alter the modality for the delivery of content. P14 and P15 referred to an understanding of clients' media communication styles that could affect how content is delivered through an app. As P14 stated

"I suppose it'd be helpful to know, Obviously Phil likes to read books, so he's obviously quite well-read. It sounds like other clients don't like to read. Maybe they want to watch videos or listen to podcasts or whatever. You might need different types of content on the app."

Therapists discussed delivering intervention content based on clients' preferences for different types of modalities. As P17 stated,

"I think some people like it's a gender issue. They like to listen to a woman or a man. So I'd always ask people, do you want to hear a male or a female voice? Sometimes they want to hear your voice because you're doing the therapy with them. Some people like to hear their own."

Understanding clients' familiarity with technology could influence the delivery method of intervention content and require the provision of an app that is easy to use for the client. In addition, the design of a personalized app should, according to therapists, take into consideration accessibility needs such as those of dyslexic clients and therefore consider different input and output modes for content delivery.

Understanding clients' availability to complete homework practice could furthermore effectively inform the frequency and content of a personalized app. As P17 stated,

"And also encouraging him with regular practice of the progressive muscular relaxation three times a week for 10, 15, 20 min, where would he do it? How is it for him? The grounding techniques, as [participant name] was saying as well, using cognitive distraction when he gets caught up in worries, looking at his surroundings, noticing buildings, noticing people, taking his mind off the worry, in essence. So building on that, I think over the next few weeks."

Therapists referred to the possibility of providing several customization options to suit client needs and different options for modality delivery such as using voice input instead of text. As P20 stated,

"And then if there was a variety of male and female voices, that kind of and then you would have to then have graded literacy as well."

Other therapists referred to the importance of modifying the language of content for each client. As P18 stated,

"So the exercise, say in a thought record, the columns are going across the page, and they're asking them to fill that in. But below that, they would have an example. They give an example to prompt, but that example might not exactly fit the client. So you might have to write in an example from their experience that they will prompt them when they're at home, because the example that's written down isn't necessarily something that they'd have experienced is that kind of way.", *"And they'd be different wording from the person with generalized anxiety."* Thus, the language could be altered to make it both more relevant to the client experience, as well as the specific form of the anxiety disorder.

6. Discussion

The personalization of mobile mental health technologies is an important step in supporting the tailoring of care for individual clients. While personalized apps may demonstrate documented efficacy, their successful integration into routine clinical practice remains a challenge (Kessler and Glasgow, 2011). Engaging key stakeholders such as therapists could play a crucial role in strengthening implementation and dissemination efforts for evidence-based practices, ultimately enhancing accessibility to these vital resources, especially within overburdened healthcare systems where clients often struggle to obtain evidence-based care. In the present work, we presented two studies that investigated CBT therapists' perspectives on the personalization of mobile technologies and identified new possibilities for delivering intervention content. In study 1 we conducted semi-structured interviews to understand current therapist practices to support client engagement with therapy, as well as therapists' perspectives on technology-supported therapy. In study 2, we conducted ideation sessions with therapists to explore possibilities for the delivery of tailored intervention content and identify characteristics key to achieving a high degree of personalization. These studies provide complementary perspectives, allowing us to build an understanding of the design of tailored mobile interventions to support clinical practice. The results from the interviews showed that clients play a central role in shaping the content of therapeutic sessions and consequently affecting the delivery of intervention content through the use of apps. The design of personalized apps should support flexible use considering each client's unique context. We identified several barriers preventing homework compliance, similar to the barriers to homework compliance previously identified in the literature (Garland and Scott, 2002; Leahy, 2002; Gaynor et al., 2006; Bru et al., 2013; Williams and Squires, 2014). Such factors include a lack of motivation to change when experiencing negative feelings, disregard for the importance or relevance of the homework, efforts associated with pen-and-paper homework formats, the inconvenience of completing homework because of the amount of time consumed, not understanding the purpose of the homework, lack of instruction, and failure to anticipate potential difficulties in completing the homework. Similar to existing guidelines for enhancing homework compliance and providing appropriate means of completing CBT homework (Tompkins, 2002), therapists discussed assigning homework that is relevant to the central goals of therapy, agreeable to both therapist and client, practiced in session, doable, and has a clear rationale. In addition, our results showed that therapy and homework practices are diverse, allowing space for further exploration of the different possibilities for tailoring intervention content. Even though prior research shows that one of the main reasons for disengagement from self-management mental health apps includes the lack of personalization and customization options (Salehi et al., 2019; Oyebode et al., 2020; Alqahtani and Orji, 2020; Alqahtani et al., 2019; Thach, 2018; Borghouts et al., 2021; Vo et al., 2019; Goodwin et al., 2016; Balaskas et al., 2022, 2023), our study results show that involving mental health professionals in design informs the development of a wide range of options for the personalization of mental health apps. Therapists requested a modular approach in which a dashboard is used to tailor the content of predefined modules based on different client characteristics. Similar to the results of previous studies (McDermott and Ebmeier, 2009; Stawarz et al., 2020), it was considered important by participants not to overwhelm the client with unnecessary materials. Recognizing this need, therapists requested an active role in the personalization of such systems. In contrast to existing technology-based systems for intervention delivery, effective personalization requires the modification of predefined modules. Our study shows that personalization strategies for the delivery of intervention content based only on the type of anxiety disorder (e.g. GAD) or severity of symptoms are inadequate for the design of highly personalized interventions and different user characteristics should be taken into consideration. The application of these personalization strategies cannot be carried out in a fully automated way and is not without difficulties.

6.1. Therapist-Led personalization and the value of flexibility

Ideation activities highlighted the need for flexibility in the choice of intervention strategies and materials that clients should access. A mobile app should deliver useful content and be congruent with the therapy being delivered and the therapeutic goals agreed upon between clients and therapists. Nine out of ten therapists who participated in our study suggested digitizing existing homework practices and adjusting intervention content based on specific client characteristics. Only one therapist referred to the use of advanced technological capabilities such as the use of sensors or machine learning algorithms. In this case, predictions could be made for both the mental health state of clients and to inform therapists' decisions about session practices. Therapists spoke about the integration of different types of homework in CBT, including, psychoeducational homework, self-assessment, and intervention strategies homework.

One issue arising from our study is that more effective tailoring requires more information gathering. In that case, different levels of tailoring can be offered over time based on assessing different client characteristics. Therapists spoke about different client characteristics that should be taken into consideration during therapy sessions that would influence the sequence of delivery of intervention strategies. The types of homework that would be assigned would then depend on different client characteristics assessed during sessions such as the type of anxiety disorder, severity of symptoms, clients' receptivity to different homework, clients' past experience with therapy, and different preferences for the modality of content delivery. Therapists emphasized the need for different delivery formats of intervention content based on different clients' needs. Similar to the results of a previous study (Harrison et al., 2011), therapists noted that clients often find the length of time spent doing homework and the lack of clear instructions discouraging. Therefore, therapists mentioned the importance of understanding clients' preferences in relation to task duration and of providing detailed instructions for app use.

Therapists highlighted the need to adjust treatment based on the client's presenting issues and preferences beyond the delivery of a CBT treatment manual. The application of different CBT techniques depends on client presentation during therapeutic sessions with psychoeducation being the most steady component of treatment. This indicates the difficulty in making predefined decisions for the personalization of intervention content. Self-monitoring and psychoeducation are major components in the early stages of CBT therapy for anxiety disorders. Other intervention strategies such as thought records, identifying cognitive distortions, and behavioral exercises depend on initiated conversations between therapists and clients. In addition, the wording of intervention content and behavioral exercises requires unique design considerations to match individual needs. Therefore, treatment modules delivered via mobile phones should meet the specific needs of each client. Previous research in the areas of blended therapy and delivery of CCBT has shown that the ability to support flexibility influences the acceptability of a system for clients (M°ansson et al., 2013; Titzler et al., 2018). In addition, our results showed that there is more being shaped in the provision of homework than might at first meet the eye. Therapists also use homework as a way to understand client barriers and client receptiveness in relation to homework provision. Table 5 presents actionable recommendations for designers of mental health technologies, drawn from the findings of our study.

6.2. Automate encouragement and maintain therapeutic barriers

On the whole, therapists were positive toward the use of technology to support clinical practice and enhance therapeutic outcomes. They suggested using technology as a reminder of the material discussed during sessions and as a substitute for current homework practices. In

Table 5
Recommendations for designers of mental health technologies.

Engage Therapists in the De- sign and Implementation of technologies (Sections 4.2 and 5.2**)**	Designing technology for therapists involves engaging them actively throughout the development process, allowing designers to gain valuable insights into therapists' specific needs, preferences, and challenges, which enables designers to tailor the technology to meet those needs.
Implement a Modular Approach with Dashboard (Sections 4.1.1, 4.1.4, and 5.2**)**	Designers should incorporate customizable modules within the dashboard interface, allowing therapists to easily select and arrange intervention components according to individual client needs. This approach addresses therapists' requests for flexibility in selecting and adjusting intervention strategies.
Overcome Barriers to Home- work Compliance (Sections 4.1.5 and 5.3.3**)**	Address barriers to homework compliance by acknowledging the challenges identified by therapists, including lack of motivation, unclear instructions, and time constraints. Develop strategies within the technology platform to overcome these barriers, such as offering varied homework options, providing clear instructions to clients, and accommodating different preferences for task duration.
Provide Flexibility in Intervention Delivery (Sections 4.1.5 and 5.3**)**	The interface should allow therapists to easily customize intervention content based on individual client characteristics and preferences. Therapists should have the ability to adjust treatment based on presenting issues and their severity, receptivity to different interventions, past therapy experiences, and preferences for content modal- ity.
Streamline Therapists' Work- load	Design the personalization system by offering quick interactions and predefined modules that are easily adjustable based on client characteristics to reduce manual effort for therapists, while ensuring not to increase their workloads.

addition, therapists spoke about the potential benefits of monitoring clients' activity before sessions while maintaining therapeutic boundaries. This can be achieved by active data collection that allows the patient to decide what they are disclosing or through passive data collection which might reduce the burden on the client yet reduce their autonomy. A lot of current work in academic settings focuses on the use of passive sensing to collect user data and provide content relevant to client needs (Balaskas et al., 2021a). Therapists referred to the value of providing tailored encouragement which is automatically delivered for clients' progress based on the commitment to homework practices and completion of different intervention activities. They also discussed the possibility of reviewing part of clients' data to guide therapy sessions that will benefit existing practices. Even though therapists value integrating technology into their practice, it is important for them to maintain therapeutic boundaries in-between sessions and avoid adding expectations on the clients' side. The goals of the technology and its limitations need to be clear to clients.

6.3. Considering therapists' workload and current practices

The use of an integrated system to support clinical practice and personalization entails the risk of increasing therapists' workload. Modifying intervention wording or behavioral exercises based on client presentation could, for example, increase the burden on therapists. The design of a personalization system should offer quick interaction for therapists. This can be achieved with the use of predefined modules that are adjustable based on the specific client characteristics identified in our study. Such a system should provide modularity and allow for flexibility considering both different modalities and the wording of intervention content. In addition, the use of such a system requires changes in current therapy practices and raises considerations as to how such a system should be integrated into traditional care settings among different providers.

7. Future work and limitations

Our results showed that personalized systems should enable therapists to flexibly make decisions at the end of each therapeutic session. Future work could explore the possibility of designing a personalization system to support therapy practices and integrating this into current therapy care settings. This study answered the question with regard to the specific tailoring needs which should be taken into consideration; however, future design work should explore in more detail the design options for such systems. In addition, future work should explore further how tailoring can be most effectively offered at different stages of treatment, and which content can be tailored for that purpose. Moreover, future work should also explore the possibilities of personalization for the design of mental health technologies beyond the realm of therapy care settings. Machine learning algorithms and data analytics could help to improve the design of such systems by learning over time from different therapists' decisions and the different client characteristics which affect such decisions. Through AI-based technologies (e.g., machine learning, deep learning), it is possible to inform the selection and delivery of treatment components (Bickman, 2020; Thieme et al., 2020). This could open possibilities for the creation of more effective personalized systems and could consequently help improve the design of self-management mental health apps.

There are a number of limitations to our current study. First, we have employed very broad recruitment criteria in our study; recruiting therapists with experience in providing computerized therapy may provide different results. Similarly, it is possible that therapists' experiences may differ according to treatment modality (i.e., for therapists applying cognitive-behavioral vs. psychodynamic therapy), and given that other factors could be identified for particular therapies, future studies should aim to assess for differences according to these factors. An additional study exploring the design of a personalized system could reveal more insights regarding therapists' perspectives.

8. Conclusions

To explore CBT therapists' perspectives on the design of personalized mental health interventions for anxiety disorders in-between face-to-face CBT therapy sessions, we interviewed 10 therapists and conducted ideation activities with 10 therapists. Our findings show that each individual's unique anxiety context requires clinicians to take an active role in personalizing such technologies. Therapists prefer a modular approach to the tailoring of intervention content and assign homework based on different client assessments and characteristics. We highlighted the different client characteristics that should be taken into consideration in the design of personalized technologies, yet also that these design decisions can have an impact on therapists' workloads. Designing personalized digital interventions for anxiety disorders requires supporting flexibility and taking different individual characteristics into account. Future research should explore the implementation of a personalized system to support clinical practice in line with clients' needs.

Declaration of competing interest

The authors declare that they have no known competing financial

interests or personal relationships that could have appeared to influence the work reported in this paper.

Funding

Supplementary materials

Supplementary material associated with this article can be found, in the online version, at doi:10.1016/j.ijhcs.2024.103319.

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