Which Apps Help Depressive Patients? A Discussion of User-centric Features and Preferences

Fenja Schulte
Leibniz University, schulte@iwi.uni-hannover.de

Finn Borchers
Leibniz Universität Hannover, finn.borchers@stud.uni-hannover.de

Paula Warnemünde-Jagau
Leibniz Universität Hannover, paula.warnemuende-jagau@ihe.uni-hannover.de

Irene Jankowski
Medizinische Hochschule Hannover, jankowski.irene@mh-hannover.de

Kai G. Kahl
Medizinische Hochschule Hannover, kahl.kai@mh-hannover.de

See next page for additional authors

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Fenja Schulte, Finn Borchers, Paula Warnemünde-Jagau, Irene Jankowski, Kai G. Kahl, and Michael H. Breitner

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Fenja Schulte
Leibniz University Hannover
Königsworther Platz 1
30167 Hannover, Germany
schulte@iwi.uni-hannover.de

Finn Borchers
Leibniz University Hannover
Königsworther Platz 1
30167 Hannover, Germany
borchers@iwi.uni-hannover.de

Paula Warnemünde-Jagau
Leibniz University Hannover
Königsworther Platz 1
30167 Hannover, Germany
paula.warnemuende-jagau@ihe.uni-hannover.de

Irene Jankowski
Medizinische Hochschule Hannover
Carl-Neuberg-Str. 1
30625 Hannover, Germany
jankowski.irene@mh-hannover.de

Kai G. Kahl
Medizinische Hochschule Hannover
Carl-Neuberg-Str. 1
30625 Hannover, Germany
kahl.kai@mh-hannover.de

Michael H. Breitner
Leibniz University Hannover
Königsworther Platz 1
30167 Hannover, Germany
breitner@iwi.uni-hannover.de

Abstract

An increasing number of depressive people is not just now leading to the healthcare system being overburdened. Therapy places are limited and waiting times to start a therapy are long. So-called depression apps have been developed that to bridge the gap or supplement a therapy. A depression app can have various features. Design Science Research (DSR) oriented, we determine 15 specific features of a depression app based on results, findings, and knowledge from a literature review and 46 expert interviews (Family doctors/Psychotherapists/Psychiatrists, Developers, Patients). Our features are then classified with a survey with 624 patients into basic features, very important features, important features and less important features. User-specific features priorities are identified based on various characteristics. Finally, we discuss and evaluate our findings and present a further research agenda. App developers and healthcare providers can use our features and focus areas to provide user-centered depression apps.

Keywords: Depression app, user-centric features, designs science research

Introduction

Depression is a global health challenge for millions, causing substantial personal, social, and economic burdens. It is the leading cause of disability worldwide, affecting an estimated 300 million people globally (Rubeis et al., 2021). Despite the availability of effective and efficient treatment options, barriers such as stigma, access, and cost prevent many from receiving appropriate care. The increasing spread of smartphone usage and the integration of technologies in healthcare has introduced mobile health (mHealth) applications (apps) as promising tools for handling depression and supporting depression therapies. These apps potentially increase accessibility to therapeutic resources, offering privacy and user convenience, which can be particularly appealing for those hesitant to seek traditional forms of treatment due to stigma or logistic barriers (Myers et al., 2021). Findings show that users not only appreciate apps that offer reliable depression screening (BinDhim et al., 2015) but also value features that support daily mental health management, such as symptom tracking and immediate feedback mechanisms (Arean et al., 2016). A suite of apps evaluated by Lattie et al. (2016), demonstrates the potential for apps to support diverse aspects of mental health, from mood tracking and cognitive restructuring to promoting healthy habits. The suite's modular approach allows users to choose tools that cater specifically to their needs, an instrumental model applicable to personalize care. However, the sheer volume and variability in the quality of available apps present a challenge to users. Myers et al. (2021) provide a comprehensive analysis of commercially available apps, showing that while many apps are of acceptable quality, there remains a wide variance, with some failing to meet clinical or user experience standards. The considerable diversity and varying quality of mHealth apps for the treatment of depression highlights the need for a robust evaluation framework. Not all identified features have to be integrated into a specific app, but can be included individually depending on the app type. While such a framework can help developers to align with quality and efficacy standards, our current focus is to first identify and analyze the critical app features. This analysis forms the core of our research, in which we investigate specific features that are tailored to the needs of people with depression. Comprehensively evaluating these features, we deduce a basis that enables developers of mHealth apps to develop user-oriented and evidence-based frameworks. Here, user-centricity specifically means the development of a depression app based on needs of the user to improve user experience. Data is primarily collected from (potential) users and their perspective and used to determine depression app features.

Research by Wu et al. (2021) highlights the importance of engagement in mHealth, using the Persuasive System Design (PSD) model to identify app features that promote user interaction and adherence. Looking at features of depression and anxiety to increase engagement, a systematic literature review was conducted, which identifies four mechanisms through which app features increase user engagement. These are facilitating the primary purpose of depression apps, encouraging interaction between user and app, utilizing social relationships, and increasing the credibility of the app. The systematic use of these features has been shown to correlate positively with app efficacy, improving user retention and clinical outcomes. While Wu et al. (2021) focus broadly on engagement strategies across existing apps, our research delves into how specific app features resonate with diverse user demographics, emphasizing design elements that meet distinct needs based on clinical and demographic profiles. We primarily focus on the general app features that are easier to identify from patients through surveys, as we assume that only a few respondents already have experience with depression apps. We place a special focus on the specific features that are important for people with depression in order to provide concrete recommendations for possible target group-specific focuses. Some features from the Persuasive System Design (PSD) study are also reflected in our findings, leading to our research questions:

RQ1: Which critical features can be deduced for depression apps?

RQ2: How the deduced critical features can be included in a depression app for specific target groups?

To answer the research questions, we first introduce health apps and depression apps in the theoretical background. Our research design and methods are justified and explained. We then explain our categorization of the features identified from literature, expert interviews, and a survey conducted with individuals diagnosed with depression. We use our survey data to assess our characteristics based on various features and identify user-centric options to develop depression apps. Our results are discussed and evaluated, findings deduced, recommendations outlined and limitations identified. Finally, a further research agenda is outlined. Our approach ensures a comprehensive understanding of critical and essential

features of depression apps, addressing both general usability and specific needs of different user groups. Focusing on these goals, we contribute to the practical development of effective and efficient digital interventions tailored to specific needs of people with depression. We lay a solid foundation for the development of mHealth apps that are clinically effective, efficient and user-centric We make a crucial intermediate step necessary before a full development framework and suite can be proposed.

Theoretical Background

According to Maaß et al. (2022, p. 13), "*health apps are software programs on mobile devices that process health-related data on or for their users. Every health-conscious individual can use them, be it medical laypersons, family caregivers, or health professionals, to maintain, improve, or manage an individual's and the community's health*". These are mostly smartphone/tablet apps, but can also be offered on other hardware like laptop or desktop computers. We consider all forms of mHealth apps. These apps can either be used on their own or integrated into a program. MHealth apps can include treatment concepts such as behavioral activation, cognitive therapy, psychoeducation or symptom monitoring (Donker et al. 2013; Stawarz et al., 2018). There are various mobile health applications, e.g., for diabetes (e.g., Izahar et al., 2017), obesity and overweight management (Kwon et al., 2017), insomnia (e.g., Simon et al., 2023), and depression (e.g., Kerst, Zielasek, and Gaebel, 2020). Here, we focus on apps developed for health interventions for mild or moderate depression, as the literature shows the benefits of supportive smartphone/tablet apps for these forms of depression (Ly et al., 2014; Proudfoot et al., 2010). Major depressive disorder differs from normal sadness or grief in that it persists and significantly interferes with daily activities. The disorder's complex nature includes a wide range of emotional, physical, and cognitive symptoms that can vary widely from one person to another (Belmaker and Agam, 2008). We refer to these applications as "depression apps" or "apps for depression". There are various studies on depression apps that cover different areas. For example, a taxonomy has been developed based on various depression apps (Mueller et al., 2022) or emotional reactions have been studied, whereby user ratings of depression apps have been evaluated and a connection with the app features analyzed (Meyer and Okuboyejo, 2021). There are also various studies on these depression apps that highlight the individualization and personalization options, among other things. In the study by Mayer et al. (2022), for example, an app was tested by patients and healthy individuals. They mainly tested the acceptance of the app, but it was also found that there is a need for orientation, selection and personalization functions for all users.

Research Design and Methods

We oriented on Design (Science) Research (DSR) based on vom Brocke, Hevner, and Maedche (2020) and adapted with Schoormann et al. (2024). DSR involves problem-solving and creation of artifacts that enhance human knowledge and generate design insights (Drechsler and Hevner, 2018; Hevner, 2007; vom Brocke, Hevner, and Maedche, 2020). Consequently, DSR frequently uses existing (design) knowledge and combines, expands, or refines it. We tackle challenges encountered by family doctors, psychotherapists, psychiatrists, patients and developers, building upon established knowledge while also extending it.

We derived three modules and eight phases (see Figure 1) aligned with Schoorman et al. (2024), oriented on the artefact driven design and the design science literature formulated by vom Brocke, Hevner, and Maedche (2020). Our first phase (problem and need finding) within the first module is the problem identification, which is already shown in the introduction. The second phase (knowledge formulation) within the second module is the derivation of the design and development guidelines and principles from the environment and the knowledge base, wherein we conducted firstly an efficient literature review using AI based and graphical tools in conjunction with the structure of Webster and Watson (2002), Watson and Webster (2020), and vom Brocke et al. (2009, 2015). We used the tools Connected Papers (www.connectedpapers.com) and Consensus (https://consensus.app), which were each used by one person. The first author used Connected Papers first entering the keyword "depression app", which brought up various papers that were then viewed. Based on this, the first paper was selected, which served as the baseline paper. The identified papers were then reviewed and as the results did not correspond to what was expected, a classic small keyword search was first carried out with the following search terms: ("depression" AND "app" AND "function"). Subsequently, highly cited papers were examined and the paper by Shen et al. (2015) was used as a new baseline paper. A total of 41 papers were identified by Connected Papers (see

Figure 2). At the same time, the second author utilized Consensus to systematically review literature on depression apps, identifying 18 relevant papers.

Figure 1. Modified Research Design adapted from Schoormann et al. (2024)
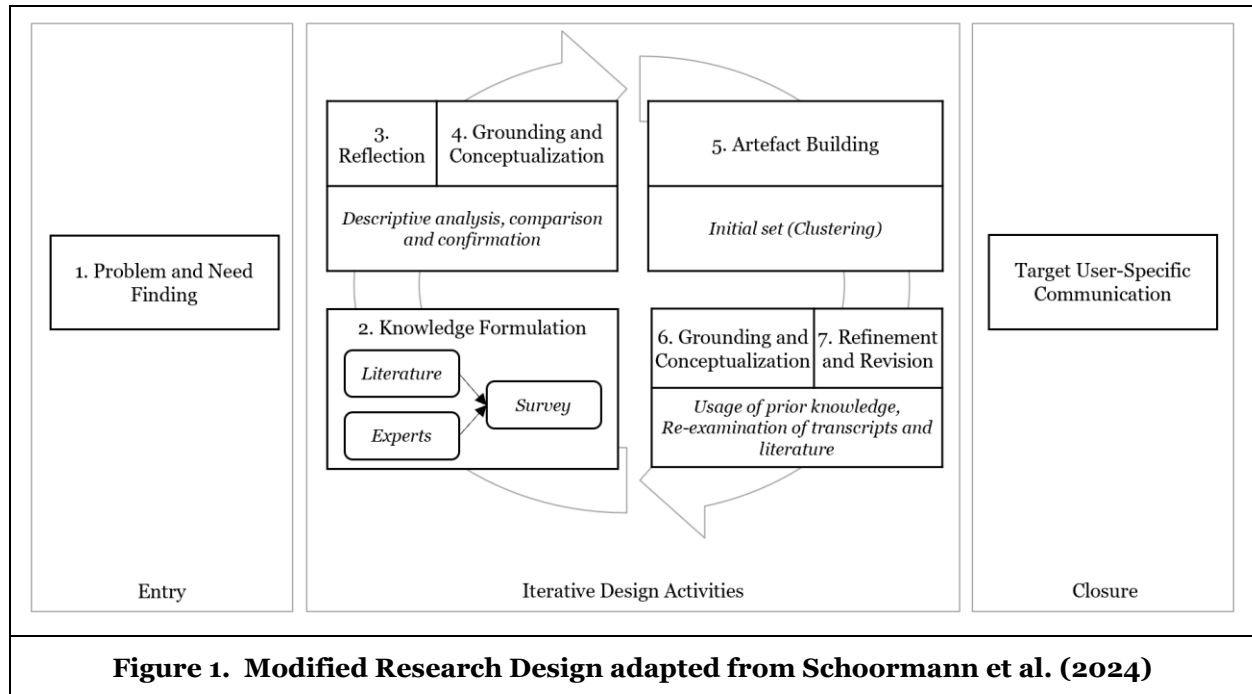
Initial searches were refined to develop a comprehensive understanding of existing applications and their fundamental features. This approach facilitated analyses of app layouts, content, design, and functionality, enabling the identification of both significant and minor app features that enhanced the foundational research for this paper. The papers found were then matched and 59 papers were subsequently analyzed and duplicates and inaccessible documents were removed. We manually reviewed a total of 48 documents. We excluded non-peer reviewed articles and included all documents with information on the functions and content of depression apps.

Figure 2. Literature search with Connected Papers
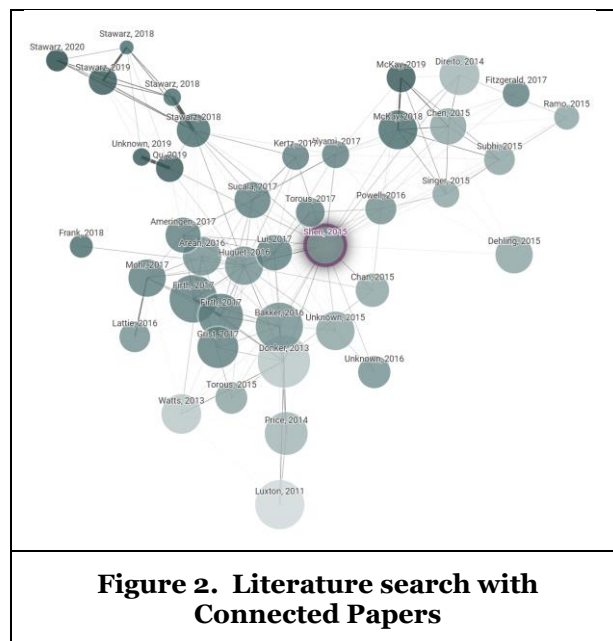
We then conducted an intensive forward and backward, author and similarity search using Google Scholar to ensure that as many important papers as possible were included. In doing so, we identified 2 additional papers, resulting in the inclusion of 19 publications in our review and in saturation. As the second part of the knowledge base, we conducted expert interviews with 46 people from various stakeholder perspectives (see Table 1), in which they talked about their experiences with depression apps.

Stakeholder group	Number
Expert interview participants	n = 46
Healthcare provider (family doctors (FD), psychotherapists (PT), and psychiatrists (PS))	17 (5/7/5)
Developers (D)	10
Patients (P)	19
Table 1. Participants in expert interviews	

Based on the results, important functions and content were identified. This resulted in combination with the literature review in 15 features that a depression app should have. These features were then used as the third component of the knowledge base in a survey. The survey invitation was sent to 7,500 insured of a German health insurance with a mild to moderate depression diagnosis. 624 insured (8.32%) returned the fully completed survey. The health insurance randomly selected this sample based on various criteria. The survey was conducted anonymized.

Survey participants					n = 624
Characteristic					
Age	< 30	31 − 39	40 − 49	50 − 59	> 60
	90	105	108	171	150
Depressiveness	healthy	inconspicuous	mild depression	moderate depression	severe depression
	85	215	166	100	58
Educational degree	no degree	lower school diploma	intermediate school diploma	higher education entrance qualification	higher education degree
	9	88	287	145	95
Experience	no			yes	
	597			27	
Health status	bad	less good	satisfactory	good	very good
	54	181	224	140	25
Risk-aversion	very high	high		low	very low
	117	325		135	47
Technology affinity	very low	low	medium low	medium high	high	very high
	42	114	171	166	88	43
Table 2. Participants in survey					

Patients were asked how important the respective features of a depression app are or would be to them. They were able to answer using a Likert scale ranging from "not at all important", "less important" and "fairly important" to "very important". A 4-point Likert scale was chosen to balance between nuanced data collection and clarity, avoiding the complexity, confusion and inconsistent interpretations of larger scales. They were also asked about socio-demographic characteristics, their health status and their experience with apps in order to identify differences between the various groups. For the analysis descriptive methods like boxplots in Python were used. We have presented all the information on the characteristics of the survey participants in Table 2.

We compared the third phase (ex-ante evaluation and justification) and the fourth phase (grounding and conceptualization) of the research design and did a descriptive analysis of the survey data using Python. The results were compared and confirmed with the results of the literature research and the expert interviews. The literature and transcripts were then reviewed again and an initial overview was drawn up, focusing on the survey results (see section "General findings from the data").

During the fifth phase (artefact building) we used the results and findings to deduce our initial set of design and development guidelines and principles. First, we cluster the basic features that every app should have and that all groups felt were very important. We then clustered the remaining features according to their importance in the survey as well as the frequency with which they were mentioned in the interviews and in the literature. The initial classification of the features was then evaluated and expanded in the sixth phase (grounding and conceptualization) and the seventh phase (refinement and revision) of the design research process. Aligning with Schoormann et al. (2024), we used prior knowledge to evaluate our results and findings. Therefore, the literature and transcripts were re-examined to find similarities and differences between the interview participants and the expert opinion or literature. The interview transcripts and the literature were largely able to support the opinions of the survey participants, which is why only specifications were made. In the last and thus eighths phase (target user-specific communication), the results are then presented in a final and clear manner. On the one hand, the general findings were recorded, in which the features were categorized in the respective clusters. On the other hand, features were identified that can be integrated into an app in a user-specific manner.

Results and Findings

We provide an insight into our results generated ultimately requested in our survey. Our 15 critical features are: Q1 - use anytime and anywhere; Q2 - selectable content focus; Q3 - varied content delivery; Q4 - support with daily structure; Q5 - inclusion of tools/aids for symptom monitoring; Q6 – clearly organized menu; Q7 - exchange with other users; Q8 - no bright colors; Q9 - emergency button for acute crises; Q10 - feedback options; Q11 - contact point for customer inquiries/technical support; Q12 - reminder functions; Q13 - playful elements; Q14 - free trial access; Q15 - companion character/person in the depression app. We can now deduce our findings from the results of our survey (see Figure 3) and review the previously generated data from the literature and the expert interviews. First of all, we present general initial results from our survey in combination with literature and our expert interviews, from which a clear pattern emerges. Basic features, very important features, important features and less important features are highlighted. Table 3 provides an overview of the first classification criteria provided. These features are then evaluated again specifically on the basis of various characteristics and it is checked whether target group or user-centered recommendations can be made. Our findings from a subsequent evaluation are then presented.

General finding from data

We identified four basic features within the results, which had an average over 3.3 at the Likert scale. These features are a "clearly organized menu", "free trial access", "selectable content focus" and "use at any time and anywhere". The feature "clearly organized menu" has the highest average of 3.54 and was therefore the most important to the patients participating in the survey. Efficient user interaction with an app is enhanced by a clearly organized menu that offers users easier navigation and usability, as highlighted by Ramnath and Suri (2021). This feature was also mentioned by some experts and described by FD5, for example, as "...it's important to have a good overview so that it doesn't get too complicated...". This shows that a user-friendly interface can have an influence on a positive user experience. The second most important feature for the participants was a "free trial access", which gives patients a detailed insight into a depression app and its functions before they commit to using it. In a systematic review of mobile apps for depression self-

management, of the 31 apps that met the inclusion criteria, 77% were available for free, while the remaining 23% charged fees ranging from $4.99 to $99 per month. Notably, all included apps provided a minimum three-day free trial, underscoring the commonality of free trial periods in depression management applications (Myers et al., 2020). This test access was also particularly requested by the family doctors, psychotherapists, and psychiatrists, as they also like to familiarize themselves with an app before making a recommendation (e.g., FD1, PS1, PS2, PS3, PS4, PS5, PT1, PT2, PT3, PT4, PT5, PT7). "Selectable content focus" is the next basic feature that was identified. This is primarily about the fact that the content of an app does not necessarily have to be processed in order, but can also be prioritized according to individual needs (e.g., D6, FD3, P6, PS2, PT4). A selectable content focus aligns with findings, where both patients and physicians expect apps to offer personalized content to meet individual needs effectively and efficiently (Bakker et al., 2016; Patoz et al., 2021). These focuses could be recommended by family doctors, psychotherapists, and psychiatrists or a patient may notice that certain modules are particularly helpful. In this context, P4 said: "*The symptoms and the people are so different and I think it's really important that you can pick out something that affects you or where you need support yourself*". Patients may also have accidentally selected a content that does not help them. It should be possible to cancel the content without having to go through all the steps (Huguet et al., 2016). Findings show that selectable content, adaptable to local languages, cultural norms, and specific mental health needs, is crucial for the effectiveness and efficiency of depression management apps, particularly in diverse settings like India (Ramnath and Suri, 2021). The last basic feature identified is the ability to "use at any time and anywhere" with an average of 3.32. Findings emphasize that due to the ubiquitous presence of smartphones/tablets, health-related apps can be utilized at any time and place, thereby greatly enhancing their usability for continuous mental health management (BinDhim et al., 2015). The use at any time and the independence of location and thus the existing flexibility was also mentioned in the interviews (e.g., D10, FD3, P19)

Figure 3. Features classification statistics
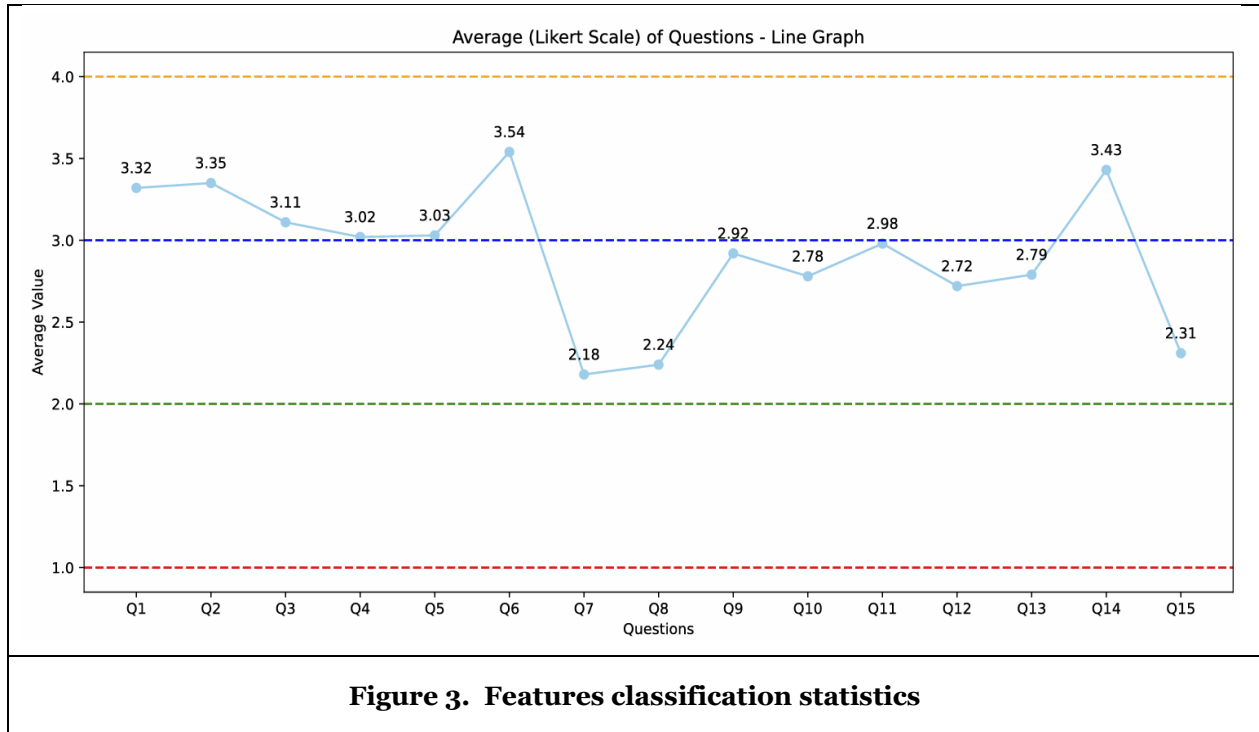
The evaluation revealed three further features, each with an average of just over 3.0 and therefore categorized as very important features. One of these is "varied content delivery" with an average of 3.11. This feature is about presenting content in a varied way and not just having to read texts, for example. In addition to the patients, who were looked at more closely in the survey, the other stakeholders also felt that the varied content delivery was important. This is exemplified by the statement from PT6: "*Accordingly, I could imagine that if you wanted to reach as many people as possible, it would be helpful to use several channels in parallel and I could imagine from experience that the most important ones would actually be*

reading material and video". Literature supports this observation, noting that most apps utilized a dynamic user interface and a variety of media types, including text, audio, and multimedia, thus catering to different user preferences and learning styles, which aligns with the concept of varied content delivery in mobile apps for depression (Shen et al., 2015). With an average of 3.03, the feature "Inclusion of tools/aids for symptom monitoring" is also rated as very important. This emphasizes the importance of self-assessment tools and confirms the statements of some experts that these features are important and are already available in some apps (e.g., D5, D9, PS2). Literature findings also highlight the prevalence of symptom monitoring functionalities in mobile apps for depression (Lui, Marcus, and Barry, 2017; Price et al., 2014; Torous et al., 2017). Similarly, data shows that such features are crucial for tailoring interventions to individual needs, thereby enhancing the effectiveness and efficiency of these apps in managing depressive episodes (Shen et al., 2015; Teles et al., 2019). The last feature within this category is "support with daily structure", which was rated almost as important as the previous feature. This feature can include various functions that help to better structure everyday life. For example, calendar functionalities provided within these apps facilitate the planning of daily activities, ranging from pleasurable to unpleasant tasks, and promote the establishment of helpful routines, crucial for re-engaging users in a structured daily routine and effectively and efficiently managing depression (Arean et al., 2016; Mayer et al., 2022; D10, FD2).

Feature Group	Classification criterion
Basic feature	Average: > 3.3
Very important features	Average: $3.0 \leq x \geq 3.3$
Important features	Average: $2.5 \leq x \geq 2.99$
Less important features	Average: < 2.5
Table 3. Feature groups with first classification criteria	

The third category contains all features that have an average of below 3.0 and above 2.5 and were therefore rated as important features by the majority of respondents. Five features fall into this category. The first feature is the "contact point for customer enquiries/technical support" with an average of 2.98. This contact option was also frequently mentioned in the expert interviews especially from the developers, as some people are not so familiar with new technologies and may therefore have questions about usability that fall outside the responsibility of the practitioner (D3, D4, D6, D7). The second feature that the participants considered important was an "emergency button for acute crises", which was mentioned by all the experts in the interviews with the psychiatrists. This was not necessarily about providing an emergency module, but rather about naming possible contact options. All stakeholder groups had a clear opinion that patients in acute crises, such as possible suicidal tendencies, must make personal contact with their family doctor, psychotherapist or psychiatrist and that an app cannot be qualified for this. Supporting this perspective, research found that while only a quarter of top-rated mobile apps for depression provide direct functionalities related to emergency services, such features are crucial. Some apps either advise users to contact local emergency services or help them create a personalized safety plan for managing crises, highlighting the essential role of handling emergencies (Qu et al., 2019). As the third feature in this category, we were able to identify "playful elements" with an average of 2.78. This feature can be modules such as concentration games and show a moderate interest to incorporate gamified features. Results show that gamification enhances user engagement, as Wu et al. (2021) found that apps with game-like elements significantly increased user interaction and enjoyment. These playful components were also addressed in the expert interviews and led PT4 to the following idea: "*Yes, maybe in a playful way, for example, in social skills training, where you are given a description of a situation and then you have to assess whether it is aggressive or self-confident or insecure and I could imagine it being a bit playfu*l". "Feedback options" is the fourth important feature in the category. This feature was very often mentioned by the developers and offers them the opportunity to make specific enhancements to the depression apps (E3, E4, E5, E6, E7, E9, E10) as E9 states "*it's always evolving and always listen to the users and trying to understand and trying to increase this retention and provide a great user experience*". The last feature in this category is the "reminder functions". The "reminder functions" feature sends notifications to users, prompting actions such as module completion or daily log-ins. Literature shows that reminder functionalities significantly

enhance user adherence in top-rated mobile apps for depression. These include medication intake reminders, appointment alerts, and mood assessment prompts. Additionally, reminder systems encourage users to engage in self-care tasks and adhere to medication schedules, thereby improving symptom management and treatment continuity. Automated emails also play a crucial role in maintaining user engagement over time (Everitt et al., 2021; Lattie et al., 2016; Qu et al., 2019; Ramnath and Suri, 2021; Stawarz et al., 2020). Within the expert interviews reminder were especially mentioned by the developers, as they are a part of several of the available depression apps (D2, D6, D7, D9, D10). The last category contains the less important features, which have an average of less than 2.5. Although these features were mentioned by some experts and have appeared in the literature, they tend to be less important for the (potential) users in our survey. First, we have a "companion character/person in the depression app" with an average of 2.31. This means that it is not so important to the survey participants whether there is a kind of avatar or interactive character in an app. Nevertheless, research shows that avatars as companion characters can enhance user engagement, potentially increasing app usage and adherence. However, while these features may improve user experience and satisfaction, their direct impact on alleviating depressive symptoms remains unclear (Six et al., 2022). In the expert interviews, virtual companions were also very rarely mentioned and PT6 finds such avatars a "*creepy idea*". The second feature in this category is "no bright colors", which was perceived as rather unimportant by the survey participants. The color scheme was rarely mentioned in the expert interviews, although it was noted positively that the existing apps are rather simple and not obtrusive (D3, PT3, PT5). The last feature and with an average of 2.18 the least important in this survey is "exchange with other users". This feature was sometimes mentioned as a way of enabling an exchange of experiences between those affected, so that they can support each other if necessary. This seemed to be rather unimportant to the participants. In the interviews with the patients, the possibility of an exchange between those affected was discussed and was also recognized as a possible feature (P1, P4, P10, P12, P16), with P10 stating: "*That would be important to me. That there might be a small chat where you can exchange experiences*". However, some patients in the interviews did not find such an opportunity for exchange so important (P2, P3, P6, P7, 15, P18). Despite its lower importance in this survey and the moderate response in the interviews, literature has shown potential benefits of community features in depression apps. For example, some apps include moderated social forums that connect individuals with depression and caregivers, offering a platform for support and experience exchange. Furthermore, certain apps feature peer-supported mood expression, allowing users to share and filter emotional content within community settings. These features can enhance user engagement providing valuable networks of support, showing that while not prioritized by survey participants, community interaction plays a significant role in user retention and satisfaction (Qu et al., 2019; Ramnath and Suri, 2021).

User-centric development insights

We collected various characteristics from the participants in the survey. To deduce recommendations on possible user-specific features, we have mainly only highlighted the groups in which the upper and lower quantiles are between 3 ("fairly important") and 4 ("very important"). In some groups, there were special cases, but these are marked in the appropriate places. We looked at the age groups, depressiveness, level of education, experience in app use, health status, risk aversion and affinity for new technologies. It should be noted that there is a control of the answers to almost all questions and almost every point on the Likert scale was mentioned at least once.

There were hardly any differences between the respective characteristic groups in the basic features identified. All groups considered the feature "clearly organized menu" to be fairly important to very important. On the other hand, "free trial access" is not quite as clear for the characteristics of affinity for new technologies and health status. With regard to affinity for new technologies, it can be seen that the answers of the survey participants with a very high technology affinity diverge more widely and the participants also selected "less important" more frequently. In contrast, the answers from the previous group, which still had a high affinity for new technologies, were not so widely spread and the answer option "not at all important" was not selected at all and the intervals are centered on "very important". With regard to educational degree, the answers vary more among participants with a lower school diploma and there are correspondingly more participants who consider this free test access to be rather unimportant. For the "Selectable content focus", the answers are not as centered in the group with a poor health status and there were more votes that classified this function as less important, which means that the quartiles are between less important and very important. Apart from health status and educational attainment, "use at any time

and anywhere" was clearly rated as very important to fairly important. The distribution is wider for participants with a poor health status and a lower school diploma and several found it less important to use an app anytime and anywhere.

For the very important features, there are only few groups in which the quartiles deviate from very important to fairly important. However, these are more common than for the basic features, which was already to be expected based on the mean/average. All age, experience, risk aversion and technology affinity groups consider "varied content delivery" to be very important to fairly important. With regard to depression, it can be seen that the healthy and moderately depressed participants tend to find the different forms of presentation less important. There is also a greater deviation among the severely depressed participants than among the participants with inconspicuous or mild depression. With regard to the "inclusion of aids for symptom control", only the experience groups agreed on the importance. This means that it does not matter whether the participants already had experience with such apps or not and they all felt it was rather important to important. Nevertheless, many groups are addressed by this feature. For example, almost all groups with an affinity for new technologies. Here, only the participants who are not at all technologically affine perceive it as less important to very important, instead of fairly important to very important for the other groups. The situation is similar for depression, with all groups except the severely depressed participants rating monitoring as fairly important to very important. It was also found that the participants with a self-assessed high risk aversion did not find this feature as important as the other groups. With regard to health status, it can be seen that the worse participants feel, the less important they consider symptom monitoring to be (see Figure 4). In the survey, in terms of educational degree, there is only a tendency towards less important among participants with a lower secondary school diploma or a intermediate school diploma, while people with no educational degree or a higher education entrance qualification consider it to be fairly important to very important. A further finding is related to age. It is fairly important to very important to participants between the ages of 18 and 49, but the older the participants are, the less important they find these symptom control options. With regard to "support with daily structure", there was no characteristic in which all groups perceived this characteristic as fairly important to very important. However, a similar trend can be seen for age as for symptom monitoring, with the highest importance among participants under 30 and then gradually decreasing. A trend can also be seen for depression, with participants with severe depression rating support with the daily structure as the most important (see Figure 5).
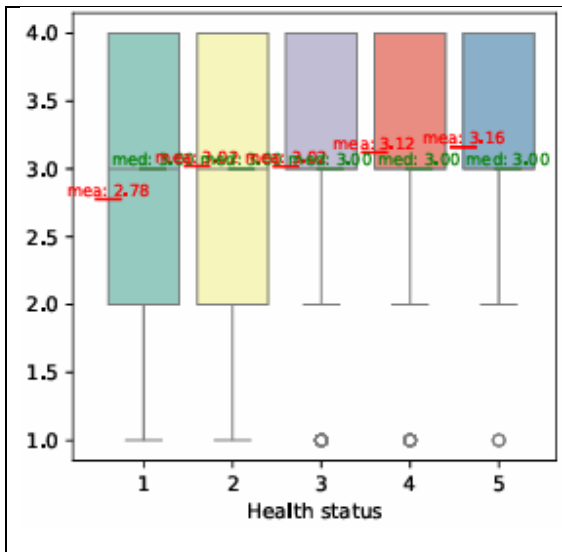

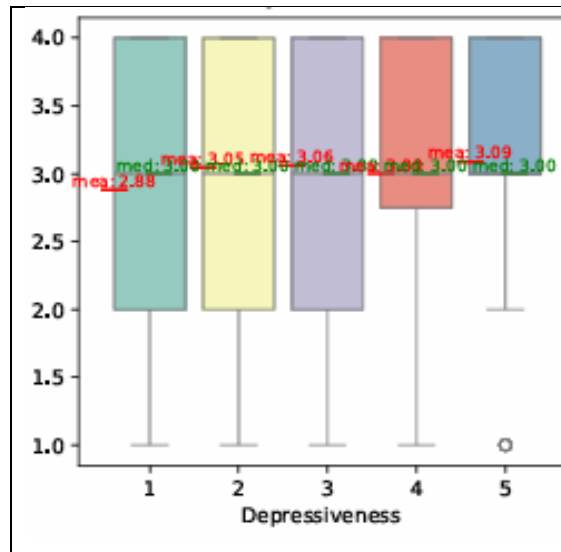**Figure 4. Boxplot for "inclusion of tools/aids for symptom monitoring" with health status**

Figure 5. Boxplot for "support with daily structure" with depressiveness

However, the mean values for this characteristic are all quite close to "fairly important". With regard to educational status, we see a strong centering among participants with no educational qualifications at

"fairly important", with the 25 % and 75 % quantiles both lying there. Participants with a higher education entrance qualification consider support with the daily structure to be fairly important to very important. No trend can be seen for health status, with people who indicated a less good and a good health status rating this feature as fairly good to good. The mean is also better for these two groups than for the remaining three groups. There is a similar pattern for technology affinity and the people with a slightly higher and a very high technology affinity see this characteristic as fairly important to very important, whereby a slight tendency from low to very high technology affinity can be seen here, at least in the mean. People with experience and people with a high risk tolerance also consider support with the daily structure to be a fairly important to very important feature of a depression app.

For the important features, we have no characteristics that have been rated as fairly important to very important by each group. Nevertheless, there are individual groups to be emphasized for some features. In general, all of these important features were rated as fairly important in the median. We only address the groups that voted fairly important to very important and otherwise only show general anomalies in the data. With regard to the feature "contact point for customer enquiries/technical support", we can see that the people with a high and very high technology affinity rated it as fairly important to very important. It can also be seen that people with no technology affinity also rated the importance better than those with a medium technology affinity. This is also confirmed by the fact that there are no outliers for not at all important. In terms of educational status, most people with a higher education entrance qualification state that they rate technical support as fairly important to very important. With regard to this feature, however, there are also two groups between less important and fairly important. These are, on the one hand, those who have no educational degree and, on the other hand, those who have a higher educational degree. In the group without an educational degree, it is noticeable that there are no answers with not at all important and therefore has a certain importance. The last group to vote for the feature relating to technical support with fairly important to very important are the very risk-taking participants in the survey. For this characteristic, all other groups are between less important and very important. Three groups with different characteristics find an "emergency button for acute crises" fairly important to very important. Among participants under 30 years of age, this feature was rated accordingly, with the mean also being clearly above the mean values of the other groups. The emergency button was also rated as fairly important to very important by participants with no educational qualifications and a very good state of health, with the other groups ranging from less important to very important. The "reminder functions", on the other hand, were considered fairly important to very important by the participants with a high risk tolerance. This characteristic actually shows a trend in the data, according to which the importance of a reminder function increases with increasing risk tolerance. For the "feedback options" and "playful elements", there are no groups that rate the characteristics as fairly important to very important. Most of the answers here are between less important and very important, but some are also between less important and fairly important.

By definition, the less important features do not have a group that rated these features as fairly important to very important. Almost all groups are between not at all important and fairly important, only in the case of the "no bright colors" feature do the 25 % and 75 % quantiles range from not at all important to almost very important and thus cover almost the entire scale, with the median still being less important. On the other hand, there are two conspicuous groups that stated not at all important to less important within the quantiles. These are the very risk-averse participants for the characteristic "no bright colors" and the participants with a higher educational degree for the characteristic "exchange with other users".

In Figure 6, we have summarized our findings and assigned all features to their respective group. The first group contains the features that were rated as fairly important to very important by the participants in each characteristics group on average and almost consistently within the 25% and 75% quantiles. Due to their importance, which was also previously confirmed with the help of the interviews and the literature, these are classified as basic features and should therefore be included in every app, regardless of a specific focus. These are a clearly organized menu, free trial access, a selectable content focus and use at any time and anywhere. The second group contains features that were rated good to very good, but which were not so clearly rated as fairly important to very important by almost all characteristic groups. Here, we have included the respective groups that consider these features to be fairly important to very important in the figure for the respective features. If all groups of a characteristic consider a feature to be very important, we have added an "a" to indicate which features are important with regard to a characteristic and whether the targeted use of specific features can be prioritized for individual groups. This figure can also be used to learn which trends may exist and whether some groups do not find some features as good as others. No strong

priorities can be set in this group of very important features, as they are still considered important by very many groups. However, this is different for the third group and therefore the important features. Here, the features are still rated well on average. Specific groups can be identified that also consider individual features to be fairly important to very important. This allows interesting insights to be gained, such as the fact that participants with an affinity for technology are more likely to want a contact option for customer enquiries and technical support, which can be taken into account accordingly during development. The last group contains the less important features that have been mentioned in the literature and in the interviews, but which the survey participants consider to be rather unimportant. There are no groups that consider these features to be fairly important or very important, which is why it is not possible to set any real priorities. However, interesting findings can be inferred from the data, which have already been mentioned above, but these are not included in the figure, as the focus here is purely on the characteristics that can be specifically addressed by all or individual groups.

Figure 6. Modified Research Model
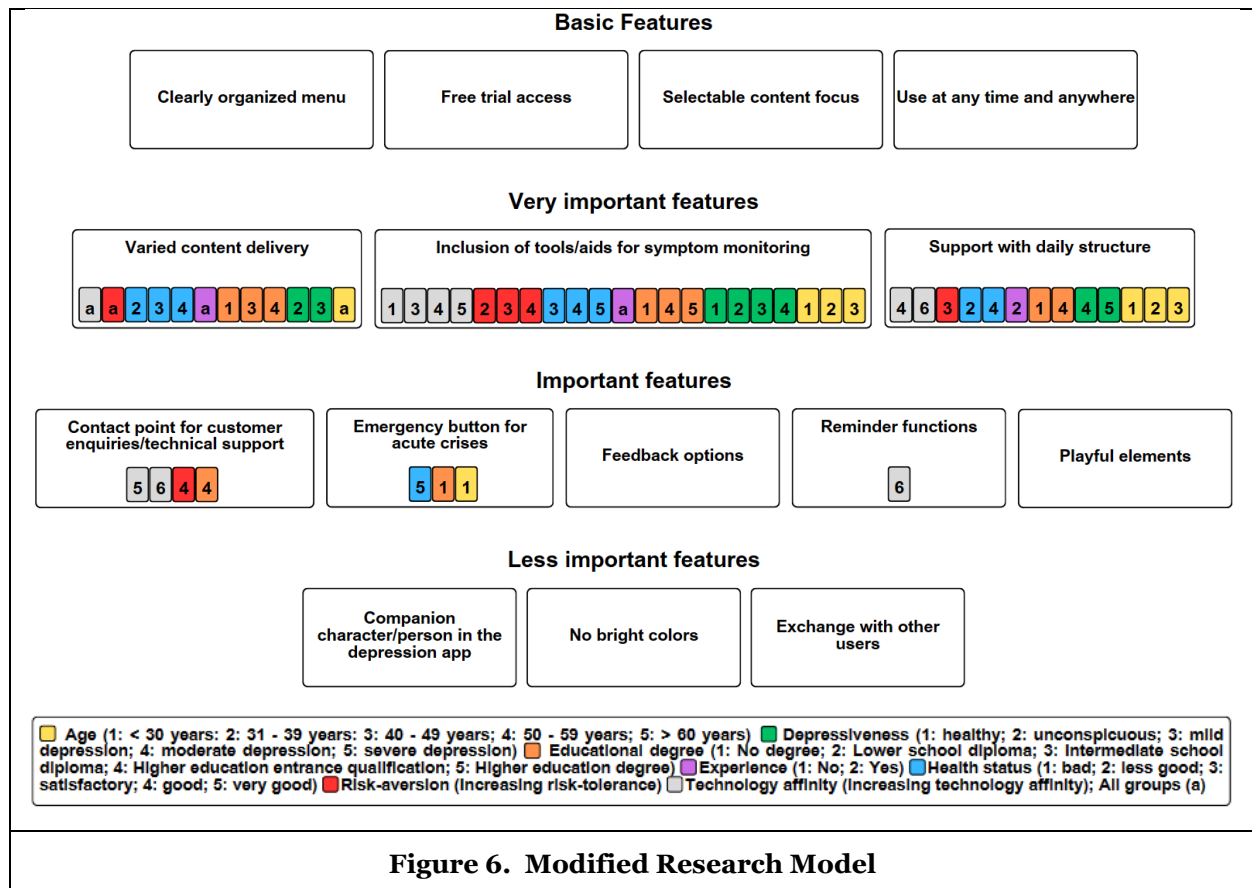
Results of the evaluation

All features could be confirmed in the literature and with the transcripts. During the evaluation, we also made specifications that supported the categorization and provided deeper insights into the wishes of the experts and the scientific community. During the evaluation, for example, it was noticed that the basic feature of free trial access is given less consideration in the literature, but is strongly desired by psychiatrists and psychotherapists in particular. The classification therefore applies primarily to users and could be confirmed. Another example is the classification of the feature of an emergency button, which was classified as an important feature in the survey. During the evaluation, it was noticed that psychotherapists in particular consider this feature to be very important in order to at least provide contact options. The authors discussed whether the feature should rather be assigned to the very important features, but due to the user group-specific evaluation of this study, it was decided to retain the classification.

Discussion and Implications

We examined user preferences for depression app features using a 4-point Likert scale, identifying key elements crucial for user satisfaction and app efficacy. Our results showed that certain features are considered essential by users, shaping the framework for user-centric design in depression apps. Features such as a clearly organized menu, the ability to use an app anytime and anywhere, and the provision of a free trial were rated as very important, highlighting the significance of an intuitive user interface, flexibility, and the opportunity to evaluate an app before full engagement. Such findings emphasize the necessity for developers to develop adaptable, easy-to-navigate, and user-validated tools to meet specific needs of individuals managing depression.

Initially, we found that there were not such strong differences between the various groups within the characteristics. We expected that clearer distinctions can be made here and that the development of a depression app can be prioritized, accordingly. Nevertheless, we were able to identify a few trends that enable individualization. For example, there is an increasing trend from healthy to severely depressed in terms of support with daily structure or in terms of not using bright colors. This means that if providers want to make a depression app available for higher levels of depression, functions to support the daily structure are more strongly integrated and bright colors tend to be avoided. Of course, it should be noted that the avoidance of bright colors was generally perceived as less important, but this could be looked at and evaluated again when targeting the app at moderately severe depressed patients. The upward trend in our data for ratings of support from daily structure in severely depressed patients underscores the important role that structured activities play in the treatment of major depression. Based on Dunkley et al. (2017), incorporating structured daily routines in depression apps is essential for managing major depressive disorder. These routines provide predictability and control, reducing the cognitive load and simplifying decision-making, which is particularly beneficial as depressive symptoms intensify. Apps that offer scheduling tools, reminders, and motivational prompts can make daily tasks more manageable and empower users, reinforcing their autonomy and effectively alleviating daily stress. Developers should focus on these features to support users in establishing daily routines.

Developers and providers can also pay attention to the design of an app if older people are to be targeted. The implications for the design and development of depression apps are profound. A user-friendly interface is not merely a convenience, but a necessity, as shown by the high priority users place on easily navigable menus. The demand for features like selectable content focus and varied content delivery shows a strong user preference for personalization within an app's functionality, allowing them to tailor their experiences to fit their daily needs and mental health status.

Another important finding of this study is that providers need to focus not only on free trial access for patients, which was perceived as very important in the survey. Such trial access is also very important for healthcare professionals. The interviews showed that the family doctors, psychotherapists, and psychiatrists consider such trial access to be very important so that they can also gain an insight into the content. The healthcare providers are the first point of contact for those suffering from depression and can therefore draw attention to depression apps in terms of a possible longer waiting period before starting treatment. The expert interviews showed that only few of these healthcare providers had any actual experience with depression apps. Most healthcare providers do not want to recommend anything not tested beforehand themselves. According to the experts, these trial accesses are not always easily accessible and, in some cases, not all functions can be accessed, which makes it difficult for them to recommend apps for depression. From this, a clear recommendation for action can be derived, especially for quality-assured depression app providers, that they must also provide trial access to family doctors, psychotherapists, and psychiatrists as free of charge, if possible, giving them an insight into all functions and giving them more confidence in depression apps.

Furthermore, the significance users place on having emergency support options, such as an emergency button for acute crises, underscores the need for safety and reassurance within these applications. This calls for designs that not only aid in everyday mental health management, but also provide support during potential emergencies. It is also noteworthy that participants who rated their health as very good considered the emergency button to be the most important of all groups. Aligning with Wu et al. (2021), who emphasized the importance of engagement in mHealth apps, our findings extend this framework by illustrating how specific features such as emergency support are crucial for enhancing the user experience

across diverse user demographics. Such insights are invaluable for providing concrete recommendations for targeted app development, paving the way to develop nuanced development frameworks that can be integrated into an Interactive Development Environment (IDE). This integration represents a crucial advancement, enabling developers to build mHealth applications that are focused on the varied needs of users.

We can also see commonalities between our user- centric design and development guidelines and principles and published models and frameworks. The "selectable content focus" feature aligns with the METUX model supporting users' autonomy and competence. It allows users to choose content that best meets their needs, enhancing their sense of control and success, which are a key to maintaining engagement and overall wellbeing (Peters et al., 2018). Incorporating varied content delivery within depression apps is crucial not only to enhance user satisfaction but also to sustain engagement over time. The Engagement in Digital Interventions framework supports this approach, emphasizing that offering content in different formats, like videos, quizzes, and interactive exercises, helps to keep users interested (Nahum-Shani et al., 2022).

Limitations and Further Research

Our methodology, while robust, has certain limitations that influence the interpretation of results. Firstly, the literature review was conducted using AI-based and graphical analysis tools. This also offers the possibility that not all important publications may have been included. Nevertheless, we had some overlaps between the tools and the small keyword searches during the use of Connected Papers and the subsequent extended searches confirmed our results or only led to isolated additions (saturation). Secondly, our interviews and surveys were primarily conducted with German-speaking experts, which may have introduced some bias into our results. However, we also interviewed two English-speaking developers, allowing us to incorporate some international perspectives. Notably, their insights aligned closely with those of the German experts. While our study offers valuable findings, it is limited by its focus on a predominantly German-speaking population, particularly drawing data from a German health insurance in that context. This relatively narrow focus does not adequately reflect the globally diverse needs and preferences of users from different cultural, socioeconomic, and age groups. Moreover, yet we cannot determine how well our user-centric design and development guidelines apply in countries with different cultural and socioeconomic contexts. Although the literature supports the identified features, their relevance may vary in different settings, which our study yet cannot confirm. To gain a global understanding, similar studies must be conducted in diverse regions, e.g. Asia or the USA, and among varied demographic groups, including both younger and older people, to capture a broader spectrum of user experiences and validate the general applicability of our findings and recommendations. This leads to the following further RQ 3) "What influence do different cultures and socioeconomic differences have on the development of a depression app?" Thirdly, the reliance on a 4-point Likert scale, excluding a neutral option, may compel participants to choose a more polarized view than they might otherwise hold. However, this forced-choice design eliminates a neutral option, reduces central tendency bias, and ensures that the data is both meaningful and actionable while allowing for fine enough distinctions in the importance of attributes. Additionally, self-reported data may not entirely reflect real-world usage or preferences due to variations in user understanding or temporary psychological states. When evaluating the survey, it must also be noted that the characteristics are not evenly distributed, which is why a smaller sample sometimes leads to a tendency. However, this cannot be avoided, as a further aggregation of the groups would also have led to distortions and unclear results. Nevertheless, our aim was to investigate trends and user group-specific focal points, which we were able to determine with this data. These factors must be considered generalizing the findings to broader populations. Longitudinal research can also provide insights into how preferences change with long-term app usage and varying stages of user mental health. Additionally, with regard to cultural differences, the integration of qualitative research methods, such as interviews or focus groups, can offer deeper insights into the reasons behind user preferences and how they engage with specific app features in real-world scenarios. This leads to the following RQ 4) What preferences change with longer-term use of a depression app?

Further research can also focus on developing a development framework and suite for depression apps, for which our work can provide a basis. This leads to the further RQ 5) "What framework and suite is needed for user-specific development of a depression app?"

In summary, this study highlights the critical role of user-centered design principles in the development of depression apps and underscores the need for continuous engagement with user preferences to ensure these tools are effective, efficient and supportive of mental health management needs.

Conclusions

Our exploration into user-centric design for depression apps, initiated by the stated research questions in the introduction, confirms the vital importance of aligning app features with user preferences to enhance usability, effectiveness, efficiency. To address our research questions, we used a research design oriented on DSR (vom Brocke, Hevner, and Maedche, 2020; Schoormann et al., 2024) based on a literature review, expert interviews and a survey. Our findings highlight the necessity of features such as a clearly organized menu, accessibility anytime and anywhere, and the option for a free trial, which users identified as crucial for a positive experience. These elements underscore the central theme of our introduction: that technological interventions in mental health must prioritize user engagement and personalization to address the significant barriers faced by traditional mental health services. Additionally, the identification of essential and highly valued features within depression apps supports the hypothesis that user satisfaction significantly influences the therapeutic efficacy of these digital tools. Despite the methodological limitations related to the use of a 4-point Likert scale, the data gathered provides robust evidence supporting the need for intuitive and flexible app designs that cater to the diverse needs of users managing depression.

In conclusion, we successfully address our research questions, affirming that the further development of depression apps must continue to emphasize user-centric design principles to ensure their relevance and utility in mental health care. Continuously integrating user feedback into the development process, these tools can be optimized to provide substantial support and empowerment to individuals navigating their mental health journeys.

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