Exploring Effective Features of Behavioural Activation Just-in-time Adaptive Interventions for Depression – A Co-designing Study with Mental Health Care Professional

Stina Marie Schröerlücke

Department of Psychology, University of Twente

202000381: Bachelor Thesis Positive Clinical Psychology and Technology

1st Supervisor: Dr. J. T. Kraiss

2nd Supervisor: Dr. J. Piano Simoes

July 3, 2024

Abstract

Depressive disorders are prevalent today. To lower their negative impact, effective treatment is essential. This thesis examined the attitudes of therapists towards behavioural activation Just-in-time Adaptive Interventions (JITAIs) addressing depressive disorders and ideas regarding their functionality and adaptability. This was done by conducting an exploratory qualitative study using a co-designing approach. Research as this one, regarding new forms of treatment, prove to be relevant to solve issues of receiving treatment in the first place, non-response, and relapses. Six therapists participated in the study through focus groups and answered short questionnaires to gain a better overview regarding the attitudes towards digital mental health (DMH) services and JITAIs. A thematic analysis of the focus groups was conducted, in which therapists' positive outlooks but also worries were represented. When it comes to functionalities, different elements are considered relevant, including bodily, cognitive, and social activation as well as an encouraging intervention design. Lastly, the results underlined the importance of strong personalisation and context related adaptability. The attitudes of the sample are positive towards JITAIs and their further exploration. The study yielded new insights into therapists' views regarding the described elements of activation, the relevance of encouragement, as well as the importance of personalisation and adaptability. The findings of this study should be reappraised in future research with different samples, especially including patients, and in-depth focus on single elements. Nevertheless, these study findings offer first expertise-based ideas to use for behavioural activation JITAI development in the context of depressive disorders.

Exploring Effective Features of Behavioural Activation Just-in-time Adaptive Interventions for Depression – A Co-designing Study with Mental Health Care Professional

Depressive disorders, commonly referred to as depression, are prevalent diseases, which pose issues to today's societies. The World Health Organisation (WHO) as well as the National Institute of Mental Health (NIH) define depression as a severe mood disorder with overarching influences on an individual's life, which can affect a vast range of people (NIH, 2023; WHO, 2023). Depressive disorders can occur in different forms, include a broad range of psychological and some physical symptoms, and are diagnosed if symptoms last throughout "most of the day, nearly every day, for at least two weeks" (WHO, 2023). The World Population Review (2024) refers to an estimate of 251-310 million people and 2-6% of the population suffering from depression worldwide. Both, NIH (2023) and WHO (2023) mention that treatments for depressive disorders are efficient, nevertheless, they also consider the vast amount of people who stay without diagnosis and treatment. Moreover, although treatments prove effective, there are still people who do not respond to or benefit from current treatment methods (Rozental et al., 2019; Vetter et al., 2022; Vöckel et al., 2023). High relapse rates even after successful treatments pose an additional problem to depression treatment (Steinert et al., 2014; Touya et al., 2022). Hence, improving care for individuals with depressive disorders further is a crucial and recent topic.

There are some well-established treatments for depressive disorders, including psychotherapeutic elements, medication, and in severe cases brain stimulation therapies (NHI, 2023; WHO, 2023). One concrete type of effective intervention is behavioural activation, which aims at "chang[ing] the way a person interacts with their environment" (Uphoff et al., 2019, p.2). This aim is achieved through understanding mutual reinforcements of inactivity and depressive symptoms, observing daily activities, identifying, and focussing on meaningful and positive activities, and reducing barriers to them (PsychologyTools, 2024). Wang and Feng (2022) conducted a literature review on behavioural activation studies with clinical trials to assess the effectiveness of the therapeutic approach. In their study results, behavioural activation leads to heightened behavioural engagement and a decrease of symptoms for different severities and forms of depressive disorders, for example, dysthymic disorder, with moderate to large effect sizes compared to other treatment approaches without behavioural activation elements or cognitive behavioural therapy. In addition to that, the therapeutic method proves effective in treating comorbidities with other mental or physical disorders, such as posttraumatic stress disorder or

coping with cancer (Wang & Feng, 2022). Still, there are issues finding treatment opportunities due to long waiting times and accessibility issues. The American Psychological Association (APA) observed an additional growth of these issues during and after the COVID-19 pandemic (APA, 2023). Thus, waiting times for and accessibility of treatment are a long-term issue for which there are still no clear solutions.

Digital mental health services can be a solution towards shorter waiting times and accessible treatments. The services include not only health technologies but also digital interventions, which can, if professionally designed and implemented, expand access, be more cost-effective, and provide additional available and scalable solutions to mental health treatment (APA, 2024; NIH, 2023). Mobile mental health (MMH) and digital therapeutics interventions one form of DMH application, which can be a useful addition to psychotherapy or an independent help for people suffering from mental health issues (APA, 2024; Bidargaddi et al., 2020). Although DMH and MMH interventions are popular nowadays, they still have shortcomings. Bidargaddi and colleagues (2020) describe a lack of engagement as the problem of many interventions. The issues that lead to a lack of engagement and thus lowered effectiveness of interventions are often rooted in a lack of tailoring the intervention to its users, especially when it comes to the right content and timing of interventions (Bidargaddi et al., 2020; Teepe et al., 2021). One novel idea that could help with overcoming the described shortcomings is the integration of so-called Just-in-time Adaptive Interventions into existent in-person and online therapy services. JITAIs are a type of mobile intervention design which focuses on monitoring the user and tailoring form, extent, and timing of support through the application to their needs and current context (Goldstein et al., 2017; Nahum-Shani et al., 2018). Evidence-based and effective JITAIs are typically optimised using a longitudinal collection of real-life user data (Bidargaddi et al., 2020; Zhu et al., 2023). Although there are theoretical background knowledge and frameworks available regarding JITAIs promises and optimisation processes, there are only a few examples of their current application.

In the mental health care field, JITAIs have rarely been used to support healthy behaviours. Examples of use cases of JITAIS promoting healthy behaviours include reducing sedentary behaviour and increasing physical activity (Hardemann et al., 2019; Müller et al., 2017) or aiding with addictive substance use (Goldstein et al., 2017; Perski et al., 2022). Wang and Miller (2020) conducted a meta-analysis on JITAI effectiveness and showed that JITAIs resulted in greater improvements than alternative approaches, as in the JITAI condition, patients improved

significantly more regarding health outcomes related to their condition and in post-intervention measures (Wang and Miller, 2020). Although JITAIs are indicated to be an effective form of treatment and potentially more effective than applications that do not use JITAI functions, Teepe and colleagues (2021) found that MMH interventions for depression scarcely include JITAI mechanisms. Hornstein and colleagues (2023) conducted a broad literature review in personalisation, also reporting that advanced personalisation, such as JITAI functions, is missing when it comes to DMH interventions. Therefore, gaining knowledge on how to construct effective JITAIs for depression may improve DMH and MMH interventions addressing depression.

To achieve the goal of tailoring MMH interventions in the form of JITAIs successfully, it is necessary to include the views of the target groups. Cooper and colleagues (2023) found that meta-analyses and qualitative studies showed that working with patients' preferences regarding their treatment process, leads to improved therapeutic relationships and motivation during therapy and thus lowers the risk of dropout and increases positive outcomes. On the other hand, a lack of inclusion of preferences and needs of patients proved to hinder the therapeutic progress of patients with depression (Cooper et al., 2023). Ideally, a JITAI will also support running therapies and facilitate a translation of therapy content into everyday situations (Austin et al., 2020; Pérez-Jover et al., 2019). Hence, including the needs and preferences of patients and the knowledge of therapists in the development of a JITAI addressing depression should be considered.

One way to explore and incorporate the patients' preferences and needs and the therapists' experience and knowledge is via co-design methods. Co-designing studies are participatory study approaches in which interventions are designed in direct cooperation with the relevant stakeholders (Huh et al., 2021). In the case of Huh and colleagues (2021), experts worked together with adults and children to figure out themes related to efficient sun protection and made use of JITAIs to make their intervention ideas timely and practical. In another study by Song and colleagues (2021), clinical expert knowledge and patient needs and preferences are used to assess mobile health services considering support of self-management for patients suffering chronic conditions. Using a co-designing approach differs from current quantitative methods and thus has a great chance of providing new and more detailed insights into users' conditions and needs.

Conducting a co-designing study regarding a behavioural activation JITAI addressing depressive disorders is of interest, as there are currently few research studies applying participatory approaches to JITAI development and none that co-created a JITAI for depression treatment at all.

Ismail and al Thani (2022) describe that more information related to the participants' conditions and needs is helpful in tailoring interventions' adaptability to their users. This information can ideally be collected beforehand to offer input into the development and improvement phases of a JITAI. Nahum-Shani and colleagues (2018) also describe that psychological and health behaviour theories, as well as qualitative inputs of the stakeholders, can be used to more efficiently optimise JITAIs. In addition to that, JITAIs are scarcely used in mobile apps targeting depression for now (Teepe et al., 2021). Considering user needs and preferences and experience and knowledge of therapists and including those in mobile interventions through JITAIs may help to foster adherence and thus intervention effectiveness (Bidargaddi et al., 2020; Goldstein et al., 2017; Nahum-Shani et al., 2018). Hence, to improve the frequently used quantitative methodology, DMH and MMH interventions, and to fill the gaps of current research, a qualitative co-designing approach related to depression treatment and behavioural activation JITAI development can be useful to gather new and helpful information through the stakeholder population.

Therefore, this study aims to gather new knowledge for developing behavioural activation JITAIs addressing depressive disorders. Two main research questions will be discussed:

1. What are the attitudes of therapists, who are working with depressed patients, towards using a behavioural activation JITAI as addition to their running therapies?
2. What are the opinions of therapists regarding a behavioural activation JITAI?
    A. What functions of behavioural activation in JITAIs do therapists expect to be effective?
    B. How do therapists think JITAIs should and could be developed to adapt to the patient?

Methods

Design

In this study, co-designing, a qualitative research approach, was employed. To do so, therapists of Thubble (https://www.thubble.nl/), the online therapy provider of a Dutch mental health knowledge provision and care service called Dimence (https://www.dimence.nl/), were involved via focus groups. Within the focus groups, the stakeholders' attitudes, opinions, and needs related to the functionality and adaptability of JITAIs addressing depressive disorders were investigated. This approach was considered appropriate, as it allows for asking structured questions and hearing the individual opinions of the stakeholders. Additionally, focus groups offer the

possibility for shared thought processes and discussions between the participants regarding a novel topic, which can yield new and unexpected insights (Cyr, 2016). Next to the focus groups, short Qualtrics questionnaires were shared with the participants to gather some additional information about the demographics, work experience, and attitudes towards DMH services including behavioural activation JITAIs.

Participants

Six therapists were recruited via volunteer sampling through an introduction video shared at Thubble and personal requests through contact persons at Thubble. Inclusion criteria specified that the therapists worked at Thubble with patients with depressive disorders. The sample consisted of four female therapists and two male therapists. Therapists were aged between 28 and 49 (M = 35.5). Through the Qualtrics surveys, some more specific information regarding the sample population was collected. Therapists had a working experience ranging from three to nine years (M = 4.9) and they worked one to five and a half years (M = 2.4) in online services. In addition to that, one therapist indicated that they never worked with behavioural activation at all, one indicated using it sometimes, two regularly, and another two indicated using this approach very often.

Material

Before participants took part in the focus group sessions, they received a Qualtrics questionnaire, which contained a short description of the study, asked them to give their identifiable consent to diverse elements such as the recording of sessions, and provided them with the researchers' contact details (see Appendix A). Later in the research progress, multiple focus group sessions were conducted applying the focus group guide, which was created together by both students working on this thesis topic (see Appendix B). The focus groups were conducted via Microsoft Teams and recorded and transcribed with the help of the system. During the sessions, different questions were asked to guide the participants' discussions (see Appendix B). As two students were writing a thesis about behavioural activation JITAIs, the topic was divided into two elements. One element is the just-in-time aspect. This first aspect has been in-depth analysed by the second student. This thesis focuses on the functionalities and the aspect of adaptability. In the focus group sessions, there were questions about both elements covered. An example question for the just-in-time aspect was "What do you think is a good time for exercise? When being depressed or when feeling better?" (see Appendix B). For the functionality and adaptability aspects questions such as "What functions/exercises/activities can you imagine to be useful in a behavioural

activation JITAI addressing depressive symptoms?" and "How do you think the JITAI could and should be able to adapt to patients' personal needs based on the functions we talked about now?" (see Appendix B) were discussed in detail.

Therapists received an additional Qualtrics questionnaire after the first focus group session (see Appendix C). First, they were asked about their gender and age. Second, they received three questions regarding their general working experience as a therapist, online therapy experience, and use of behavioural activation in their work. Lastly, the questionnaire contained questions regarding their attitude. The first two questions could be answered with positive, neutral, or negative and asked about the general attitude towards DMH services and JITAIs. The third question asked therapists if they could imagine integrating behavioural activation JITAIs into their practice with the answer options no, as not perceived as helpful, yes, as an addition, or yes, with the assumption that they could substitute parts of their practice. In the last question, therapists were able to enter any remaining thoughts regarding behavioural activation JITAIs.

Procedure

Before starting the study, ethical approval was provided through the Ethics Committee Behavioural, Management and Social Sciences/Domain Humanities and Social Sciences of the University of Twente. To recruit the participants, a concise introduction video was shared with the therapists of Thubble in their Microsoft Teams channel by a psychologist working at Thubble and the university, who was the contact person for this thesis. This video included information regarding behavioural activation JITAIs, the motivation behind the study, the role of the participants, and practical information, and aimed at finding interested therapists who could imagine participating in our study. As there were no direct responses to the video, the first and a second contact person of Thubble, who joined as representation of the first, actively reached out to their colleagues to find some interested participants. All participants gave their informed consent (see Appendix A) before starting the focus groups. In total, three focus groups took place during the data collection. The participants were divided into two groups of three related to their point of recruitment. With the first three participants, two focus groups were conducted. Each took an hour, and the first one took place in the first week of May and focused on the just-in-time aspect, whilst the second one took place in the third week of May as last data collection appointment of this study and was dedicated to the functionality and adaptability discussion. With the second group of participants, there was only one session, which took place in the third week of May as second

appointment and took an hour but included both aspects of the behavioural activation JITAI due to a lack of time for another session. During the sessions, all therapists were able to freely express their opinions and voice their thoughts regarding the guiding questions. Next to that, there were some discussions among the participants, and they also brought their topics of interest or concerns into the sessions, which led to a great amount of input for the analysis. After the focus group sessions, the recordings with identifiable data as well as the anonymised transcriptions were stored in line with the university guidelines within the university OneDrive clouds. The recordings and therefore any identifiable data are going to be destroyed after the finalisation of the thesis.

Data Analysis

First, the questionnaire data of the attitude section (see Appendix C) were analysed using descriptive values. For the first three questions, answer frequencies and modes were described. For the last open question, the open answers were described. Second, anonymised verbatim transcriptions of the focus groups were created, as the analysis was supposed to focus on what participants said rather than their way of expressing themselves. These verbatim transcriptions were used to conduct a thematic analysis. Thematic analysis is appropriate for this study, as it allows for inductive and deductive approaches to qualitative data analysis and the understanding of the opinions and attitudes across the data set (Kiger & Varpio, 2020). After getting familiar with the data, coding was conducted manually within the transcript documents in Microsoft Word by the author of this thesis. Due to the focus of this study and the questions asked in the focus group sessions, *Attitudes*, *Functionality*, and *Adaptability* were deductively set as three main themes. The data was coded iteratively, which means that there was an initial coding scheme developed, that was refined and corrected through the analysis of further data and comparison between the different focus group sessions. The inductively identified codes resulted in more detailed subthemes, which were merged into bigger ones or split into separate ones at the hand of occurring data and their concreteness. Lastly, these subthemes were named, categorised related to the main themes, and their content was defined as summed up in the resulting report, leading to conclusions regarding the initial research questions.

Results

Attitude Assessment

The Qualtrics questionnaire was used to assess the attitude of the participating therapists towards DMH and MMH as well as behavioural activation JITAIs and their usage. All six therapists

indicated a positive general attitude towards DMH care services. Regarding behavioural activation JITAIs, the general attitude mode was also positive, with only one therapist indicating a neutral attitude. Lastly, all therapists agreed on being able to imagine using a behavioural activation JITAI as an addition to their practice. One therapist decided to use the last open question to share the thought that "[their] thinking is that the more personalised (content and timing wise) and in agreement/tune with the client the JITAIs are used, the better".

Thematic Analysis

The thematic analysis revealed twelve subthemes that could be connected to the deductively chosen main themes. Table 1. offers an overview of the findings mentioning the three main themes, their related subthemes, and the number of codes and quotes these subthemes consisted of. Appendix D offers a complete overview of the codes and quotes relevant to the thematic analysis. The quotes are not differentiated regarding the therapists voicing them, as the study focussed on the experience and ideas of all participants together, with no focus on comparisons and differences.

Table 1

Themes, Subthemes per Theme, Number of Codes per Subtheme, Number of Quotes per Subtheme

Theme	Subthemes	n codes	n quotes
Attitudes	Believed benefits	1	5
	Remaining concerns	1	11
Functionality	Encouragement	1	7
	Physical activation	4	15
	Cognitive activation	3	13
	Social component	1	7
	Timing of interventions	3	4
	System elements	2	8
Adaptability	Case specific personalisation and adjustments	8	37
	Use of patient inputs	3	7
	Use of objective measurements	1	3
	Changes due to development of the patient	3	11

Note. “n codes” is the abbreviation used to describe the number of codes subthemes consisted of, whilst “n quotes” describes the number of quotes belonging to the subthemes.

Attitudes

The first main theme *Attitudes* describes the standpoint of therapists related to the potential future use of behavioural activation JITAIs addressing depression. The data reveals two subthemes (*Believed Benefits and Remaining Concerns*) that represent the opinions of the six therapists in more detail.

Believed Benefits. The subtheme *Believed Benefits* describes the directly voiced positive attitudes of the therapists regarding the potential future use of behavioural activation JITAIs in the therapeutic practice. This, for example, is demonstrated through statements such as: “But to give them a bit more support during the time we are not available. I think it would be really nice to, to integrate that in the therapy”, which focuses on the additional support seen in this type of intervention that cannot be provided through the therapists (see Appendix D). Moreover, “some patients would be like, would, could benefit from, yeah, monitor their state and then an intervention at the right moment what it is helpful for that specific patient or clients” and

> The adaptive part of the JITAIs is, is, if I understand it correctly, that based on the data of the of the client at the right time, the, the suggestion is given to the to the client, right? And that is something that we do not do at Thubble. […] So, I do think that is a good thing that, that the JITAI can add to the therapy. (see Appendix D)

demonstrate that therapists think of the just-in-time and adaptability aspects as beneficial contributions to depression treatment. Overall, there is no great disagreement when it comes to the imaginable benefits of incorporating behavioural activation JITAIs into the running therapeutic practice in the future.

Remaining Concerns. The second subtheme *Remaining Concerns* summarises a faceted inventory of concerns that are mentioned within the focus groups. None of these concerns represent entirely negative attitudes but points that are important to consider in developing and integrating behavioural activation JITAIs. For example, “knowing all of this still keeping like boundaries in a way […]” is a quote related to concerns regarding the clear role of the therapist and clear-cut directions for using the JITAI in extreme cases such as suicidal ideation (see Appendix D). Another example are concerns regarding a social component to the JITAI, which

are mentioned in expressions such as: “keep in mind that not every client has attuned friends” (see Appendix D). Therefore, it becomes clear that there are some concerns regarding the concrete character and application of behavioural activation JITAIs, whilst no clear negative attitudes come across in the focus groups towards the general idea of using behavioural activation JITAIs in future practice.

Functionality

The second main theme *Functionality* entails the thoughts of therapists regarding the possible ways a behavioural activation JITAI could and should function. Six subthemes are found coding the data (*Encouragement, Physical Activation, Cognitive Activation, Social Component, Timing of Interventions, and System Elements)*.

Encouragement. The first *Functionality* subtheme can be described as an element of *Encouragement* in potential future JITAIs. Therapists describe, for example, “some positive messages but more like an extra nudge […] like, oh, you are doing a really good job, you, you, you went outside today” and that a “little pick me up or a motivational JITAI is, is better if someone is feeling down” (see Appendix D). Therefore, it is apparent that the participating therapists believe it is important for the JITAI to be encouraging and motivating towards the patient using the intervention.

Physical Activation. Secondly, therapists mentioned different forms of *Physical Activation* as essential element that should be provided through a behavioural activation JITAI. On the one hand, the most obvious feature of practising some kind of sports is described in expressions as: “[…] one of the parts is physical, you know, physical, physical health. What would fit you? You know, yoga, taking a walk, bicycling or fitness? […]” (see Appendix D). On the other hand, there are also more abstract forms of getting active in a physical way underlined as important to recognise and include. An example is everything that is connected to music, like “in playing an instrument you are in touch with a very different, you know, a different part of your being really” but also different forms of self-care as “tak[ing] a shower” and the practice of “making a planning” are considered to get the patient into activation (see Appendix D).

Cognitive Activation. With the third subtheme, *Cognitive Activation*, there is another element of activation described which the therapists mentioned frequently as an important component of an intervention design. There are different elements of activation related to cognitive processes, one of them being “active thinking”, which is further described as

> Is also something that really can help a depressed client get out of this, you know, depressive cloud that they are in. So, would it be also possible to implement provoking questions, instead of offering everything, just asking. So, let us think about a time where, what is it that you, you would love to doing? Now go find a moment and execute that, I do not know, once, once a week.

and "reflective question[s], how did this make you feel?" or "[the] client can also gain more insight in the, the effect of going for a walk or yeah" (see Appendix D). These quotes reflect the importance of the patients actively dealing with the behavioural activation JITAI and thinking about possibilities that are suitable for them as individuals, so they are not only habituating to do something but rather noticing what helps them further and learning to implement that as needed. This phenomenon is described by another quote in detail:

> Encourage reflective thinking because elsewise I think there is a really big risk for habituation […] what you are hoping for is that then think about the normal curve, this reflective thinking, well, makes the client really incorporate, for instance, you know going for these walks like, yeah, wow, I really felt better, I, you know? […] I might do it again. (see Appendix D)

More general elements that are described are "track [your mood and related factors] for a few days and then maybe we can find some, yeah, find some factors that, that improve or, or decrease your mood" (see Appendix D), which is related to the need of some patients to understand their feelings and related experiences better first before they can act on them. Lastly, strengthening positive thinking is described as a useful feature through expressions such as: "if someone is feeling good, right, you want to put the focus on that too, because the, the focus is on the negativity too much already" or

> Trying to think about, OK, what did went well? So, not only focusing on, OK, what, what was depressing or what was difficult or all the negative parts, but also focus on more the positive things and also even if they are really small and little but to zoom in on that and, yeah, put their attention on these smaller things that they really want, went well, or they had a good feeling, or they felt happy for a small moment, or was satisfied, or proud of. (see Appendix D)

Social Component. The fourth subtheme *Social Component* is the only subtheme regarding which therapists have some critical thoughts and questions in mind. Nevertheless, the therapists agreed that this element is important, as visible in quotes as

> When we think about us as human species, you know, we are, we are, we are group kind of group oriented or relational beings. So, I guess that it, it could be very useful for the app to send out a notification focusing on the social aspect […]. (see Appendix D)

The discussion about problems with this function leads to the idea that next to suggestions as "calling a, calling a friend" or "seeking out to other people" on one's own the JITAI could possibly "[…] [screen] the area for existing self-help groups" and provide those as suggestions to patients with no or problematic social surroundings, which all therapists agree to be a good solution to any doubts (see Appendix D). Hence, functions that contribute to getting active in a social sense are considered as important by all therapists but a concrete agreement on their character is not present in this subtheme.

Timing of Interventions. As explained earlier, the second thesis related to behavioural activation JITAIs is focussing on the just-in-time aspect. Nevertheless, *Timing of Interventions* seems to be an element of the JITAI *Functionality* as therapists expressed thoughts regarding inactivity or low moods leading to the interference of the JITAI. This subtheme is mentioned in quotes as: "we have noticed that you have been sitting down for almost an hour […] Maybe it would be a good idea to have, to take a walk or do another activity […]" and "to have the insight, OK, I am not feeling well […] what can I do to come out of this situation? And then actively do something about it" (see Appendix D). In addition to this facet, the therapists consider timing connected to unique events as "birthdays or like significant days. For example, like a loved one has passed away […]" important, as these are contexts in which patients might need additional support (see Appendix D).

System Elements. The last subtheme related to the *Functionality* of behavioural activation JITAI *System Elements* is less focused on a therapeutic view but entails more practical considerations the six therapists talk about. Some therapists describe using "interventions that, that that they did not think of, but were helpful for other patients with kind of similar profiles" as an additional element to the very personalised character of behavioural activation JITAIs described in "selection of interventions […]" for the patients (see Appendix D). Next to that, design-related elements such as "[…] language" and "how childlike or challenging do you make

it in, in the words you use or if someone does better with visuals than with text" are discussed in this subtheme (see Appendix D).

Adaptability

Lastly, *Adaptability* of behavioural activation JITAIs was a topic of interest and defined as a main theme. Therapists discussed the importance of personalisation and further features of *Adaptability*, as visible through the four subthemes that emerged.

Case Specific Personalisation and Adjustments. The first subtheme of *Adaptability* is called *Case Specific Personalisation and Adjustments* and includes a broad range of discussed features. In general, therapists underline the importance of individualising behavioural activation JITAIs for each patient and adjusting their character and functioning regarding the patient's current needs. The reasons for this are multifaceted and reach from the differing starting points in therapy over motivation and needs to considering goals. Looking at the element of different starting points, therapists describe - in a very hypothetical way – two client groups with quite dissimilar needs:

> Clients who come into therapy because they really want to change because they are in touch with a sense that they are not themselves or they are in touch with the sense that this cannot go on any longer, I do not want to. That is one. Then a second one is maybe a group of clients who have been quote on quote forced to do something about how, how they are feeling by a partner, by a family member, by friends. (see Appendix D)

In addition to that, the motivation throughout therapy plays a similar role:

> It is really important how motivated the client is. It is, it is really hard to get someone to really start like being more active if they do not really want it, or they do not really see the benefit of it. (see Appendix D)

Also, differences between patients, in general, are used to underline the necessity of thorough personalisation through expressions as "even though they carry the same diagnose, it is of course a very wide thing. Depression for person A does not necessarily mean the same as for depression in person B" (see Appendix D).

Furthermore, case specificity and cooperation with the client are described as useful for personalisation. The therapists describe

> Standard parameters and that you have a lot of different options in there to, to, to fit it to the personal needs. So, that you do not have the one-size-fits-all, but really like finding the smaller ingredients and steps for, for one particular client.

or "individual profile for each client to, to manage or to, to, to consider what kind of struggles do they experience? What do they know? What kind of insights do they have in their depression and symptoms?" and "To, to, together develop steps that the clients can, can do, that they wanna do in order to enhance the motivation" in connection to efficient and effective ways of personalization (see Appendix D). Considering therapeutic and client goals was a third element of the described successful personalisation. Therapists describe this element by mentioning: "it should be personalised no matter what […] I do agree with Therapist C that in order to, to have some benefit in the treatment, it, yeah, it should dive deeper into the, the goals of the treatment" and "I think it will be personalised from the beginning and also embedded in the therapy. Because then you are actually working on goals of, of, of the client, him or herself" (see Appendix D).

The last element rather relates to the adjustments connected to personalisation, which might be necessary to achieve suitability throughout the progress of clients. Again, two hypothetical extremes of clients are used by the therapists to underline this point:

> Client, client one seems to be based on your description already a bit, you know able to incorporate what he or she has learned throughout therapy. If you look at the level of activation and the other one is somewhere else in the process where he might, he or she might benefit more from the interventions, as the self-activation is not really there yet. (see Appendix D)

This description leads to the further specified example:

> [Client one might need a] different kind of nudge or a message more like "You are doing very well. Keep going. Keep the spirit up" and client two maybe can benefit more from the directive [inaudible], yeah, to, to be more engaged in, in activation. (see Appendix D)

The quotes used underline that most patients develop further throughout their treatment and that the intervention needs to take the progress of each patient into account to suit their needs. Lastly, in this context, "resources" also play a role (see Appendix D). Therapists suggest to using as many patient ideas and wishes as possible:

> Just ask the clients while setting up the app, how frequent when and, and basically because, yeah, all our answers were it depends, it depends on the client and I think the clients do have a sense that the best sense of that when would I be more receptive and how often and how pushy do I want it to be.

or "like to start then with interventions that patients or clients themselves propose that they were helpful in the past, and mostly they can come up with interventions that were helpful for them" (see Appendix D).

Use of Patient Inputs. The cooperation with the patient and prior and recent *Use of Patient Inputs* are considered as important by the therapists when it comes to achieving proper *Adaptability*. "Upload your planning or your activities from the week" is discussed as one outstanding element that could lead to ultimate and well-timed support through a behavioural activation JITAI, as they would be ideally adjusted to the individual participant's daily routine, regular appointments, and weekly schedules (see Appendix D). Furthermore, "if you could have the, the choice to indicate how much time you have" or

> Quick breathing exercise of a minute would maybe also be helpful, and sometimes it would be good to have like a ten-minute walk or half an hour walk or so if you could have the, the choice to indicate how much time you have. (see Appendix D)

and other expressions described the importance of the JITAI fitting into the planning of the patient in more detail and describe adjustment through active choices patients can make. Lastly, one therapist especially underlined the importance of "[…] interventions that immediately improve their, their mood or well-being" (see Appendix D), which is connected to the input of patients related to these elements of mood and well-being regularly or as feedback to the offered interventions and their suitability.

Use of Objective Measurements. The direct discussion of the third subtheme *Use of Objective Measurements* is sparse but as this is a distinct element of and thought behind JITAIs, it is nevertheless mentioned as subtheme. Therapists discussed especially the tracking of inactivity in this regard when saying things like: "the JITAI is monitoring the patient, right? So, the device knows when he or she is not, has been inactive for periods" (see Appendix D).

Changes due to Development of the Patient. The last subtheme *Changes due to Development of the Patient* is entailing the thoughts of therapists regarding the development and changes of the character of behavioural activation JITAIs throughout their usage. The therapists

agree that there will be a connection between the therapeutic practice and the JITAI application, as described in statements as: “JITAIs can fit, fit in in sort of extra dimension on how to use the, the, the, the, the schedule or the, the planning you made during therapy” and “[…] JITAIs can be like the, the extra help, extra motivation to actually do the behaviour activation” (see Appendix D), which means that therapy developments should influence the development of the JITAI. Next to that, therapists discussed the JITAI to “go about it in like a normal curve kind of way”, which is further described through the opinion “start with more structure and helping the clients. Start to, to behave or activate more and then slowly build it off” (see Appendix D). This normal curve type of development is further connected to the goals in the therapeutic progress, described in expressions as: “[…] this app and the suggestions would help in the beginning […] if the patient is a bit further in in therapy, then we want to change the, the goal to do it yourself […]” (see Appendix D). Hence, the therapists underline a need for continuous adaptation of the behavioural activation JITAI in accord with the patient’s development through time.

Discussion

This co-designing study aimed at exploring attitudes and ideas regarding the functionality and adaptability of behavioural activation JITAIs addressing depressive disorders. The motivation behind exploring new treatment approaches stems from the high prevalence of depressive disorders and issues related to treatment availability, non-response, and relapses (NIH, 2023; Rozental et al., 2019; Vetter et al., 2022; Vöckel et al., 2023; WHO, 2023). It was found that the therapists in this study hold positive attitudes towards behavioural activation JITAIs, are interested in further research regarding this intervention type, and could imagine incorporating them into their work. Further, the therapists shared their thoughts on the most essential features, namely, elements of bodily, cognitive, and social activation as well as an encouraging intervention design. Lastly, they emphasised the relevance of personalisation and adaptation of JITAIs to the patient and their changing context.

Main Findings

The reported attitudes towards the idea of behavioural activation JITAIs addressing depressive disorders answer the first research question. The questionnaire results show a positive attitude towards DMH care services and behavioural activation JITAIs, as well as openness towards JITAI application as addition to therapeutic practices. The *Believed Benefits* underline these findings. Topooco and colleagues (2017) conducted the first European-wide research regarding

attitudes towards online mental health services and reported positive attitudes of care providers, especially towards a combination of online mental health services and face-to-face therapy. Therapists in the current study specified the use of behavioural activation within the JITAI framework as promising. The reported high effectiveness of behavioural activation for depressive disorders as well as comorbidities underlines this expected effectiveness (Wang & Feng, 2022). Further, therapists' description of the intervention as possible positive addition directly connected to the online therapy services fits the thoughts of Austin and colleagues (2020) who identified the usefulness of a connection between the content and progress of the running therapy and MMH interventions through their study with a patient sample as well. Thus, the findings of the current study imply that therapists hold positive attitudes and openness towards the future application of behavioural activation JITAIs as addition to their practices. This suggests that future research could deal with first JITAI developments and use-trials in the field of depressive disorder treatment. It should be noted, however, that the sample of this study might be positively biased towards the application of new online therapeutic approaches and interventions, as they are all working in online services and have positive experiences within their work environments and with their clients. This experience might differ for other samples, with less or different experiences related to online therapeutic services.

Additionally, therapists voiced *Remaining Concerns*. They were wondering about the additional information a JITAI offers therapists about their patients and their responsibility connected to this extended knowledge. A concrete example would be a therapist's responsibility in the case of receiving information about suicidal ideation of a patient through the JITAI. Therefore, for JITAIs similar in detail considerations towards their ethical implications will have to be discussed, as it was the case with the rise of online therapy services before (Stoll et al., 2020). These ethical implications might include aspects directly connected to the technology as privacy and confidentiality issues or user competence. Further, the described issues related to the therapists' responsibilities play a role and might include clear use guidelines for the therapists and emergency rules for cases as the suicidal ideation example (Stoll et al., 2020). All in all, this study yielded new insights into the first concerns regarding behavioural activation JITAIs, which should be considered and ideally solved in future research by for example discussing and establishing tolerable and realistic guidelines with both user groups, the patients as well as the therapists.

Opinions of the therapists were assessed regarding imaginable functionalities and necessary adaptability of behavioural activation JITAIs. Most thematic findings are new insights for the field, as this is the first co-designing study about behavioural activation JITAIs addressing depressive disorders. First, *Encouragement* is mentioned, which entails the importance of the JITAI providing motivational and encouraging messages. Berg and colleagues (2022) conducted a study regarding high-quality and effective communication in online therapy settings and ascribed encouragement a significant role, which implies that encouraging messages could as well heighten the effectiveness of behavioural activation JITAIs. Second, *Physical Activation* is a key aspect described by the therapists. Research of the past underlines the positive health outcomes of physical activity towards depression (Currier et al., 2020; Kandola et al., 2019; Marques et al, 2020; Oberste et al., 2020; Zhang et al., 2021). Kandola and colleagues (2019) describe the antidepressant effects of exercise in the sense of a reduction of symptoms related to biological, psychosocial, self-esteem and self-efficacy influences. Thus, physical activation is likely to be a particularly crucial element of JITAIs addressing depressive disorders. However, physical exercise might not be possible or feasible for every patient. The additionally described aspects of patient-chosen activities as music and the element of self-care are put up as alternatives by the therapists, which might be useful for patients struggling with exercising, and thus should be considered in future research and JITAI development as well.

Third, regarding *Cognitive Activation*, the therapists discussed active and reflective thinking related to the consideration of the JITAIs functioning and its implications for the patient as well as insights into feelings, symptoms, and the connected factors of life as helpful towards the therapeutic progress. They agreed that reflective thinking about the effects of interventions is necessary to achieve progress and avoid habituation. Active consideration and understanding of the own feelings, symptoms, and helpful factors and actions could lead to heightened self-efficacy, which in turn is ascribed to have a positive influence on the daily functioning abilities of depressed patients (Milanovic et al., 2018). This could, for example, be achieved through using diary methods (Alexander et al., 2016), which were also discussed as an effective intervention approach by the therapists and could open up opportunities to the client to understand the effects of interventions and discuss them within the therapeutic setting. Moreover, therapists discussed a focus on the positive, as a focus on the negative is prevalent in depressive disorders. Research suggests that the focus on the positive and use of positive psychology interventions is an effective treatment

approach towards depressive symptoms and increased mental well-being (Chakhssi et al., 2018; Chaves et al., 2017; Geerling et al., 2020). These findings imply that incorporating functions which foster self-efficacy and such that are oriented at positive psychology practices should be considered in JITAI development.

Fourth, therapists think a *Social Component* will be useful to integrate into a JITAI. Activation of own social networks is considered effective if this is achievable and unproblematic. If this is not the case, offering an overview of local self-help groups was an alternative idea to foster social activation and prevent isolation. Studies of the past show a clear connection between social isolation, loneliness, and depressive symptoms (Erzen & Çikrikci, 2018; Ge et al., 2017). Further research underlines that social activation is considered an essential element of behavioural activation and positive interactions could support therapeutic progress (Solomonov et al., 2019). Hence, elements counteracting loneliness and social isolation are considered important for future JITAIs. To achieve this, future research could orient at social interventions and social network interventions, which provide opportunities to social interactions and contacts in different ways, as for example neighbourhood engagement, and proof to be effective in counteracting loneliness and social isolation as well as limiting their negative consequences, in some cases even depressive symptoms directly (Harada et al., 2021; Nagy & Moore, 2017).

Sub question B can be answered considering the *Adaptability* subthemes *Case Specific Personalisation and Adjustments*, *Use of Patient Inputs*, and *Changes due to Development of the Patient*. Different starting points of clients in therapy, differences in their symptoms and needs, and different goals need to be considered from the beginning. Moreover, patients will experience progress throughout their treatment. Their motivation levels play a role, as well as changes to their symptoms and needs, which makes continuous adaptation of JITAIs necessary. Therapists underlined the importance of cooperation with the patients regarding their lifestyle and routines as well as experiences and well-being. Cooper and colleagues (2023) also underlined the importance of cooperating with patients and incorporating patients' needs and preferences into their treatment to optimise its effectiveness. The described personalisation and case specificity, as well as adaptation to the patients may be achieved through the possibility for the patient to incorporate their needs and preferences in the presetting of the JITAI as well as the possibility to adapt these choices to possible changes and their progress at any time. If patients are uncertain regarding the individual choices for the JITAI, therapists could help them out with suggestions based on the

therapeutic experience with the patient and regularly check the adequacy of the JITAI support with the patient throughout their progress in therapy.

Limitations

First, no patients could be recruited for this study, which means that there are no inputs from the end user group of a potential future behavioural activation JITAI. Although we were able to speak to therapists who actively work with clients experiencing depressive disorders, we cannot guarantee that patients would agree to everything said and that there would be no new insights through the inclusion of patients. Next to that, the therapists participating in the focus groups are all working at the same online therapy provider. Their opinions towards DMH and MMH and therefore also JITAIs could be more positively biased than those of therapists providing their therapeutic care offline. As there were no such therapists included, we cannot be sure that the pictured attitudes and ideas are generalisable to other therapist groups. Lastly, as visible through only a short mention of *Objective Measurements* in the Results section, this essential element of JITAIs could not be discussed extensively in the current study, which means that the study was not able to include all relevant aspects regarding behavioural activation JITAIs.

Directions for Future Research

First, patients need to be included in co-designing studies. In addition to that, collaboration with more therapists and different institutions is equally important to broaden the picture. In general, larger sample sizes and more focus groups may lead to a greater number of insights into the range of opinions and thoughts and their overlaps and differences. Second, it might be advisable to start and make use of first prototypes to help the target group picture the issue they are being asked about more clearly. Third, it might be useful to focus on the different elements of JITAIs separately again. In the current study, a differentiation between timing and functionality and adaptability took place but during the study, it became clear that aspects as *Objective Measurements* cannot be discussed extensively with a focus that broad. Fourth, any concerns of the target group, as the question about responsibilities of therapists, clear guidelines, and emergency rules in this study, should be discussed and ideally solved in future research as soon as they arise, to allow for unproblematic progress of the field. Lastly, related to depressive disorders as well as other mental health issues it might be worth considering the usefulness of JITAIs not only as an addition to therapeutic treatments but also as standalone treatments before or after therapy, for example, to bridge the time of receiving treatment or for providing relapse prevention tools.

Conclusion

This thesis is the first co-design contribution to research on behavioural activation JITAIs addressing depressive disorders. Therapists had a positive attitude towards further investigation and future application of JITAIs. Moreover, therapists voiced concrete design ideas describing the features bodily, cognitive, and social activation as well as an encouraging intervention design, and expressed the importance of consequent personalisation and adjustments throughout the intervention use. The research at hand suggests to further investigate the ideas and opinions of the target group and to develop first prototypes based on this research and the positive attitude of the target group to allow for testing effective functions and adaptability in practice.

References

Alexander, J., McAllister, M., & Brien, D. L. (2016). Exploring the diary as a recovery-oriented therapeutic tool. *International Journal of Mental Health Nursing*, *25*(1), 19–26. https://doi.org/10.1111/inm.12179

American Psychological Association. (2024). *Digital mental health technologies*. https://www.apa.org/practice/digital-therapeutics-mobile-health

American Psychological Association. (2023, April 1). *Providers predict longer wait times for mental health services. Here's who it impacts most.* https://www.apa.org/monitor/2023/04/mental-health-services-wait-times

Austin, S. F., Jansen, J. E., Petersen, C. J., Jensen, R., & Simonsen, E. (2020). Mobile App Integration Into Dialectical Behavior Therapy for Persons With Borderline Personality Disorder: Qualitative and Quantitative Study. *JMIR Mental Health*, *7*(6), e14913. https://doi.org/10.2196/14913

Berg, I., Hovne, V., Carlbring, P., Bernhard-Oettel, C., Oscarsson, M., Mechler, J., Lindqvist, K., Topooco, N., Andersson, G., & Philips, B. (2022). "Good job!": Therapists' encouragement, affirmation, and personal address in internet-based cognitive behavior therapy for adolescents with depression. Internet Interventions, 30, 100592. https://doi.org/10.1016/j.invent.2022.100592

Bidargaddi, N., Schrader, G., Klasnja, P., Licinio, J., & Murphy, S. (2020). Designing m-Health interventions for precision mental health support. *Translational psychiatry*, *10*(1), 222. https://doi.org/10.1038/s41398-020-00895-2

Chakhssi, F., Kraiss, J. T., Sommers-Spijkerman, M., & Bohlmeijer, E. T. (2018). The effect of positive psychology interventions on well-being and distress in clinical samples with

psychiatric or somatic disorders: a systematic review and meta-analysis. *BMC Psychiatry*, *18*(1), 211. https://doi.org/10.1186/s12888-018-1739-2

Chaves, C., Lopez-Gomez, I., Hervas, G., & Vazquez, C. (2017). A Comparative Study on the Efficacy of a Positive Psychology Intervention and a Cognitive Behavioral Therapy for Clinical Depression. *Cognitive Therapy and Research*, *41*(3), 417–433. https://doi.org/10.1007/s10608-016-9778-9

Cooper, M., di Malta, G., Knox, S., Oddli, H. W., & Swift, J. K. (2023). Patient perspectives on working with preferences in psychotherapy: A consensual qualitative research study. *Psychotherapy Research*, *33*(8), 1117–1131. https://doi.org/10.1080/10503307.2022.2161967

Currier, D., Lindner, R., Spittal, M. J., Cvetkovski, S., Pirkis, J., & English, D. R. (2020). Physical activity and depression in men: Increased activity duration and intensity associated with lower likelihood of current depression. *Journal of Affective Disorders*, *260*, 426–431. https://doi.org/10.1016/j.jad.2019.09.061

Cyr, J. (2016). The Pitfalls and Promise of Focus Groups as a Data Collection Method. *Sociological Methods & Research*, *45*(2), 231-259. https://doi.org/10.1177/0049124115570065

Erzen, E., & Çikrikci, Ö. (2018). The effect of loneliness on depression: A meta-analysis. *International Journal of Social Psychiatry*, *64*(5), 427–435. https://doi.org/10.1177/0020764018776349

Franx, G., Meeuwissen, J. A. C., Sinnema, H., Spijker, J., Huyser, J., Wensing, M., & de Lange, J. (2009). Quality improvement in depression care in the Netherlands: the Depression Breakthrough Collaborative. A quality improvement report. *International Journal of Integrated Care*, *9*(2). https://doi.org/10.5334/ijic.314

Ge, L., Yap, C. W., Ong, R., & Heng, B. H. (2017). Social isolation, loneliness and their relationships with depressive symptoms: A population-based study. *PLOS ONE*, *12*(8), e0182145. https://doi.org/10.1371/journal.pone.0182145

Geerling, B., Kraiss, J. T., Kelders, S. M., Stevens, A. W. M. M., Kupka, R. W., & Bohlmeijer, E. T. (2020). The effect of positive psychology interventions on well-being and psychopathology in patients with severe mental illness: A systematic review and meta-analysis. *The Journal of Positive Psychology*, *15*(5), 572–587. https://doi.org/10.1080/17439760.2020.1789695

Goldstein, S. P., Evans, B. C., Flack, D., Juarascio, A., Manasse, S., Zhang, F., & Forman, E. M. (2017). Return of the JITAI: Applying a Just-in-Time Adaptive Intervention Framework to the Development of m-Health Solutions for Addictive Behaviors. *International Journal of Behavioral Medicine, 24*(5), 673–682. https://doi.org/10.1007/s12529-016-9627-y

Harada, K., Masumoto, K., Katagiri, K., Fukuzawa, A., Touyama, M., Sonoda, D., Chogahara, M., Kondo, N., & Okada, S. (2021). Three-year effects of neighborhood social network intervention on mental and physical health of older adults. *Aging & Mental Health, 25*(12), 2235–2245. https://doi.org/10.1080/13607863.2020.1839858

Hardeman, W., Houghton, J., Lane, K., Jones, A., & Naughton, F. (2019). A systematic review of just-in-time adaptive interventions (JITAIs) to promote physical activity. *International Journal of Behavioral Nutrition and Physical Activity*, *16*(1), 31. https://doi.org/10.1186/s12966-019-0792-7

Hornstein, S., Zantvoort, K., Lueken, U., Funk, B., & Hilbert, K. (2023). Personalization strategies in digital mental health interventions: a systematic review and conceptual framework for depressive symptoms. *Frontiers in Digital Health, 5*. https://doi.org/10.3389/fdgth.2023.1170002

Huh, J., Lee, K. J., Roldan, W., Castro, Y., Kshirsagar, S., Rastogi, P., Kim, I., Miller, K. A., Cockburn, M., & Yip, J. (2021). Making of mobile SunSmart: co-designing a just-in-time sun protection intervention for children and parents. *International journal of behavioral medicine*, *28*, 768-778. https://doi.org/10.1007/s12529-021-09987-9

Ismail, T., & al Thani, D. (2022). Design and Evaluation of a Just-in-Time Adaptive Intervention (JITAI) to Reduce Sedentary Behavior at Work: Experimental Study. *JMIR Formative Research, 6(*1), e34309. https://doi.org/10.2196/34309

Jennissen, S., Connolly Gibbons, M. B., Crits-Christoph, P., Schauenburg, H., & Dinger, U. (2021). Insight as a mechanism of change in dynamic therapy for major depressive disorder. Journal of Counseling Psychology, 68(4), 435–445. https://doi.org/10.1037/cou0000554

Kandola, A., Ashdown-Franks, G., Hendrikse, J., Sabiston, C. M., & Stubbs, B. (2019). Physical activity and depression: Towards understanding the antidepressant mechanisms of physical activity. Neuroscience & Biobehavioral Reviews, 107, 525–539. https://doi.org/10.1016/j.neubiorev.2019.09.040

Kiger, M. E., & Varpio, L. (2020). Thematic analysis of qualitative data: AMEE Guide No. 131. *Medical Teacher*, *42*(8), 846–854. https://doi.org/10.1080/0142159X.2020.1755030

Marques, A., Bordado, J., Peralta, M., Gouveia, E. R., Tesler, R., Demetriou, Y., & Gomez Baya, D. (2020). Cross-sectional and prospective relationship between physical activity and depression symptoms. *Scientific Reports*, *10*(1), 16114. https://doi.org/10.1038/s41598-020-72987-4

Milanovic, M., Ayukawa, E., Usyatynsky, A., Holshausen, K., & Bowie, C. R. (2018). Self-Efficacy in Depression. *Journal of Nervous & Mental Disease*, *206*(5), 350–355. https://doi.org/10.1097/NMD.0000000000000804

Müller, A. M., Blandford, A., & Yardley, L. (2017). The conceptualization of a Just-In-Time Adaptive Intervention (JITAI) for the reduction of sedentary behavior in older adults. *MHealth, 3,* 37–37. https://doi.org/10.21037/mhealth.2017.08.05

Nagy, E., & Moore, S. (2017). Social interventions: An effective approach to reduce adult depression? *Journal of Affective Disorders, 218,* 131–152. https://doi.org/10.1016/j.jad.2017.04.043

Nahum-Shani, I., Smith, S. N., Spring, B. J., Collins, L. M., Witkiewitz, K., Tewari, A., & Murphy, S. A. (2018). Just-in-time adaptive interventions (JITAIs) in mobile health: key components and design principles for ongoing health behavior support. *Annals of Behavioral Medicine,* 1-17. https://doi.org/10.1007/s12160-016-9830-8

National Institute of Mental Health. (2023, September). *Depression*. https://www.nimh.nih.gov/health/topics/depression

Oberste, M., Medele, M., Javelle, F., Lioba Wunram, H., Walter, D., Bloch, W., Bender, S., Fricke, O., Joisten, N., Walzik, D., Großheinrich, N., & Zimmer, P. (2020). Physical Activity for the Treatment of Adolescent Depression: A Systematic Review and Meta-Analysis. *Frontiers in Physiology*, *11*. https://doi.org/10.3389/fphys.2020.00185

Pérez-Jover, V., Sala-González, M., Guilabert, M., & Mira, J. J. (2019). Mobile Apps for Increasing Treatment Adherence: Systematic Review. *Journal of Medical Internet Research, 21*(6), e12505. https://doi.org/10.2196/12505

Perski, O., Hébert, E. T., Naughton, F., Hekler, E. B., Brown, J., & Businelle, M. S. (2022). Technology-mediated just-in-time adaptive interventions (JITAIs) to reduce harmful substance use: a systematic review. *Addiction*, *117*(5), 1220–1241. https://doi.org/10.1111/add.15687

PsychologyTools. (2024). How To Use Behavioral Activation (BA) To Overcome Depression. https://www.psychologytools.com/self-help/behavioral-activation/

Rozental, A., Andersson, G., & Carlbring, P. (2019). In the Absence of Effects: An Individual Patient Data Meta-Analysis of Non-response and Its Predictors in Internet-Based Cognitive Behavior Therapy. *Frontiers in Psychology, 10*. https://doi.org/10.3389/fpsyg.2019.00589

Song, T., Yu, P., Bliokas, V., Probst, Y., Peoples, G. E., Qian, S., Houston, L., Perez, P., Amirghasemi, M., Cui, T., Hitige, N. P. R., & Smith, N. A. (2021). A Clinician-Led, Experience-Based Co-Design Approach for Developing mHealth Services to Support the Patient Self-management of Chronic Conditions: Development Study and Design Case. *JMIR MHealth and UHealth, 9*(7), e20650. https://doi.org/10.2196/20650

Steinert, C., Hofmann, M., Kruse, J., & Leichsenring, F. (2014). Relapse rates after psychotherapy for depression – stable long-term effects? A meta-analysis. *Journal of Affective Disorders, 168*, 107–118. https://doi.org/10.1016/j.jad.2014.06.043

Stoll, J., Müller, J. A., & Trachsel, M. (2020). Ethical Issues in Online Psychotherapy: A Narrative Review. Frontiers in Psychiatry, 10. https://doi.org/10.3389/fpsyt.2019.00993

Teepe, G. W., Da Fonseca, A., Kleim, B., Jacobson, N. C., Salamanca Sanabria, A., Tudor Car, L., Fleisch, E., & Kowatsch, T. (2021). Just-in-time adaptive mechanisms of popular mobile apps for individuals with depression: systematic app search and literature review. *Journal of Medical Internet Research*, *23*(9), e29412. https://doi.org/10.2196/29412

Topooco, N., Riper, H., Araya, R., Berking, M., Brunn, M., Chevreul, K., Cieslak, R., Ebert, D. D., Etchmendy, E., Herrero, R., Kleiboer, A., Krieger, T., García-Palacios, A., Cerga-Pashoja, A., Smoktunowicz, E., Urech, A., Vis, C., & Andersson, G. (2017). Attitudes towards digital treatment for depression: A European stakeholder survey. Internet Interventions, 8, 1–9. https://doi.org/10.1016/j.invent.2017.01.001

Touya, M., Lawrence, D. F., Kangethe, A., Chrones, L., Evangelatos, T., & Polson, M. (2022). Incremental burden of relapse in patients with major depressive disorder: a real-world, retrospective cohort study using claims data. *BMC Psychiatry, 22*(1), 152. https://doi.org/10.1186/s12888-022-03793-7

Uphoff, E., Ekers, D., Dawson, S., Richards, D., & Churchill, R. (2019). Behavioural activation therapies for depression in adults. *Cochrane Database of Systematic Reviews*. https://doi.org/10.1002/14651858.CD013305

Vetter, J. S., Schultebraucks, K., Galatzer-Levy, I., Boeker, H., Brühl, A., Seifritz, E., & Kleim, B. (2022). Predicting non-response to multimodal day clinic treatment in severely impaired depressed patients: a machine learning approach. *Scientific Reports, 12*(1), 5455. https://doi.org/10.1038/s41598-022-09226-5

Vöckel, J., Sigrist, C., Kaess, M., & Koenig, J. (2023). Predictors of treatment non-response for depression in a sample of female adolescents with risk-taking and self-injurious behavior – A one year follow-up. *Journal of Affective Disorders, 324*, 129–135. https://doi.org/10.1016/j.jad.2022.12.073

Wang, X., & Feng, Z. (2022). A Narrative Review of Empirical Literature of Behavioral Activation Treatment for Depression. *Frontiers in Psychiatry, 13*. https://doi.org/10.3389/fpsyt.2022.845138

Wang, L., & Miller, L. C. (2020). Just-in-the-Moment Adaptive Interventions (JITAI): A Meta-Analytical Review. *Health Communication, 35*(12), 1531–1544. https://doi.org/10.1080/10410236.2019.1652388

World Health Organisation. (2023, March 31). *Depressive disorder (depression)*. https://www.who.int/news-room/fact-sheets/detail/depression

World Population Review. (2024). *Depression Rates by Country 2024.* https://worldpopulationreview.com/country-rankings/depression-rates-by-country

Zhang, S., Xiang, K., Li, S., & Pan, H.-F. (2021). Physical activity and depression in older adults: the knowns and unknowns. *Psychiatry Research*, *297*, 113738. https://doi.org/10.1016/j.psychres.2021.113738

Zhu, Z., Aitken, J. A., Dalal, R. S., & Kaplan, S. A. (2023). The Promise of Just-in-Time Adaptive Interventions for Organizational Scholarship and Practice: Conceptual Development and Research Agenda. *Organizational Research Methods*. https://doi.org/10.1177/10944281231202740

Appendix A

Informed Consent Qualtrics Survey

Q1:
Welcome to this research study about Just-in-time Adaptive Behavioural Activation Interventions!

We are interested in understanding your opinion, needs, preferences and suggestions related to the possibility of integrating Just-in-time Adaptive Behavioural Activation Interventions (behavioural activation JITAIs) into depression treatment.

In today's and the second online focus group, we will ask you some questions related to this topic and you are welcome to discuss your thoughts with the other participants. The sessions will be conducted in English and will take about 60 minutes each.

In this short survey, we will ask you for your consent to participate in the study.

Q2:
Please enter your full name here. (Your name will not be shared with anyone besides the research team and is just important to enable us to identify that you agree to all of the conditions relevant to your participation.)

Q3:
With the following answer, you give your consent to the procedures of and participation in this study, namely:

I am older than 18.

I could ask questions regarding the content and procedure of this study and my questions were answered well.

I had enough time to decide whether to participate in this study.

I understand that my participation in this study is voluntary.

I understand that I can withdraw from the study or stop my participation at any point in time without giving a reason for it.

I also understand that I can withhold answers for specific questions at any time without giving a reason for it.

I have been informed about the possible risks and benefits of my participation in this study.

I understand that the focus groups will be recorded and that the recordings will only be accessed by the research team and destroyed after finishing the thesis.

I understand that there will be an additional questionnaire to collect more general data about me

as a person.

I agree to the storage and use of anonymised data in transcripts, survey results and the thesis paper.

I am aware of the possibility that the finished thesis will be presented or published.

- I read the points thoroughly and give my consent to everything said.

Q4:
If there are any questions after the end of this survey, I am aware that I can contact the researchers via the following contact details:

[…]

If there are issues regarding ethical concerns, you can also always contact the University of Twente ethics committee:

ethicscommittee-hss@utwente.nl

Appendix B

Focus Group Guide

Session 1

1. ***Start recording after making sure everyone in the meeting has already filled in the consent form.***
2. ***Explain just-in-time behavioural activation adaptive interventions and ask for questions related to the main concepts. Also quickly mention the original plan to have 2 sessions: This session on just-in-time and a second on functionality and adaptability and explain the alternative if things take less time than expected. (~ 10 minutes)***
3. ***Discuss the just-in-time aspect (see [guiding] questions below). (~ 40 minutes)***

Questions: When/just-in-time aspect (Xeniya)

- Maybe some moments your patients feel better or worse than other moments, how long do these moments last for them?
- What do your patients do if they stay home when they are in a very bad mood?
- Do you think there is a change in the amount your patients use their phone when they are depressed in comparison to when they are feeling good?
- In what situations or contexts would you find a behavioural activation JITAI particularly helpful? Please describe specific scenarios where this support could assist you/patients. And when would it not be helpful/needed?
- What do you think is a good time for exercise? When being depressed or when feeling better? (imagine you receive a notification when you are feeling unhappy, will you open it at that time, you think? Why not? If not, what do you think could be a better moment for engaging with the intervention?)
- How about a good mood? Do you think it would also be useful to receive an exercise (intervention) when feeling neutral/happy and not only when feeling depressed? Why/ why not?
- Which context would be good for receiving an intervention? (home/work/doesn't matter)
- What time of the day would be good for completing an intervention? (BA intervention)? (right after waking up, before going to bed, during the day, during some fun activities, when they are bored)?
- How engaging do you think the app should be? (if an app was sending them notifications from time to time during the day, or you think once a day would be more than enough?)
- Do you think sending a push notification would be better (shown on a screen where you have to complete it right away) or a disappearing notification in the form of a reminder?
- How do you feel about having the option to access a personalized intervention whenever a person wants to assess it (on-demand option)? Additionally, what factors do you think are important to consider when developing such a tool to ensure it meets the needs of your patients effectively?
- Do you see your patients engaging with the JITAIs daily?

<u>If we are way faster than expected (only ~ 20 minutes When-discussion, we could continue with the What-discussion in this session! → Skip to Step 3 Session 2!</u>

4. ***End the session with room for questions regarding this session and explain to the participants that there will be additional questionnaires sent to them after this session to gather some more general information. Talk about planning a second session for the what/functionality and adaptability aspect. (~ 10 minutes)***

Session 2

1. ***Start recording after making sure everyone in the meeting has already filled in the consent form.***
2. ***Ask for questions that came up in the meantime. (~ 10 minutes)***
3. ***Discuss functionality and adaptability aspects (see [guiding] questions below). (~ 40 minutes)***

Questions: What/functionality and adaptability aspect (Stina)

- Have you already used some types of online/digital/mobile apps/interventions before when it comes to depression treatment? What was your experience? Can you remember certain factors and functions you liked or disliked? Did you miss any functionalities or adaptibility features you could imagine to be effective?
- What is your experience with behavioural activation as a treatment approach to depressive disorders?
- What functions/exercises/activities can you imagine to be useful in a behavioural activation JITAI addressing depressive symptoms? (Might be useful to give some examples if participants do not have ideas directly. Examples could be oriented at the basic building blocks of behavioural activation such as recording positive/meaningful activities and reminders regarding those.) Does this depend on certain factors like context or the state users/patients are in? How long should these behavioural activation exercises take?
- How do you think the JITAI could and should be able to adapt to patients' personal needs based on the functions we talked about now?
- How do you think that a new intervention with functions mentioned in the earlier discussion could support your (daily) work with your patients? Can you imagine behavioural activation JITAIs as a helpful addition to your therapeutic practice? Why? Why not?

4. End the session with room for remaining questions, thank for participation, ask new participants (who did not take part in session 1; OR if the second session is not necessary everyone) to fill in the additional questionnaire, and offer the researcher contact for potential questions and if interested in research progress. (~ 10 minutes)

Appendix C

Qualtrics Questionnaire Therapists

Q1:
In this short questionnaire, we would like to ask you for some additional information that will help us to define the sample of this study in more detail.

You will need to answer some demographic questions first. Afterwards, there will be some questions related to your working experience and history as a therapist. Lastly, you will find some questions that are related to your attitude of working with online or digital mental health services.

Demographics
Q2:
What is your gender?
- Male
- Female
- Non-binary/third gender
- Prefer not to say

Q3:
What is your age (Please enter in numbers e.g., 36)

Working Experience
Q4:
How many years are you working as a therapist? (Please enter in numbers)

Q5:
How many years are you working as a therapist in online services? (Please enter in numbers)

Q6:
Were you or are you working with behavioural activation interventions?
- Not at all
- Sometimes
- Regularly
- Often
- Very often

Attitude
Q7:
What is your general attitude towards digital mental health care services?
- Positive
- Neutral
- Negative

Q8:
What is your general attitude towards behavioural activation JITAIs?

- Positive
- Neutral
- Negative

Q9:
Would you be open to integrate behavioural activation JITAIs into your practice?

- No, I do not think they will be helpful.
- Yes, I can imagine using this type of intervention as an addition to my practice.
- Yes, I could imagine this type of intervention to be capable to substitute (parts of) my practice.

Q10:
You are welcome to use this last text field to express any remaining thoughts regarding behavioural activation JITAIs.

Appendix D

Overview of all Quotes, Codes, Subthemes, and Themes

Quotes	Codes	Subtheme	Theme
"difficult to generalize" "even though they carry the same diagnose, it is of course a very wide thing. Depression for person A does not necessarily mean the same as for depression in person B" "very personal" "you cannot generalise this to every, every client" "very difficult to generalise" "depends, I think, very much on the client" "really dependent on the client" "very individually dependent" "very person centred. Because elsewise it is, in my opinion, it is kind of like a protocol that we apply and, and it really misses the beauty of the fact that we are all different. So, the I think we spoke a bit about this in the last focus group where depression for person A does not necessarily mean the same for person B"	Difficulty of generalising clients with depression and their experiences	Case specific personalisation and adjustments	Adaptability
"clients who come into therapy because they really want to change because they are in touch	Different starting points in therapy	Case specific personalisation	Adaptability

with a sense that they are not themselves or they are in touch with the sense that this cannot go on any longer, I do not want to. That is one. Then a second one is maybe a group of clients who have been quote on quote forced to do something about how, how they are feeling by a partner, by a family member, by friends" "what is your commitment in the beginning?"		and adjustments	
"Client, client one seems to be based on your description already a bit, you know able to incorporate what he or she has learned throughout therapy. If you look at the level of activation and the other one is somewhere else in the process where he might, he or she might benefit more from the interventions, as the self-activation is not really there yet." "different kind of nudge or a message more like "You are doing very well. Keep going. Keep the spirit up" and client two maybe can benefit more from the directive [inaudible], yeah, to, to be more engaged in, in activation."	Different patient needs throughout their therapy progress	Case specific personalisation and adjustments	Adaptability

“nudge them into filling it out. And for others, if you are working on, I do not know, letting go of control, I do not think it is that, it is that great of an idea to say: “well, you have to fill it out”. No, just try and sense into what do you feel you need instead” “parameters like maybe BMI or something like that. Because if you have physical activation and yeah you, you need also to consider different in, in high weight and physical impairments or.” “That you are not getting like exercises that you will think well sorry, but I am not doing that because it is not, it is not working for me.” “what is this client like? What, what should we work on in order for all the inside gains in in, in therapy in order for it to integrate and result in behavioural activation?”			
“it really comes down too to the level of motivation a client has.” “it is really important how motivated the client is. It is, it is really hard to get someone to	Level of motivation	Case specific personalisation and adjustments	Adaptability

really start like being more active if they do not really want it, or they do not really see the benefit of it. So that is, that is the main thing that is important. Like, how is the motivation of the client and how could I support that motivation or how could I explain it in such a way that someone gets motivated to, to try it out? “			
“put an option at first, like “Hey, we could do it this way or that way. This is intense and you have like a deadline and you get a, a notification or whatever. And this is whenever you feel like tracking, you can fill it out” and maybe give them, give them a choice.” “just ask the clients while setting up the app, how frequent when and, and basically because, yeah, all our answers were it depends, it depends on the client and I think the clients do have a sense that the best sense of that when would I be more receptive and how often and how pushy do I want it to be” “So, maybe this is also something dependent on the insights and wishes of a, of a client. So, if they know OK, I need someone who is	Personalisation through preferences/choices	Case specific personalisation and adjustments	Adaptability

really, like, just give me the nudge and I have to do it. And maybe another person say, well for me it would be sufficient to have a gentle persuasion, and then I will do it myself." "use some personal hobbies they already did, or they they know from themselves that they worked some time ago, maybe before they were depressed" "what kind of activities do someone thinks are suitable for, for, for himself. And what Therapist F already said about the timing" "like to start then with interventions that patients or clients themselves propose that they were helpful in the past, and mostly they can come up with interventions that were helpful for them" "resources"			
"you should do everything in […] Cooperation - samenwerking - like together with, with the client" "personalisation. To, to, together develop steps that the clients can, can do, that they wanna do in order to enhance the motivation"	Cooperation with the client	Case specific personalisation and adjustments	Adaptibility

“depends on the, the goals” “very client centred and adjust the behavioural experiment to give the, the client a bit of a push to, to start really working on incorporating the insight” “it should be personalised no matter what […] I do agree with Therapist C that in order to, to have some benefit in the treatment, it, yeah, it should dive deeper into the, the goals of the treatment” “I think it will be personalised from the beginning and also embedded in the therapy. Because then you are actually working on goals of, of, of the client, him or herself.”	Personalised interventions related to goals	Case specific personalisation and adjustments	Adaptability
“things that are not case specific have a, have a much lesser amount of efficiency” “knowing a little bit about the profile of the client and what he or she struggles with is very helpful to then, yeah, make this successful” “depending on the day, on the client, on things going on in in their lives at that moment”	Importance of case specificity	Case specific personalisation and adjustments	Adaptability

“individual profile for each client to, to manage or to, to, to consider what kind of struggles do they experience? What do they know? What kind of insights do they have in their depression and symptoms?” “standard parameters and that you have a lot of different options in there to, to, to fit it to the personal needs. So, that you do not have the one-size-fits-all, but really like finding the smaller ingredients and steps for, for one particular client”			
“upload your planning or your activities from the week”	Incorporating planning/activities	Use of Patient inputs	Adaptibility
“objective data” “the JITAI is monitoring the patient, right? So, the device knows when he or she is not, has been inactive for periods” “we have noticed that you have been sitting down for almost an hour now”	Adaptability through objective data	Use of objective measurements	Adaptability
“questionnaires you have to fill out” “content of the intervention would, would be adapted based on the changes in in mood and well-being”	Adaptability connected to mood/well-being	Use of Patient inputs	Adaptability

“if a person was able to perform an activity or to do an activity and, and it did not lead to changes in well-being or mood, then we should adapt the intervention to try to get changes that we desire” “, I would like to see that we have interventions that immediately improve their, their mood or well-being”			
“hit the button for I have five minutes or I have a full afternoon” “quick breathing exercise of a minute would maybe also be helpful, and sometimes it would be good to have like a ten minute walk or half an hour walk or so if you could have the, the choice to indicate how much time you have.”	Availability	Use of Patient inputs	Adaptibility
“send like a bit of motivation or “hey, you can do it”, or “whatever happens”, you know, “you are still yourself”” “Ultimately, you'd like to encourage them, right?” “little pick me up or a motivational JITAI is, is better if someone is feeling down” “you are with other people and you can use the encouragement to,	Encouraging/motivating messages	Encouragement	Functionality

yeah, to continue doing those things” “But should be motivating, right?” “like a coach or trainer or just pushing you a bit, but in a friendly way” “some positive messages but more like an extra nudge […] like, oh, you are doing a really good job, you, you, you went outside today”			
“nudge or a message like “hey, maybe it is good to” and then a personalised [inaudible]. Or if the client likes to walk, maybe “it's, it's a good time to go for a walk” because the JITAI is monitoring the patient, right? So, the device knows when he or she is not, has been inactive for periods.” “we have noticed that you have been sitting down for almost an hour now, and these moments are a very vulnerable for you. Maybe it would be a good idea to have, to take a walk or do another activity that you suggested that would be very helpful for you”	Concrete behavioural activation in inactive moments/periods	Timing of interventions	Functionality
“to have the insight, OK, I am not feeling well. I am feeling shitty. I am feeling depressed. OK, what	Activation against low states	Timing of interventions	Functionality

can I do to come out of this situation? And then actively do something about it."			
"get to, get a moving like, physical activities, like walking, or going to the supermarket, or buying themselves a treat, or doing something nice" "Breathing exercises, yoga" "going to the gym" "workout or fitness or some something that someone wants. So, you could maybe like put in like OK, one of the parts is physical, you know, physical, physical health. What would fit you? You know, yoga, taking a walk, bicycling or fitness? Maybe like give options of, of how people would like to fill, yeah, how to work on their physical health"	Physical/bodily activation	Physical activation	Functionality
"cognitive demanding activities are like, filling out a thought questionnaire" "Journaling" "Journaling, yeah" "active thinking is also something that really can help a depressed client get out of this, you know, depressive cloud that they are in.	Cognitive activation	Cognitive activation	Functionality

So, would it be also possible to implement provoking questions, instead of offering everything, just asking. So, let us think about a time where, what is it that you, you would love to doing? Now go find a moment and execute that, I do not know, once, once a week" "reflective question, how did this make you feel?" "client can also gain more insight in the, the effect of going for a walk or yeah" "encourage reflective thinking because elsewise I think there is a really big risk for habituation […] what you are hoping for is that then think about the normal curve, this reflective thinking, well, makes the client really incorporate, for instance, you know going for these walks like, yeah, wow, I really felt better, I, you know? […] I might do it again."			
"kind of a support system for them and to activate that system. And help them think about how could you ask for help? How can you? […] involve someone else in your situation, in your, in your, in	Social (system) activation	Social component	Functionality

your process. So, I think that would be in the ideal case, it would be nice to have someone to take that part." "calling a, calling a friend" "seeking out to other people" "social component" "when we think about us as human species, you know, we are, we are, we are group kind of group oriented or relational beings. So, I guess that it, it could be very useful for the app to send out a notification focusing on the social aspect, but I would I, I think I would prefer. Also, if I would role reverse with the client, I would prefer the notification to be stated in a question instead of saying reach out to a friend because I might have no friends" "social aspects is also really important" "app screens the area for existing self-help groups. I mean, it is out there. We and the team even provide just a big document with links to self-help organisations, self-help initiatives, you know. So it is out there and it is out of our hands. It does not have to do			

anything with therapy. It is just a suggestion”			
“Petting an, an animal” “drawing or sketching” “Listening to a music, a favourite music, or watching a favourite programme.” “kid movies” “play in musical instrument. It is not physical exercise, but yet it, it might reach the same effect as physical exercise, because also in playing an instrument you are in touch with a very different, you know, a different part of your being really. So, I would very much like to stress that when we talk about depression and like, yeah, you should go for a walk is like, yeah, we can take walks in many different ways.”	Other forms of/activities to achieve activation	Physical activation	Functionality
“Take a shower.” “self-care in general, like eating regular meals” “something as simple as make up your bed”	Self-care	Physical activation	Functionality
“if someone is feeling good, right, you want to put the focus on that too, because the, the focus is on the negativity too much already”	Focus on the positive	Cognitive activation	Functionality

“trying to think about, OK, what did went well? So, not only focusing on, OK, what, what was depressing or what was difficult or all the negative parts, but also focus on more the positive things and also even if they are really small and little but to zoom in on that and, yeah, put their attention on these smaller things that they really want, went well, or they had a good feeling, or they felt happy for a small moment, or was satisfied, or proud of. So, that focusing also on this positive emotions would some, would be ,or is often helpful I guess to not only have this, this, this focus on all the negative parts, that are they are really good in that, to focus on that and stay focused on that.” “celebrate the little moment” “if they are feeling good and to, to, to act on it and and, and, and, and have positive experiences from that could be rather helpful to be more resilient, to be more positive”			
““when do I feel bad? Where does it come from? What do I think	Tracking of mood and influencing factors	Cognitive activation	Functionality

then" maybe put it as an intervention. Like, OK, track it for a few days and then maybe we can find some, yeah., find some factors that, that improve or, or decrease your mood" "supportive tool to gain more insights in, but for a specific period during the treatment, and are not throughout the whole"			
"divide things up or to. Like to reach your goal, yeah, that is, with baby steps, and that is time and process" "making a planning" "another part would be structure. Like, how do you want to work on structure? Do you want to use alarms? Do you want to use an agenda? Do you want to use reminders?"	Personalised planning/tackling of ‚tasks'	Physical activation	Functionality
"birthdays or like significant days. For example, like a loved one has passed away and there is a remembrance coming up, for example. Then if the app knows that it is, yeah, it is usually a difficult date or like around that time the person needs more support or a specific loss thing could, could, could be done."	Integration of special dates/events	Timing of interventions	Functionality

“make a plan like and then a schedule with the client from hey maybe you can try this. And I think that the JITAIs can be like the, the extra help, extra motivation to actually do the behaviour activation” “JITAIs can fit, fit in in sort of extra dimension on how to use the, the, the, the, the schedule or the, the planning you made during therapy” “questionnaire or a semi-structured interview with the therapist to gain insight in, into the person's resources and also like what, what Therapist C said, what they used to like to do or things they would like to do but do not have the motivation to do right now. Because then the, the, the JITAIs can be informed based on the that personalised intervention and then it is, it, it is, yeah, I think it will be personalised from the beginning and also embedded in the therapy.”	Connecting behavioural activation JITAI and therapy	Changes due to development of the Patient	Adaptability
“interventions that, that that they did not think of, but were helpful	Experience/scientifically based suggestions	System elements	Functionality

for other patients with kind of similar profiles” “some things that, that would be able to work for everyone. Like, yeah, some kind of, of movement and, and maybe also a check in” “positive thinking. Like, one positive thing of the day, like just to, to shift, to focus on something positive. That is also I think pretty much a one-size-fits-all intervention”			
“go about it in like a normal curve kind of way” “start with more structure and helping the clients. Start to, to behave or activate more and then slowly build it off” “when we again think about the normal curve, you can lessen the frequency of these notifications all the time, right? Because the client gives him or herself a notification if you will.” “positive reinforcement starts to become internalised instead of external”	Normal curve development of intervention	Changes due to development of the Patient	Adaptability
“activities that get them moving, physically moving, then, then please as much as possible. But if the activities are demanding of	Elements of the intervention per progress/capability	Changes due to development of the Patient	Adaptability

their attention and our cognitive capabilities, that is very taxing for them in the beginning and those you need to be sparce use sparcely." "But also knowing that, OK, like background information of something not in the beginning like first all those physical nudging activities and then the rest can come later. Yeah, I do agree with that." "I think this, this app and the suggestions would help in the beginning if the patient is, if the patient is a bit further in in therapy, then we want to change the, the goal to do it yourself and maybe not give suggestions, but more the positive, positive messages like, hey, you are doing good or something like that" "the active thinking can also start from, from the beginning of therapy, with the extra encouragement like, hey, you can, you can do this, you can do that. But I would almost opt for the active questioning to, to remain present. And both lessen in frequency, both, you know, that			

the frequency of these nudges that, let us say they, they lessen throughout therapy, but yeah that critical thinking or active thinking kind of stays. Because in the end, that is what they need afterwards too, in order to make a behavioural change part of their lives."			
"What you offer in Dutch or in English, or maybe even another language" "Or like, what is your, what are your cognitive abilities? And how, how easy or how difficult? And then I am thinking in words of like how childlike or challenging do you make it in, in the words you use or if someone does better with visuals than with text, then can you adjust it for that?" "selection of interventions or, or, or things a client can do and then that the client can select a few, and then that those selection options pop open" "structure the types of interventions. Like, things that the clients can do by themselves, or things they can do with others,	System elements/options	System elements	Functionality

things inside the house, things outside the house” “screening the area on the presence of self-help groups”			
“some patients would be like, would, could benefit from, yeah, monitor their state and then an intervention at the right moment what it is helpful for that specific patient or clients” “I do have some clients in mind that could really benefit from it” “But to give them a bit more support during the time we are not available. I think it would be really nice to, to integrate that in the therapy” “in traditional practise, I think where it does not happen this, this could be very beneficial” “The adaptive part of the JITAIs is, is, if I understand it correctly, that based on the data of the of the client at the right time, the, the suggestion is given to the to the client, right? And that is something that we do not do at Thubble. So, we, we send a random, at random moments the nudge, but not at the yeah, we, we hope it is timed correctly but it is,	Positive opinion	Believed benefits	Attitude

it is we, we do not have, like, the background information of the client at the moment. So, I do think that is a good thing that, that the JITAI can add to the therapy"			
"offer it to a client, again, I would go about it in a very client, client focused way. And to, I don't know, to really see it as an aid instead of a first choice" "dependence thing" "involve someone else […]ideal case […] But I think it is not possible for everyone" "Well but, but also interesting to see then if they tend to, to push like I have got five minutes because I do not have energy and I am choosing the, the option that takes least time. Or, well actually, yeah, I have the whole day ahead and let us, let us be honest and I can do a longer activity." "knowing all of this still keeping like boundaries in a way, and this is obviously like a technical thing, but if you, if you use it as a person, like that is also what I noticed initially working like this. You have insight into a daily journal. So, like what do you do	Point of concern	Remaining concerns	Attitude

with that information if there is no scheduled appointments? Do you just leave it or do you need to action on it or? Yeah, like, the way you interact, you do not want to make that too dependent like you want to encourage, you want to help, but it should not be reliant on, well, what you do or what the app does, or. I think there is, there is a, there is a difference there of the interface and the actual face." "challenge to initially work with it, but like what do you and what do you not do with the information that you get there" "the ethical point of you maybe, if you detecting someone who is maybe suicidal or really depressed. What do I have to act on it or is it the same as what we have now that we say, OK, if you are not feeling well, if there, if you need more, if you are in crisis, do not use the chat for it, but call the, your, your GP or us or the, the 113? Like this kind of but you need to have that clear as well and also for the therapist so that we are not signalling it, and we do not know what to do about			

it. So, I think the, the terms should be clear for the therapist and for the for the users, for the clients." "encourage the client to think actively as well. Because elsewise, you know, I see a risk that clients, that clients become quite dependent on the app" "keep in mind that not every client has attuned friends" "The self-management, yeah, yeah. the independence. Like, like they do not have they do not need other people to feel better" "then we get an extra function and I think it is very good that Therapist A is stressing that we do not want to go that way"			

Note. This table is used to list the quotes and codes relevant to the development of subthemes, to allow for transparency regarding the qualitative analysis conducted in the case of this study.