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**How to increase acceptance of digital mental health services  
among students and future healthcare providers?**

Dissertation

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## **Zusammenfassung**

Studierende weisen besonders häufig Symptome psychischer Erkrankungen wie Angststörungen und Depressionen auf. Oft bleiben diese jedoch unbehandelt aufgrund fehlender Ressourcen, langer Wartezeiten oder begrenzter Flexibilität standardisierter Verfahren. Die jüngsten Fortschritte im Bereich der digitalen Gesundheit, einschließlich der Entwicklung von digitalen Gesundheitsangeboten für psychische Erkrankungen, bieten hier innovative Lösungen für die oben genannten Zugangsprobleme. Trotz der gut dokumentierten Wirksamkeit solcher Angebote bleibt ihre Akzeptanz aufgrund mangelnder Kenntnis oder allgemeiner Skepsis jedoch sowohl bei Patient:innen als auch bei Gesundheitsfachkräften begrenzt. Zur Behebung mangelnden Wissens, wurden akzeptanzfördernde Interventionen wie zielgruppenspezifische Informationsstrategien vorgeschlagen. In dieser kumulativen Dissertation werden verschiedene methodologische Ansätze angewendet, um Faktoren zu erforschen, die die Akzeptanz solcher digitalen Gesundheitsangebote sowohl fördern als auch behindern können, um darauf basierend Informationsstrategien für potenzielle Nutzer:innen (d.h. Studierende) und zukünftige Gesundheitsfachkräfte zu entwerfen. Die erste qualitative Studie (Studie 1) zielte darauf ab, Informationspräferenzen zu digitalen Gesundheitsangeboten unter n = 21 Medizin- und Psychologiestudierenden aus der Perspektive von Nutzer:innen explorativ zu erforschen. In der quantitativen Studie (Studie 2) wurde der Fokus auf die Rolle der zukünftigen Verordner:innen gesetzt, indem die Akzeptanz verschiedener digitaler Gesundheitsangebote für unterschiedliche Anwendungszwecke unter n = 216 Psychotherapeut:innen in Ausbildung untersucht wurde. In der dritten Studie wurden die Daten aus Interviews mit n = 102 Studierenden herangezogen, die als Patient:innen an einem verzahnten Psychotherapie-Programm teilnahmen. Der Fokus lag hier auf der Exploration von Faktoren, die mit der Nutzung eines digitalen Gesundheitsangebots für Depressionen und Angststörungen assoziiert sein könnten. Insgesamt legen die Ergebnisse nahe, dass Studierende und zukünftige Gesundheitsfachkräfte noch begrenztes Wissen über sowie Erfahrungen mit digitalen Gesundheitsangeboten haben. Trotzdem zeigt sich eine positive Einstellung und Offenheit für die Nutzung solcher Angebote. Um die jeweiligen Zielgruppen zu erreichen, scheinen Bildungsumgebungen wie Universitäten oder Ausbildungseinrichtungen am geeignetsten zu sein. Die Ergebnisse der drei Studien liefern eine wichtige Grundlage, um basierend auf identifizierten personen- und interventionsspezifischen Faktoren akzeptanzfördernde, zielgruppengerechte Interventionen zu entwerfen und zu implementieren.



## **Summary**

University students are especially susceptible to be experiencing symptoms of common mental disorders (CMDs), such as anxiety and depression. However, they often do not seek treatment due to limited resources of psychological counseling, long waiting times or limited flexibility of standardized programs. Recent progress in digital health, including the establishment of digital mental health services (dMHSs), provide innovative approaches to the handling of CMDs. However, despite their well-documented effectiveness, their adoption remains limited due to a lack of awareness and general skepticism among both patients and healthcare professionals (HCPs). To close this knowledge gap, acceptance-facilitating interventions (AFIs) such as recipient-targeted information strategies have been proposed to provide trustworthy information targeting doubts, possibly increasing acceptance and actual uptake of dMHSs. Within this cumulative dissertation, various methodological approaches are applied to explore factors that could both facilitate as well as impede the dissemination and uptake of dMHSs to design effective information strategies for both potential users (i.e. students) and future HCPs. The first qualitative study (study 1) aimed at exploring information preferences on dMHSs among N = 21 future HCPs (i.e., medical and psychology students) as potential users, while the quantitative study (study 2) investigated the intention to use various dMHSs for different application purposes and explored which predictors best determine the intention to use dMHSs among N = 216 psychotherapists in clinical training as potential future prescribers and recommenders of dMHSs. The third study qualitatively evaluated factors that might be associated with the use of a dMHS for mild to moderate depression and anxiety symptoms in N = 102 students that participated in a bCBT program. Overall, the results suggest that students and future HCPs still have limited knowledge about as well as experiences with dMHSs, but they reported positive attitudes and claimed to be open towards the use of dMHSs. To reach the respective target groups, educational environments, such as university or clinical training settings, appear to be the most appropriate. By exploiting person- (i.e., facilitating conditions, effort expectancy, performance expectancy, social influence and concerns) and intervention-specific factors (i.e., features, usability and developmental background of dMHSs) that are associated with dMHSs' acceptance among users and providers, the results of the three studies lay an important foundation to design and implement recipient-targeted AFIs.

## **List of abbreviations**

<b>AFIs</b>	Acceptance-Facilitating Interventions
<b>bCBT</b>	blended Cognitive Behavioural Therapy
<b>CMDs</b>	Common Mental Disorders
<b>CBT</b>	Cognitive Behavioural Therapy
<b>DCEs</b>	Discrete Choice Experiments
<b>dMHSs</b>	digital Mental Health Services
<b>DTx</b>	Digital Therapeutics
<b>EHRs</b>	Electronic Health Records
<b>EPIS</b>	Exploration, Preparation, Implementation, and Sustainment framework
<b>HCPs</b>	Healthcare Providers
<b>iCBT</b>	internet-based Cognitive Behavioural Therapy
<b>ISO</b>	International Organization for Standardization
<b>VR</b>	Virtual Reality

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# **1 Introduction**

## **1.1 Conceptualization of common mental disorders**

According to the World Health Organization (2021), almost one billion people live with a common mental disorder (CMD). CMDs are associated with significant disruptions in thinking, emotional regulation or behavior (2), impacting the physical and mental well-being as well as the social lives of those affected (3). Consequently, CMDs represent a major public health issue owing to factors such as challenges in treatment and rising prevalence (4,5). Among CMDs, depression and anxiety disorders remain the leading causes of this burden worldwide (5–7). Symptoms of an anxiety disorder include excessive worry associated with generalized or situation-specific responses to perceived threats over a period of at least six months (8). A depressive episode is defined by the presence of depressed mood, lack of energy and diminished interest in activities, which sometimes come with physical symptoms such as sleeping difficulties or psychosomatic pain that last for more than two weeks (8,9).

A significant majority of symptoms emerge by early adulthood (10). Consequently, adults aged 18-24 seem to be more likely to be experiencing symptoms of depression and anxiety than their older counterparts (11,12). University students are especially susceptible to the development of anxiety and depression disorders. A recent meta-analysis by Li et al. (13) showed a high prevalence of anxiety and depression symptoms of 39% and 33,6% respectively. Similar results can be seen when looking specifically at Germany, where every third student feels emotionally exhausted according to a survey conducted in 2023 by the opinion research institute Forsa on behalf of on one of the largest national statutory health insurances, the Techniker Krankenkasse (14). Additionally, more students report to receive antidepressants according to this survey, which represents a significant increase of 30% in comparison to 2015. Significant challenges that affect students' health and academic performance appear to stem from psychological instability, often linked to major life transitions, stress, employment uncertainties and general financial worries (11,15–17). This could have resulted in a notable increase in the demand for counselling services and therapy (18).

However, psychological counselling services at student services are often limited and many universities struggle to keep up with the high demand (19), which might also explain the significant increase of antidepressant prescription (14). For instance,

at the Technical University of Berlin, there are only three psychologists for 35.000 students (20), even though a ratio of 250-to-1 is recommended (21). This is accompanied by long waiting times (22) and also limited flexibility, because students have to adapt to the opening hours of the student services centers or take up a place that has become free at short notice, which is many times not possible due to their busy time schedules (23,24). Additionally, students often do not seek treatment due to unawareness of services, failure to recognize a need, or discomfort related to visiting a therapist (25,26), while the stigma around mental health issues seems to be even higher among medical students (27,28).

Digital approaches have been proposed as alternatives or supplements to traditional mental health services in order to provide extensive, accessible, flexible, and effective psychological support for students facing challenges (29,30). Recent progress in digital health, including the establishment of mental health apps or telemedicine services, provide new and promising approaches to the handling of CMDs.

## **1.2 Conceptualization of digital health**

The strategic support of the European Union within the framework of the “eHealth Action Plan 2012-2020” has contributed to digital health receiving a remarkable amount of attention (31). In general, digital health can be understood as a combining element that includes all use of information and communication technologies in the field of health (32,33). Digital health services can be classified into five categories: sources (e.g., information databases, online rating portals or directory of physicians), economy (e.g., online pharmacies, electronic billing of services), cross-linking (e.g., networking of stakeholders through electronic health records, sharing of research data), mobile health (health apps for mobile devices), and care (e.g. telemedicine) (32,34). Furthermore, the field of digital health has branched out into specialized areas such as digital mental health, which involves the utilization of digital tools e.g., for the prevention, self-management, counseling, therapy, or rehabilitation of CMDs (32).

The advancing digitalization in the healthcare system has enabled and accelerated widespread access to high-quality healthcare, even in underserved or rural areas (35,36). Furthermore, it has simplified communication between healthcare providers (HCPs) and the potential to provide much-needed relief and support for HCPs, easing their daily tasks and responsibilities (37). For patients, it aims to empower them to become more engaged when e. g. focusing on their mental health. By providing digital

tools and resources, affected individuals are enabled to make well-informed decisions and actively manage their symptoms in an empowered manner. In Germany, the Federal Ministry of Health has put in place the required legal framework to significantly promote the process of digital transformation starting with the Act on secure digital communication and applications in the healthcare system, the E-Health Act, in 2015. Since then, many laws have been passed with the goal to consistently enhance healthcare services throughout the country across various levels (38).

### **1.2.1 Legal framework for digital health in Germany**

Germany has been trying to drive the digital transformation in the healthcare sector for several years, including the integration of technology and data-driven solutions to enhance patient care, improve efficiency, reduce costs, and promote innovation. Through the advancements in technology, the healthcare sector seems to have undergone a significant paradigm shift. At first, the E-Health Act has laid an important legal foundation by establishing the first framework for setting up telematics infrastructure and introducing medical applications (38). Through the establishment of electronic health records (EHRs), which is the central element of networked healthcare, HCPs can access patient records instantly, which allows for more informed decision-making, better care coordination, and reduced paperwork (39–41). The suggested infrastructure facilitates the storage of medical patient data either on central servers or on electronic medical data card. One of the primary objectives of the implementation is to promote patient-centered medicine while enhancing the standardization, efficiency, and transparency of medical treatment procedures (41). With regard to hospitals, the digitalization has advanced through the Hospital Future Act which was also passed to pave the way for a digital care structure in Germany. Specifically, the Federal Ministry of Health has presented the prospect of up to 4.3 billion for this purpose, enabling hospitals to invest in digitalization projects and in their information technology security (42).

Corresponding framework conditions to treat patients independent of time and location have been introduced at latest since the Digital Healthcare Act, which aims improve healthcare provision through digitalization and innovation (43). Specifically, the prescription of reimbursable digital therapeutics (DTx), such as medical apps, by physicians and psychotherapists, has been initiated but also telemedicine approaches and access to a safe healthcare data network (43). In general, these digitally provided services can be applied for different application purposes, including the prevention and

aftercare of CMDs, but also as a flexible, low-threshold treatment addition or even substitute.

### **1.2.2 Conceptualization of digital mental health services**

Digital mental health services (dMHSs) are services that are internet-delivered via web browser or mobile phone apps to support patients with mental health problems (44). In general, digital solutions enable patients to track their health and share their health data such as sleep patterns or physiological symptoms with HCPs, which can e.g. empower them to take a more active role in the management of their CMDs (45–47). Additionally, they allow for remote psychological consultations and follow-ups and therefore even patients in underserved regions suffering from CMDs can have access to healthcare (48). They lower the threshold for help-seeking and provide healthcare that is evidence-based to a large number of individuals, and represent in cost-efficient solutions (49). In addition to for the considerable scalability, advantages of dMHSs include the flexibility entailing the option to participate at one's own pace and to use the help at any time as well as the possibility of anonymous participation so that the risk of stigmatization can be reduced (50). Generally, dMHSs are characterized by great heterogeneity and range from self-help psychoeducation programs (51,52) over chats (53,54) and blended cognitive behavioral therapy (bCBT) programs (55–57) to virtual reality (VR) interventions (58,59) that are applied along the entire patient journey (44,60). They can be either unguided or delivered with the support of HCPs (guided), e.g., blended with face-to-face treatment (61). Frequently, guided dMHSs are grounded in internet-based cognitive behavioral therapy (iCBT), where users engage in a structured electronic treatment program while receiving synchronous or asynchronous support from a therapist through email, texts, or calls (62). Overall, dMHSs have demonstrated their effectiveness e. g. in reducing symptoms of stress, eating disorders, social and academic functioning as well as depression and anxiety among students (26,63–65). Specifically, a systematic review among this target group could show that the majority of interventions delivered via a digital platform, such as mobile phones, websites, VR systems or blended formats were at least partially effective (33,37%) or effective (42,47%). However, half of the studies did not present any acceptance outcomes and only 4,4% examined a broad implementation of dMHSs on college campuses (66).

Despite the well-documented effectiveness of dMHSs for the prevention, treatment and aftercare of CMDs (29), their adoption remains limited in countries that are

still at an early stage of integrating digital health into healthcare systems like Germany (67). Even though Germany has initiated several Acts to lay the foundation for digitalization in the healthcare sector, Germany ranks second-to-last in regards to the digital health development when compared internationally with 16 other countries and thus has a long rung ahead to join the more advanced countries (68). As to confirm, the adoption and uptake rates of dMHSs in the country is still limited and only increase at a relatively slow pace (69,70), while digital solutions have not yet become part of routine healthcare (67). In total, only 16,4% of HCPs participating in a recent study have prescribed DTx in Germany in 2023 (71), while there seems to be special development potential in rural areas, where only 5% of physicians and psychotherapists have prescribed DTx (72). Furthermore, only around 800.000 personal EHRs (“elektronische Patientenakte”, ePA) and just 4.1 million electronic prescriptions have been activated since their introduction in 2021, which represents a relatively small amount regarding the total number of people with a statutory health insurance in Germany (73.7 million) (73). Accordingly, the significance of understanding the factors that impact the implementation of dMHSs in order to design strategies and policies targeting the effective and extensive dissemination by addressing obstacles in its adoption has been emphasized (74).

### **1.3 Acceptance of digital mental health services**

An increasing number of health facilities, such as hospitals and medical practices, are in the process of deploying digital healthcare services, and although their advantages in improving healthcare are documented, the value of such solutions heavily depends on their acceptance and successful implementation (75), making HCPs’ and patients’ acceptance of digital health a fundamental requirement to make an impact on healthcare (76). This underscores the importance of exploring and understanding how patients and HCPs respond to the emergence of new technologies.

In general, the acceptance of digital healthcare solutions such as dMHSs can be defined as the intention to use these services and, according to the Unified Theory of Acceptance and Use of Technology (UTAUT), serves as a direct predictor of the actual usage (77). The UTAUT model is a widely recognized framework in the field of technology acceptance research (78). Introduced as an integration of various prior models, UTAUT aims to explain and predict a person’s intention to adopt and use technology (79). Even though it was originally developed for the work context, it has been



successfully validated and modified for use in digital healthcare (80). The model implicates that there are four factors that influence technology acceptance: performance expectancy, which represents the perceived usefulness of the technology, effort expectancy implying the perceived ease of use, social influence as in the influence of others' opinions, and facilitating conditions which include the availability of resources that are necessary for the technology's use. According to the UTAUT model these factors, along with individual characteristics (i.e., age, gender, experience, and voluntariness) collectively shape individuals' behavioral intentions and actual technology use (77). Research has shown that the perceived usefulness of new technologies tends to be the strongest predictor of acceptance (80), which implies that HCPs and patients are inclined to accept a technology when it is perceived as beneficial for their medical practice or the control of one's own health. Generally, acceptance of dMHSs seems to be even lower among HCPs in comparison to patients (80,81) which could hypothetically be explained by HCPs feeling responsible for what they prescribe or recommend to their patients and therefore engage more intensively with dMHSs (82,83).

Despite its popularity, the UTAUT model also has its limitations. To increase its explanatory power, researchers have endeavoured to extend it by incorporating variables from alternative theoretical frameworks or by investigating possible moderators (84). One important and decisive factor that has been shown to influence acceptance of dMHSs is knowledge (85,86). Accordingly, for countries with developed digital health infrastructures, greater knowledge and acceptance is reported (87). If patients and HCPs are simply not aware of digital services and their effectiveness, it seems reasonable that acceptance is still low even though the facilitating conditions such as a regulatory framework have been implemented. In accordance with the modest acceptance and uptake rates of digital services in Germany, a survey from 2021 revealed that no-one out of a sample of 51 general practitioners felt very well informed about the Digital Healthcare Act, but instead 63% felt that they are poorly or very poorly informed (88). In regards to DTx, four out of five HCPs still consider information on medical apps to be at least partially insufficient (69). Additionally, a recent study by the German Stiftung Gesundheit (health foundation) revealed that 55,4% of surveyed general practitioners state that they either think poorly of DTx in general, believe that the prices seem too high or that there is simply no useful medical app for their area of clinical expertise yet (89). With 64,7%, the scepticism among psychotherapists seems to be even higher (89).

Furthermore, HCPs do not seem to be sufficiently aware of possible risks and benefits of dMHSs and only few have gained practical experience (88,90,91). Specifically, only 37% of physicians have gained at least some experience with DTx, while just 14% plan to try out such medical apps on prescription in the near future (70). Regarding education, only one out of ten surveyed HCPs received training on digital health, while only half were tailored specifically to dMHSs (92). In line, general practitioners have so far lacked well-founded information about DTx and wish for systematic further training options (93). Recent studies have shown similar results for patients (72). The conclusions are that the integration of DTx such as dMHSs into healthcare routines still suffers from a lack of awareness regarding available information resources. The absence of clear and comprehensive information seems to persist, even years after the Digital Healthcare Act came into force (72). A similar picture emerges with regard to university students. Even though universities have been expanding their range of mental health services offered by student services centers, it appears that information on these services may not effectively reach students who are in need of help (25,26).

To close knowledge gaps, acceptance-facilitating interventions (AFIs), such as recipient-targeted information strategies, have been proposed. AFIs can provide trustworthy information targeting doubts, possibly increasing acceptance, recommendations and actual uptake of digital health services among HCPs and patients (85,94–98).

## **1.4 Acceptance-facilitating interventions**

AFIs range from short videos to psychoeducational information material, aiming to provide comprehensive and verified information on one specific topic (99). Characteristic for AFIs is that they are built of various components, i.e. attributes, such as information on potential barriers and facilitators of dMHSs, including quality criteria (e.g., scientific evidence base, data security) or user reviews (e.g., user ratings or recommendations of patients or HCPs) transferred via different media formats (e.g., text, video) (100). For instance, in cooperation with the University Ulm Baumeister et al. developed an AFI to increase acceptance of blended therapy among psychotherapists. It included a 5-minute video showing information about the dMHSs facing potential worries, a role play scene between a patient and a psychotherapist, facets of the UTAUT model as well as ways to integrate dMHSs in traditional psychotherapy (97).

Results showed that the UTAUT factors performance expectancy, effort expectancy and facilitating conditions were significantly increased in comparison to the control group who only received an attention placebo video. No effects were found on social influence. Interestingly, the AFI seemed to be specifically promising in subpopulations of initially rather skeptical psychotherapists (i.e., psychodynamic oriented psychotherapists). Regarding students as patients, a simple AFI has been shown to increase their intention to use mental health services, even though the effects were relatively small (96). In this study, the intervention group received an AFI including personalized feedback about their symptom severity, tailored psychoeducation, and information about available university and regional mental health services as components. In comparison, in a study by Lin et al., the 3-minute informative video about a specific dMHS with screenshots of the program, including information on data security, anonymity and the effectiveness of the dMHS, its advantages and the possibility to receive technical support and general assistance while using the service, was not effective with regard to acceptance, uptake rate, or adherence in a target population of patients with chronic pain (101). According to Ebert et al. (96) the mixed results can be explained by rather general approaches instead of more personalized approaches tailored to the specific needs and characteristics of respective target groups, as well as to perceived barriers and facilitators in regards to dMHSs.

In general, research has demonstrated several perceived barriers in regards to the usage of dMHSs among HCPs, including concerns about data security and privacy, concerns about building a professional relationship, low digital health literacy and lack of individualization options (94,97,102,103). Among patients, privacy concerns do also seem to represent a barrier, however, in comparison to HCPs it does not represent a major issue as long as their data remain anonymous (104). Greater acceptance is generally shown of blended treatments, such as bCBT (87), because more personalized care seems to be possible in comparison with stand-alone dMHSs (55). For students as users of dMHSs and HCPs as distributors of dMHSs, however, facilitators and barriers to the acceptance of dMHSs are not yet clear. This dissertation aims to close this research gap by giving insights into factors associated with the acceptance and usage of dMHSs to design recipient-targeted AFIs in form of information strategies.

## 1.5 Aims of dissertation

In summary, it seems reasonable to promote the integration of dMHSs into the German healthcare system in two different ways: on the one hand, via potential users and, on the other hand, via prescribers and recommenders of dMHSs such as HCPs. Potential users could be primarily young people like students, who, as already explained, are particularly at risk due to the relatively high prevalence rate of depression and anxiety disorders (105) and, if CMDs are chronified, will pose challenges for the healthcare system with relatively high long-term costs (106). The focus here is specifically on future physicians and psychotherapists. These are the professional groups that will recommend dMHSs or even prescribe DTx in Germany in the future and can thus spread them nationwide. Further, they are themselves at risk of developing CMDs during their professional training (13). So far, however, this target group and students in general have been neglected in technology acceptance research.

The specific aims of this dissertation were thus as follows:

1. To qualitatively gain in-depth understanding of barriers and facilitators to the acceptance of dMHSs among future HCPs (i.e., medical and psychology students) as potential users of dMHSs to design AFIs
2. To quantitatively explore barriers and facilitators to the acceptance of dMHSs among future HCPs (i.e., psychotherapists in clinical training) as potential providers of dMHSs by applying an extended UTAUT model
3. To qualitatively gain in-depth understanding of barriers and facilitators to the actual usage of a dMHS among students as users of dMHSs

Table 1 provides an overview of research papers that are included in this dissertation.

Table 1. Overview of research papers included in dissertation

Study	Chapter	Study method	Focus	Reference
1	2.1	Semi-structured Interviews	Future HCPs as potential users of dMHSs	Braun et al., 2023
2	2.2	Cross-Sectional Survey	Future HCPs as potential providers of dMHSs	Braun et al., 2022
3	2.3	Semi-Structured Interviews	Students as actual users of dMHSs	Braun et al., 2023

Given the explorative nature of study 1, a qualitative design with semi-structured interviews was chosen as a first in-depth analysis to get a thorough understanding of future HCPs' information preferences and needs as users of dMHSs. For study 2, an exploratory secondary analysis based on data derived from a cross-sectional survey-

study was executed to assess the acceptance of various dMHSs for different application purposes among future HCPs psychotherapists as providers. For study 3, a qualitative design with semi-structured interviews was again chosen as part of a feasibility and effectiveness study to thoroughly explore factors that might be associated with the actual use of a dMHS in a bCBT program among students. It was intended that the results can be used to derive recipient-targeted information strategies.

Informing about dMHSs has a strong public health relevance as promoting awareness and understanding of dMHSs aligns with the broader goals of improving access to healthcare services (36), improved patient engagement and empowerment (46). It could also lead to enhanced preventive care, because provision of users and providers with information on dMHSs, could prevent the onset of CMDs and reduce the overall demand on the healthcare system (107). Additionally, integrating digital solutions can contribute to cost savings within the healthcare system, as remote patient monitoring and virtual consultations can reduce the need for in-person visits, which has the potential to optimize healthcare resources (49). Lastly, the German healthcare system has been adapting to the digital age, with regulatory frameworks evolving to support the integration of digital health solutions (43). Informing future HCPs as potential users about these developments ensures that they can gain experience, make informed decisions and take advantage of the available resources. The insights gathered from this dissertation can thus be used for the design of recipient-targeted information strategies on dMHSs to reduce skepticism and increase knowledge in both users and providers, which allows for more effective public health interventions.

Ethical approval for conducting the first qualitative study (study 1) was obtained from the Ethics Committee of the Medical Faculty of the Heinrich Heine University Düsseldorf (study number 2020-972) by principal investigator JAH. To ensure that ethical standard are met by the quantitative study (study 2), written consultation with the President of the Ethics Committee of the University of Zurich was obtained on 3 March 2020 by the principal investigator MD. The checklist to self-assess ethical safety was also completed, thus the ethical safety of the study was approved. Ethics approval for the second qualitative study (study 3) was obtained from the Ethical Board of the University of Mannheim (EK Mannheim 27-A/2021) by the principal investigator MS.

## **2 Publications**

### **2.1 Investigating information needs and preferences regarding digital mental health services among medical and psychology students in Germany: A qualitative study**

# Investigating information needs and preferences regarding digital mental health services among medical and psychology students in Germany: A qualitative study

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## Abstract

**Background:** Since 2020, physicians and psychotherapists in Germany can prescribe digital mental health services (dMHSs). However, even future healthcare professionals (HCPs), such as medical and psychology students, remain reluctant to use dMHSs, although they are a risk group for mental health issues themselves. Reasons include scepticism and lacking awareness of dMHSs, which can be addressed by acceptance-facilitating interventions (AFIs) such as information strategies. To date, though, little is known about their information needs.

**Methods:** Semi-structured interviews with  $n = 21$  students were conducted between August and September 2021. Students of legal age studying psychology or medicine at a German university could participate. Interview recordings were transcribed verbatim and content-analyzed according to Mayring, using deductive and inductive coding.

**Results:** Most students reported having little experience with dMHSs. Digital health has barely been raised in their study, even though it was perceived as crucial for personal needs as well as in preparation for their work as HCPs. Students favoured receiving information on and recommendations for dMHSs from their university via, e.g. social media or seminars. Among others, information about data safety, scientific evidence base and application scope were preferred. Additionally, information on costs as well as user reviews seemed to be essential components of information strategies because students were concerned that high costs or low usability would hinder uptake.

**Conclusions:** The results give first insights on how future HCPs would like to be informed on dMHSs. Future research should focus on systematic variations of AFIs' components mimicking real-world decision scenarios to increase the adoption of dMHSs.

## Keywords

Digital health, digital health literacy, technology acceptance, mental health, medical students, psychology students

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## Introduction

Common mental disorders (CMDs), such as depression, post-traumatic disorders or anxiety disorders, remain among the top 10 leading causes of burden worldwide, while the prevalence of CMDs seems consistent.<sup>1–3</sup> However, in the wake of the COVID-19-pandemic, CMDs have increased tremendously.<sup>4,5</sup> Innovation in digital health tools, including mental health apps, provide new approaches to the management of CMDs. For instance, evidence-based digital mental health services (dMHSs) have been suggested as promising options for the large-scale dissemination of interventions for the prevention and treatment of CMDs.<sup>6,7</sup> Concerning prevention purposes, dMHSs, such as well-being apps or structured stress management programs, have been considered as helpful for the promotion of patient empowerment and coping strategies.<sup>8–10</sup> In regards to the treatment of different CMDs with dMHSs, a recent systematic and comprehensive meta-review by Philippe et al. showed that 52% of research on dMHSs has involved the treatment of substance use disorders, 29% focused on mood, anxiety, and traumatic stress disorders, and less than 5% on remaining CMDs.<sup>11</sup> In general, dMHSs are defined as services that make use of information and communication technology in the field of mental health.<sup>12</sup> They are considered to be auspicious low-threshold tools or therapy-add-ons because of their flexible modes of delivery, low associated costs, anonymity, and low access barriers since they are location-independent.<sup>13–16</sup> Other advantages of dMHSs include time flexibility, acceleration of the treatment process and outcome, improved therapy adherence, increased health literacy, simplified contact maintenance, and the management of symptoms of CMDs.<sup>17–19</sup> In Germany, the “Act to Improve Healthcare Provision through Digitalization and Innovation” (Digital Healthcare Act)—passed in December 2019—allows for the prescription of evidence-based dMHSs (i.e. medical apps) by physicians and psychotherapists, online video consultations, and access to a secure healthcare data network for flexible and location-independent treatment of, for example, CMDs.<sup>20</sup> The costs for the use of evidence-based dMHSs are reimbursed by statutory health insurances, covering around 73 million citizens.<sup>21</sup> The German healthcare system is unique worldwide. Other countries, such as France, Belgium or Sweden, are just starting to integrate this concept into their own healthcare systems.<sup>22</sup>

In general, dMHSs have been proven to be effective regarding the prevention and treatment of CMDs, for instance in reducing symptoms of anxiety, depression, stress, eating disorder, or social and academic functioning.<sup>23–27</sup> However, even though evidence supports the efficacy of many dMHSs concerning an improvement of mental health,<sup>16,28–31</sup> uptake rates of dMHSs, such as medical apps, remain low.<sup>32,33</sup> This can be explained by unawareness and skepticism toward dMHSs among patients and healthcare professionals (HCPs) such as psychotherapists and general practitioners, including

concerns related to data security, confidentiality, efficacy, impersonality, insufficient information, and low digital health literacy.<sup>8,17,18,34–39</sup> Accordingly, Gerlinger et al. pointed out that HCPs do not feel well informed about benefits and risks of dMHSs,<sup>8</sup> while other studies showed that only few of them already have practical experience with dMHSs.<sup>17,40,41</sup> For a comprehensive dissemination of dMHSs into the healthcare system, it seems logical to educate future HCPs, such as medical and psychology students, for several reasons. First, as a consequence of the Digital Healthcare Act, HCPs will have to deal with manifold questions related to digital health in their practice, which calls for an early acquisition of digital health literacy more than ever before.<sup>20</sup> This early acquisition also seems important in regards to giving future HCPs the possibility to gain practical experience with dMHS during their studies, which has been shown to be a determinant of dMHSs’ acceptance.<sup>17</sup> Second, future HCPs will represent the gatekeepers of healthcare delivery because they are the primary source of health information for many patients, thus having a large influence on their attitude formation.<sup>42</sup> Lastly and most importantly for our research interest, they are potential users of dMHSs themselves since they show high proportions of distress<sup>43,44</sup> and represent a high-risk group for CMDs.<sup>45</sup> They report manifold attitudinal barriers to seeking help<sup>46–50</sup> and still tend to have little knowledge about mental health services.<sup>36</sup> Attitudinal barriers include the preference to manage problems on one’s own, low help-seeking intentions, expected career disadvantages, fear of stigmatization, and skepticism about the efficacy of care.<sup>46–50</sup>

To tackle these concerns and close knowledge gaps, tailored acceptance-facilitating interventions (AFIs) such as multi-component information strategies have been found to be a promising tool in educating individuals about innovative approaches, such as dMHSs.<sup>51–60</sup> For instance, Hein et al.<sup>61</sup> could show that physicians’ acceptance of health apps focusing on chronic pain was strengthened by a short educational video providing information about the content of health apps, for example, how they can be used and evidence of recent studies. Credibility and performance expectancy were the strongest predictors of acceptance, followed by skepticism.<sup>61</sup> Among psychotherapists, Baumeister et al.<sup>52</sup> found that acceptance of blended therapy might be improvable by AFIs, particularly in subpopulations that were initially rather skeptical such as psychodynamic oriented psychotherapists.

Despite the stated reasons for educating future HCPs on dMHSs and initial positive findings on the usefulness of AFIs in improving the acceptance of dMHSs, there is insufficient research on their needs and preferences regarding how and about what they wish to be informed as potential users of dMHSs.<sup>16,51,53</sup> Most research has either focused on university students’ preferences regarding the design of dMHSs<sup>62</sup> or their attitudes toward dMHSs,<sup>63</sup> but not on how information about dMHSs should be disseminated



to targeted recipients to facilitate acceptance. Some studies provided at best few insights into the design of AFIs on dMHSs.<sup>54,55,64–67</sup> For instance, Apolinário-Hagen et al.<sup>68</sup> investigated the influence of information with or without varying testimonials but found no change in attitudes toward dMHSs among university students, while a follow-up experiment indicated positive findings on attitudes and acceptance using optimized AFI material with testimonials.<sup>67</sup> Research on future HCPs as a specific student group is even scarcer. However, this is an essential first step that has not been covered by research yet, which could be one reason for the low uptake rates of dMHSs. Until today, it remains unclear how information strategies on dMHSs should be designed and disseminated to meet the preferences and needs of both uninformed and possibly distressed students that will one day become HCPs. In conclusion, an in-depth understanding on what they would like to be informed about by whom as well as on how they would like to be informed is needed to design effective AFIs on dMHSs for the early acquisition of digital health literacy.

Hence, the purpose of this study was to explore information preferences and needs on dMHSs among medical and psychology students as potential users of dMHS who are at risk to develop CMDs. At the same time, according to the Digital Healthcare Act physicians and psychotherapists are the two groups that will be allowed to prescribe medical apps in the future and thus will have a large influence on the adoption of dMHSs in Germany.<sup>20</sup> We were interested in (a) exploring design as well as content needs and preferences regarding information on dMHSs and in (b) identifying the most relevant components (i.e. attributes) and their possible levels which together constitute AFIs (i.e. information strategies) on dMHSs. An example for an attribute could be “information source,” while a corresponding attribute level could be “university” or “HCPs,” representing the source where the information on dMHSs for students come from.

## Methods

### Study design

Given the explorative nature of the study, a qualitative design was chosen as a first in-depth analysis. It is most suitable for application in areas where information seems incomplete or not yet attainable through quantitative approaches.<sup>69</sup> To get a thorough understanding of students’ information preferences and needs related to dMHSs, we conducted semi-structured video-based individual interviews via the software Webex™ by Cisco (Version 41.6.0.19119). The results of this study further help select and specify attributes and attribute levels for information strategies on dMHSs. The ethics committee of the Medical Faculty of the University of Duesseldorf approved the study (study number 2020-972). The study was preregistered at the Open Science Framework on August 11, 2021.<sup>70</sup>

### Sampling

Students who were 18 years and older could participate in the study if they were enrolled at a German university in medicine or psychology (bachelor’s or master’s program), excluding students from other health-related disciplines that will not be allowed to prescribe medical apps in the future. We followed a convenience sampling strategy, that is, for example, recruiting via social media, personal contacts or flyers and posters at universities. To ensure a wide range of characteristics, we intended to recruit participants from all over Germany. Additionally, our strategy was to recruit specifically for participants with a wide variation of characteristics (e.g. age, gender and federal states) to increase the chances of obtaining differing perspectives. Medical and psychology students who expressed interest to participate in the study were provided with more details of the study and the participant consent form. Participants who did not provide written informed consent were excluded from the study.

### Data collection

Based on research literature on possible attributes of information strategies on dMHSs we developed a preliminary topic guide with eleven themes and possible follow-up questions as well as a short background questionnaire covering questions about demographics, familiarity with and readiness to use dMHSs.<sup>52,55–57,60,64,68,71–75</sup> Participants who provided written informed consent were asked to complete this questionnaire before the interview. The interview guide was developed by AKS and JAH, discussed in the team (AKS, JAH, AL, PB), and pre-tested by AKS. In total, six test-interviews were performed ( $n = 2$  male,  $n = 4$  female), simulating an interview under realistic context conditions. In addition to conventional pretesting, comprehension probes was used as an element of cognitive pretesting to collect further information about the way participants understand certain questions or terms (e.g. What do you understand by the term *e-mental-health*?).<sup>76</sup> Results led to small changes in the topic guide and in the background questionnaire.

In the beginning of each interview, the term *digital mental health* as well as examples for dMHSs were introduced. Data were collected by AKS and PB from August to September 2021 until consensus on thematic saturation was achieved, that is, no substantially new content emerged from the interviews.

Online interviews were recorded as audio files with an external recorder. The audio files were transcribed by an external transcription provider and analyzed (verbatim) for content analyses. Interviews were conducted in German and quotes were translated into English by a researcher and professional translator (LG) for this publication. All procedures strictly adhered to the Declaration of Helsinki in the latest version and applicable regulations (e.g. General Data Protection Regulation, Federal Data Protection Act).

## Data analysis

Qualitative content analysis was performed using the MAXQDA 2020 software (VERBI GmbH, Berlin, Germany) based on the approach of Mayring.<sup>77</sup> According to Mayring, categories can be either formed deductively from theory and then assigned to text passages, or inductively out of the data. Correspondingly, we applied a combination of both inductive as well as deductive coding. During interview transcript coding, main categories (attributes) were formed deductively according to the preliminary topic guide which we developed based on a literature search.<sup>52,55–57,60,64,68,71–75</sup> Within these main categories, subcategories (attribute levels) were formed inductively based on the transcripts. PB and AKS independently coded six interview transcripts. These six interviews were chosen based on the distribution of gender, federal state and study program to ensure heterogeneity. Subsequently, the category systems and text samples were compared, and discrepancies were resolved via discussion, which led to the preliminary coding scheme. PB then performed the qualitative analysis of all remaining interview transcripts according to this scheme, which was extended. After completion of the first coding round, the scheme was further reviewed and slightly modified by JAH as principal investigator as well as by AL, who is an experienced researcher in the field of qualitative data analysis.<sup>78–80</sup> The revised coding scheme was then again applied to all transcripts in a second round of coding. As only small modifications were made during the second coding round, two coding rounds were deemed sufficient. Additional file 1 presents the final coding scheme. The conduction and reporting of findings followed the checklist of consolidated criteria for reporting qualitative research (COREQ)<sup>81</sup> and further recommendations on formative qualitative research in preference elicitation.<sup>82</sup> The members of the study team that were engaged in the analysis process had different professional backgrounds (i.e. medicine, psychology, public health, and epidemiology), which should ensure intersubjective transparency, replicability, and discriminatory power of the categories.<sup>83</sup>

## Results

### Sample description

In total,  $n = 21$  online interviews were conducted with an average duration of 31.7 minutes (range 16–55 minutes) including  $n = 16$  medical students ( $n = 4$  male students) and  $n = 5$  psychology students ( $n = 1$  male student), who participated in the study. Table 1 summarizes the main characteristics of the sample. On average, students were  $M = 25.5$  years old (standard deviation [ $SD$ ] = 3.86, range = 20–33) and studied in five different federal states of Germany (North Rhine-Westphalia, Baden-Württemberg, Hesse, Bavaria, Rhineland-Palatinate). Among all students,  $n = 11$  ( $n = 7$  medical students) had already completed at

**Table 1.** Sample characteristics.

Variables	Mean (Min–Max, SD) or $n$
Students ( $n = 21$ )	
Interview duration in minutes	31.7 (16–55, 10.3)
Codes linked to interviews	679
Age in years	25.52 (20–33, 3.86)
Female	16
Male	5
Subject: Medicine	16
Subject: Psychology	5
Earlier completed training or studies	11
Location: North Rhine-Westphalia	7
Location: Baden-Württemberg	3
Location: Hesse	1
Location: Bavaria	5
Location: Rhineland-Palatinate	5

least one educational program, such as surgical technical assistant, nurse or paramedic, or study program, such as a bachelor's degree in molecular medicine or psychology, before being enrolled in their current study program.

### Attitudes toward dMHSs

Generally,  $n = 20$  of the interviewed students reported positive attitudes and said they were open toward the use of dMHSs as a preventive service if they were offered free of charge by their university. Most mentioned areas of interests were stress management, sleep difficulties, exam nerves, concentration problems, and generally overcoming fears.

Many students reported having little knowledge about or no experience with dMHSs. However, more than half of the interviewed students ( $n = 13$ ) had at least heard about dMHSs, such as apps for meditation or online stress prevention programs, while only  $n = 2$  students had heard about medical apps before (i.e. dMHSs on prescription). Furthermore, students expressed that the topic of digital health had barely been mentioned in the course of medical or psychology studies, even though it was perceived as a crucial topic both for personal needs (e.g. during stressful exam periods) as well as in preparation for their future work as HCPs.

Most participants did not favor information strategies on dMHSs for personal use that were designed for medical or psychology students only. Instead, they favored information strategies on dMHSs that generally targeted students' needs, as they did not perceive any relevant difference between student groups in terms of stress and mental health problems.

### Information sources

Figure 1 provides an overview over all deductively derived attributes and inductively formed levels of attributes that, in combination, could constitute an information strategy. Our results showed that an information strategy consists of an information source, information format, content preferences, and general design preferences. An example is that medical and psychology students as future HCPs could be informed by their university (information source) via social media (information format) on the scientific evidence base of dMHSs (content preference). This social media post could be written in cheerful, humorous language, designed in light blue and green colors (design preference).

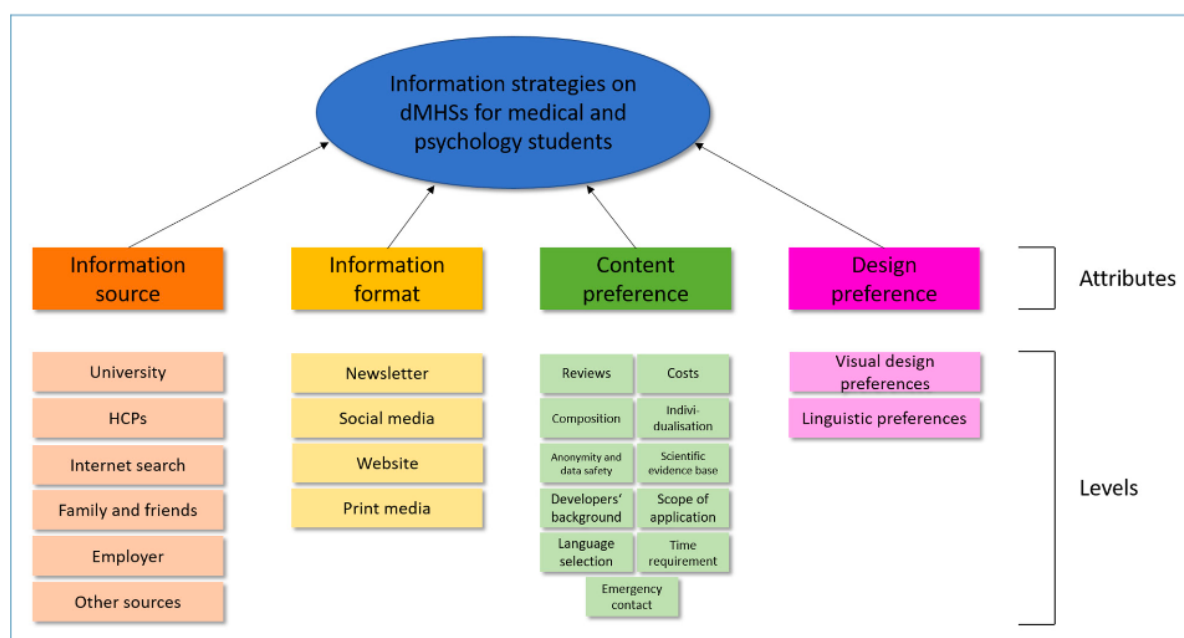
**University.** Students mentioned different ways of how they would like to be informed, but many indicated that, in their opinion, the university is mainly responsible for information provision. Students wished to get a clear overview and recommendations for dMHSs by their university because of the large number of existing dMHSs, such as commercial mental health apps. They said that they

missed guidance or counseling at their university, both from the perspective of a potential user of dMHSs as well as with respect to their planned future career as HCP. Additionally, students indicated that they would like to be informed about dMHSs right at the beginning of their studies, as a preventive service, and highlighted the importance of proactive information provision. Many students reported a lack of knowledge of existing psychological support structures available at their university.

*"So, I think it would be useful to talk about this topic in general at the beginning of any study, because stress is such an important issue nowadays, no matter whether it's during your studies or in your job. And I think that everybody, including me, deals with stress in the studies, at least quite often. Which is why this is a topic that needs to be addressed more often in general. And in this context, when talking about it, it would be actually very helpful to immediately provide different services on how it could be implemented." (3730EJUG)*

Furthermore, some students said that they would like digital health, including dMHSs, to be introduced as an integral part of the education of future HCPs. When asked for the preferred form of information transfer, many students favored interactive forms such as seminars as part of an elective subject.

*"There are different ways of exchanging information with each other, for example presentations that can be given*



**Figure 1.** Overview of attributes and levels.



*in turn. You could maybe do a course, a minor subject, where everyone gives a small presentation on a subtopic of e-mental-health, like five or ten minutes, that would be enough, and you'd have heard about it at least, so that you're not completely on your own."* (POX4QTL2)

However, some of the medical students expressed concerns about providing information on dMHSs only in an elective subject since they feared that information might get lost this way. These concerns include a limited number of electives that students can choose, restricted access to elective subjects as well as too little information in the description of each elective.

*"I think corresponding elective subjects would actually be a good idea, but I also have to say that you don't really get much information on some of these subjects (...), well some of them have a small description, (...) but I don't know if some students decided not to take it, simply because they wouldn't have enough information (...) and you can also only choose a limited number of elective subjects and some of the subjects have a limited number of participants, so ultimately, the majority of students wouldn't take part probably. Exactly, so there are special services, but access is also limited."* (W0366MAW)

Instead, some students expressed the idea of digital health being introduced as an integral subject of their studies or as a compulsory seminar, for example, for all freshmen. Furthermore, students reported several other possibilities to get informed by their universities including services from the student representatives, the student services center, student working groups or the deanship.

**Healthcare professionals.** Students mentioned HCPs as another trustworthy source of information regarding dMHSs because they were often seen as primary and trustworthy source since they provide their patients with reliable information. However, some students stated they would feel uncomfortable asking HCPs for advice as they would often seem annoyed or stressed. Additionally, some students showed general low help-seeking intentions because of expected career disadvantages, which still appears to be a widespread reason for not seeking support at HCPs or health insurances.

*"Health insurance might also be an option, but somehow... well, it could be said—and I have also noticed this with my fellow students—that they were having some problems in their studies, and they were like: Alright, I won't go to a doctor or a psychologist now, because I know that I can't practice some professions if I receive certain diagnoses. And I don't know in what way they are worried in advance maybe, so that they might hesitate to use the services. So, I think I'd prefer the most anonymous way, like using google or the internet."* (57VOPFC7)

Some students reported that they could imagine that the exchange with other HCPs as information source for medical innovations such as dMHSs might become more important once they are in that role themselves.

**Internet search.** If interviewees already had experience with dMHSs, they most often mentioned own internet search as their initial information source. In accordance, when asked how they would now search for support in stressful phases, for example, during exam periods, almost all students replied they would "use google" (DVHQI4ZS) and see what they could find on the internet.

Some students stated they found specific dMHSs through app store research or personalized advertisement on social media.

*"And well, if you do some research on the topic you mysteriously get corresponding ads, on Instagram for example. And I think I found one of them myself, I had searched for it and clicked it and the other one was suggested to me, yeah, that's more or less how it was."* (B3ACVZZ6)

However, most students said that they would prefer to be informed about dMHSs by their university or HCPs instead of doing internet research themselves because they thought that "the risk of drawing a blank is way too high" (MHMEUCIZ).

**Family and friends.** Some students also reported that if they had already used services for their mental health, they got their information about these dMHSs from friends or family members. Since significant others are usually perceived as a trustworthy information source, some students described word-of-mouth as a good option to get informed. In general, they said that they would rely on their family or fellow students and friends when it comes to mental health because they might either experience similar stressors or would only recommend services that they also benefited from in the past.

*"Well, I would say close family members and friends, of course, simply because they are people that I know. And I know that they share their personal opinions with me, without any hidden agenda. This is actually always the best thing, if they have no personal benefit, they are being honest. They tend to give me their honest opinion. And therefore, I think that I'd immediately do so I'd say."* (373OEJUG)

**Employer in healthcare.** Another idea to inform future HCPs about dMHSs was through the employer. Especially for medical students, who must complete several internships at, for example, clinics, during their studies, it was mentioned that they would appreciate being informed about

health promotion services by their employers as they should also have an interest in their staff's overall health.

*"I think it would be really cool if my employer did that. Simply because they should also be interested in me doing well in the job for a longer time. And especially because—well, I work at a university hospital myself; it's a huge organization and they also have far more resources that are used anyway, for, I don't know, all sorts of studies, PR. So, I'd be really happy about more services for the employees, I would say." (OEFFMG40)*

**Other sources.** Finally, some students mentioned additional information sources that do not fall into the deductively defined main categories. These include public bodies, such as the federal ministry of health or the federal ministry of education, and research but also TV advertisement. Regarding public bodies, students mentioned that they would assess them as trustworthy sources when it comes to mental health recommendations, as opposed to websites of dmHSs where these services are to be sold. Interestingly, one student did not see information from dmHSs' producers as problematic, but mentioned that, for example, TV advertisement of dmHSs could indeed be another valuable source of information because many persons could be reached.

*"I could also imagine advertisement on television. From my point of view, there should be way more advertising for health services. You should just try to reach as many people as possible. Not everyone has a cell phone, especially elder people." (KB4I9VSV)*

### Information format

**Newsletter.** Students imagined several different ways of how to get informed about dmHSs. One possibility mentioned was sending a newsletter to all students, for example, from the student services center, the deanship, or by health insurances. However, the usefulness of these newsletters was also discussed.

*"It's always quite difficult to really reach all students. Sending an e-mail would probably be the easiest way, just sending it via mailing list. But honestly, I don't know if that's a good idea, because e-mails that come via mailing lists, for example from the deanship or something like that, are often skipped, I think. You just skim them, and then you notice: Okay, it's nothing important, and it goes straight into the trash or storage. It might work better with a personal form of address or some advertising by the lecturers or in seminar groups; places where you are in smaller groups, but I'd still say that you reach the most students via e-mail and effectively also those who are interested in it after all and who notice it and be like 'Oh, this*

*does even exist?' (...) Everyone who is not interested or who doesn't need it can still delete the e-mail. So yes, I think this is still the most effective way." (TNN4A5ZZ)*

**Social media.** Regarding the use of social media in information strategies, students had dissimilar opinions. Some stated they benefitted from personalized advertisement on, for example, Instagram, whereas others argued that they were not sure whether information on dmHSs retrieved from social media platforms was trustworthy. However, if the information source is assessed as reliable (i.e. the institution behind the social media profile, such as the student services center), presented information is more easily accepted. Additionally, students mentioned Facebook student groups as another option to stay updated. Many reported that they had heard from the possibility to participate in this interview-study in a Facebook group from their course of studies and that they could imagine being informed about dmHSs in these groups, too, for instance, by student council groups. Podcasts were also mentioned as a possible way to retrieve information on dmHSs, especially because one can be notified about possible updates such as new dmHSs. This way, students reported that social media could be an effective and low-threshold way to reach those in need.

*"The university also has two Instagram accounts now, for example. So, generally speaking, it would also be possible via social media. (...) Therefore, yes, trustworthiness would definitely increase for me if it were a university recommendation." (W0366MAW)*

**Website.** Lastly, some students wished for a website, for example, hosted by the university or health insurances, where all information on dmHSs and other services for mental health could be listed and shortly explained to get an overview. In their point of view, this would reduce uncertainty and save time.

*"Well, I think it would be good if there was some kind of platform that has all the information. So, that you could list different apps and additional online therapists or something like that, that you'd have at least a phone number or a contact person." (WVRROB3C)*

**Print media.** On the other hand, two students stated that they would prefer print media, such as flyers, brochures or scientific literature from the university library, over digital platforms so that they would have something tangible at hand.

*"I always think that it's nice to have something tangible at hand, which is why I thought of flyers first. Something that you can also pass on, but of course, that's true for an e-mail or an info page, as well. I just prefer having things in my hand." (TNN4A5ZZ)*



## Content preferences

**Reviews and recommendations.** For many students, online reviews by other users seemed to be important information on dMHSs that would influence their usage intention because it gave them an initial indication of whether dMHSs were worth engaging with. For instance, when searching for a mental health app targeting a specific disease pattern such as depression, students appreciated it when users reflected on whether this app was helpful or not. Additionally, students wanted to know whether dMHSs were intuitive, technically well-established and self-explanatory, for example, through self-reports by other users. When reading online reviews, many students seemed to specifically look for detailed, supposedly honest opinions.

*"You usually notice if they are written honestly and then you can really work with them. That is, if you have concrete and positive feedbacks instead of 'Oh yes, I feel totally great now'. Instead of this general feedback you could mention precisely what you liked about it. So, I mean concrete feedback and not just a good rating." (G58596A1)*

However, most students also expressed their skepticism about online reviews and even mentioned that it would scare them off because they did not know whether they could take them seriously. Additionally, a few mentioned that they regarded online reviews as not meaningful because they perceived mental health as a topic that is too individual and thus cannot be transferred to others.

*"Of course, I'm really happy if someone writes: 'It really helped me a lot, I feel much better'. But in the end, this can't necessarily be related to your personal usage. Unless it's about technical issues (...). But for me, this was no exclusion criterion nor was it a selection criterion. If the ratings are great, it doesn't necessarily mean that it's great for me, too." (0SCEPLP9)*

A lot of interviewed students stated that they would be more willing to use dMHSs that were previously tested and approved by friends, students, or university lecturers because students had difficulties to decide as *"there are 1000 offers, and most of them cost a little bit"* (B3ACVZZ6). Many students favored dMHSs that were recommended by central institutions such as universities or health insurances as well as by HCPs. Thus, including those recommendations in information strategies on dMHSs seems critical.

*"Well, with a psychotherapist, you simply know: Okay, she has experience with this. Others have also tried it before. So, there is some personal experience involved." (WVRROB3C)*

*"Certification is also very appealing to me. (...) Let's say, for example, there is an app that should help with the treatment of depression, and I would either be in the role of the therapist or also in the role of the patient. For me, it would be extremely helpful if it simply said: accepted by the German Psychologists' Association or found to be good." (KB4I9VSV)*

**Costs information.** The importance of information on costs was highlighted by most students. No or low costs seemed to be a decisive factor for the uptake of dMHSs as students often do not earn a lot of money. Thus, this information seems essential for information strategies.

*"Well, I don't really earn much as a student and I'd really like to save some money or get special offers, a discount for students or something like that." (POX4QTL2)*

In general, students agreed that information strategies on dMHSs needed to include information on costs because high monetary expenses were seen as a barrier for usage. Students agreed that if dMHSs were not free of charge, they would like to be informed whether trial subscriptions were offered because they wished to have the opportunity of getting to know the service or app before paying for it.

*"And I think it would be important that it's free of charge. I think, a lot of people are put off if there are any costs for potential users. (...) Or that there is, I don't know, a time period where you can try it out for free. (...) I mean, of course, all of this has to be paid for, without a doubt. But then you should perhaps have the opportunity to test it first. And then, you can buy it if you are convinced of it." (DVHQI4ZS)*

**Anonymity and data safety.** Students held varying opinions about data safety, that is, whether they wanted to be informed about this topic as part of targeted information strategies on dMHSs greatly differed. For some students, data safety was essential, especially in the context of a sensitive issue like mental health. Many reported that they would not like to use dMHSs that required entering personal data, because talking about mental health issues seems to be stigmatized among future HCPs. Thus, this information should be presented before using dMHSs due to the importance of privacy and discretion.

*"I wouldn't really want to share personal details on an app like this. (...) I mean, I don't really know how you could trace back that I am using the app as a person concerned. Because it just occurred to me that if people find out that I have this app, then there is a certain stigma to it, (...) so that you wouldn't really want to mention that you get psychological help. This always makes me really sad. (...) But yes, I'd say data you put online should be reduced to the minimum." (MHMEUCIZ)*

Some students stated that information on whether data is treated in accordance with the General Data Protection Regulation (GDPR) or a GDPR certificate would be sufficient to be perceived as trustworthy as realistically no one reads the general terms and conditions. Others reported that they did not necessarily need to have information on data safety when educated on dMHSs because their data was already “out there,” but pointed out that anonymity would play a crucial role for usage.

*“I must say data safety (...) has not been an issue I’ve been worried about, maybe because I know that you can’t really do much with the data. (...) I’ll be there, and I might be talking about my problems, it’s anonymized maybe. And even if that’s not the case, it falls under some form of data protection law anyway. (...) I think many people are more willing to pour their hearts out and talk about their problems, for example in an online forum, if they are anonymous, because, let’s face it, nobody wants to have their name and picture there and talk about crying all night long because of an exam. So, I can imagine that this is somehow liberating and that it motivates people to exchange experiences. So that you can find other people who are going through similar things.” (HNIQK3ZD)*

**Individualization.** Some students wished to be informed about whether a service or mental health app offers individualization options, for example, by using a questionnaire to diagnose symptoms at the beginning and then customize the content of dMHSs accordingly to their needs. Similarly, they would like to know whether dMHSs are flexible in terms of exercises and their duration, so that they could choose tasks according to the time available.

*“Or, for instance, that you have various exercises that you can choose from. How much time do you have right now? What would you like to do? And then, it should be possible to choose between five, ten, or twenty minutes. I think I would like something like that.” (KB4I9VSV)*

**Composition.** Students said that they wanted to be informed about the content and structure of dMHSs, for example, how many courses a program consisted of or whether one could choose between different subscription options, including a test subscription that offers an insight into the program. They also wanted to know if dMHSs offered a wide range of content to quickly determine whether they fitted their individual needs.

*“I think it would be nice to get a clear insight at first, to see what the program includes, to determine its strengths, so to speak. I mean, there are different kinds of relaxation techniques or possibilities. It would be good to have an overview, because some things just don’t suit you.” (G58596A1)*

Furthermore, interviewees valued dMHSs that were diversified and did not quickly become boring because they favored services that covered different interests. Thus, this was an additional point that they wanted to be informed about.

*“I would really appreciate it to see that there are, like four different aspects. It’s not always the same, it varies and maybe I don’t have to answer each aspect every day. I think it would be quite interesting to see that a lot of aspects are covered, that it’s not just ‘are you sad?’, ‘are you happy?’ all the time. Which means that I’d be appealed by this distinctive character, (...) I need to see that many aspects are covered.” (MHMEUCIZ)*

**Scientific evidence base.** Students considered it crucial to be informed about the scientific evidence base of dMHSs. They wanted to know whether there was sufficient empirical support for dMHSs or whether, for example, mental health apps had been proven effective and efficient in trials because otherwise they would wonder why they should even use them. Furthermore, some students stated that they would like to read some information about scientific studies on dMHSs.

*“This means that I would find it great if you could somehow retrace the following: Okay, how many participants have tested it and what are the results and maybe also, I don’t know, is any S3-guideline included? For me, a certain evidence level would be important. Because otherwise, I could also go to someone who holds a compass over my chest or something like that. But yes, it would be nice to know that work was put into it to examine it, and this would make it more appealing in my opinion. (...) For me, it’s actually enough to see: Okay, it has been examined by a research group. They have good results, six university hospitals are using it, and then I’d definitely be convinced of it.” (MHMEUCIZ)*

**Background of developers.** The scientific evidence base was often mentioned in combination with the background of dMHSs’ developers, meaning their professional expertise. Informing students on whether the team of developers included, for example, psychologists and specialized physicians seemed to increase integrity.

*“So, yes, I think it’s always good when there is a certain professional background somehow. For example, that (...) psychologists have been involved in the development of it maybe. (...) I think this enhances your trust in the app. Because you feel that it’s really useful and even though it won’t replace therapy, (...) you can start helping yourself with it.” (5DV5XVFM)*

Additionally, informing students on who developed dMHSs was considered to expand long-term attachment.



*"I also think it's nice to know who is behind it, so who has developed it and why. I think that's especially important, because it binds you to the whole matter in a different way." (OEFFMG40)*

**Scope of application.** Interviewed students wished to be informed about the intended target group, such as seniors, employees or students, because they could then evaluate whether a specific service could be applied to them. They also stated that they would like to be informed about the intended purpose of dMHSs, that is, for which problems and diseases dMHSs were specifically developed. For instance, if students explicitly wanted to learn to cope better with exam nerves, they wanted to immediately see whether a program was developed with this intention.

*"Well, if the meaning, the purpose or targeted diseases of the app are adequately formulated in advance, open and honest, or (...) what you'd like to accomplish with it, then it's probably more appealing to everyone—including me—compared to when nothing is really expressed clearly, and you'd practically have to try to get along with it, and see if you can find anything at all. Because this would actually set me back a step right away." (OEFFMG40)*

**Emergency contact.** In case of psychological emergencies, students wished for dMHSs that could provide suitable contacts as well as quick, reliable information in order to help patients in acute need. In this case, anonymity would lose importance.

*"Also, to what extent you are forwarded to non-digital locations, let's say, in case of acute need. This should be present as well. People should not be pushed into a digital service, and don't come out of it in that sense. I think that's the most important aspect." (OSCEPLP9)*

**Time requirement.** Additionally, students stated that they would dislike time-consuming dMHSs as they already have a stressful everyday life as a student. For this reason, they wished to be informed about the recommended daily effort that was required to achieve results before usage.

*"And maybe also the time limit (...). Some (...) also advertise with something like: 'Seven minutes per day and the day is less stressed.' This would also be important for me as well (...). I don't want to install the app and then enter information for over an hour. Maybe you weren't even prepared for this, because you don't have enough time." (AT900OCZ)*

**Language selection.** Furthermore, one student mentioned that she once unintentionally downloaded a mental health

app that was only available in English, which increased the threshold to use it. Another student stated that, especially as future HCPs, it would be desirable to be informed about whether dMHSs were available in different languages so they could be recommended to patients with varying mother tongues. In general, talking about emotions and struggles seems to be easier using dMHSs in the native language.

*"Well, I just feel more comfortable there. It's not like I don't understand it or something like that, but I can just kind of let go." (B3ACVZZ6)*

## Design preferences

**Visual design preferences.** Because of limited time resources, most students preferred images or short videos in combination with brief, explanatory text in terms of information strategies. For instance, when sending a newsletter to students, interviewees preferred some facts about dMHSs, such as costs, recommendations, and scope of application, and only a few images or videos about the content and structure of the app.

*"I'd say I really like short and concise sentences. (...) When I'm not feeling well mentally or when I'm stressed, and I'm looking for such a service, I don't want to have to go through the cognitive effort of reading long texts. (...) Short, concise sentences that stay in mind, a bit like a mantra maybe. Definitely pictures. Animations would be nice as well." (HNIQK3ZD)*

On the other hand, some students preferred texts over videos. They argued that students were often in public locations, such as cafés, where videos were harder to watch:

*"I can also imagine videos, especially in the context of explaining how things work. For example, in the app, you can show people how to use everything. And here you have the different functions. (...) But I think that text is one of the clearest things. Because if you are out, for example, and you want to get some information, you wouldn't watch a video. Well, I think that many people do some research when they are not at home. Sometimes, they are in a café, at university, they're working. And I always think that videos are a bit inconvenient in that case." (KB4I9VSV)*

When dMHSs provide personal contact with HCPs, some students had the idea of portraying the experts to make dMHSs more appealing and credible.

*"It has a different effect if there's a person on it, compared to, I don't know, if you have a picture of some landscape or something else, or no picture at all. But I think it would really make a difference, for me personally at least, because it's more appealing." (SDV5XVFM)*



A few other students had the idea of a modular composition of information, giving interested recipients the opportunity to dig deeper into specific themes.

*“Actually, I like to have a brief summary of the most important information and then, there is additional information in the background, so to speak. For example, that you have the possibility of reading more on an individual issue if you want to do so. But that everything is very compact at first glance, especially if you want to compare things.”* (KB4I9VSV)

Congruently, students favored information material in light, subtle colors, such as light green or light blue, because they seem to be associated with the healthcare sector and general professionalism.

**Linguistic preferences.** Regarding linguistic preferences, students had different opinions. Some preferred scientific language and the focus on facts, others would rather go with cheerful, humorous language because addressed topics are already serious enough.

*“Yes, I think you catch more people with casual and humorous behaviour. If you really start casually and with humor. This means I wouldn’t read it probably, if it were just facts. If I want to read about facts, (...) I open a book. And I just think that you should somehow also see things in a relaxed manner.”* (GFUI3FCB)

## Discussion

The aim of the present study was 1) to explore medical and psychology students’ needs and preferences regarding information on dMHSs and 2) to identify attributes and attribute levels that help to design acceptance-facilitating information strategies on dMHSs. Despite future HCPs’ important role as gatekeepers of healthcare innovations, such as dMHSs,<sup>42</sup> and their high risk to develop CMDs themselves,<sup>45</sup> only little is known about their preferences and needs on dMHSs.<sup>84</sup> Our results may help fill this research gap.

Overall, almost all interviewed medical and psychology students reported to be open toward the use of dMHSs as a preventive service if they were offered free of charge by their university. However, participants still had little experience with dMHSs. Even though the German Federal Institute for Drugs and Medical Devices already included the first medical apps into the prescription index in October 2020, only a few participants had heard about medical apps before.<sup>85</sup> This result is in line with prior research, showing that future HCPs report little knowledge about and experience with such apps.<sup>36,86</sup> Interestingly, 14 out of 34 (retrieved on December 23, 2022) approved medical apps address the management of mental health

problems and some of them are even tailored at young adults.<sup>87</sup> However, the lack of information on dMHSs seems to have led to a lack of awareness of these offers until today. Accordingly, results of a recent survey by the Fraunhofer Center for International Management and Knowledge Economy IMW showed that even practicing HCPs seem to have low digital health literacy, potentially explaining low uptake rates.<sup>41</sup> At the same time, knowledge about dMHSs was perceived as important by interviewees both for personal needs as well as in preparation for their role as HCPs. Again, this highlights the need for structured education programs.<sup>17</sup> Additionally, interviewed students outlined the importance of proactive and preventive information provision because they often experience stress from the beginning of their studies, which is also in line with prior research.<sup>43,47,88–90</sup>

As possible sources regarding information provision on dMHSs for medical and psychology students, their university, HCPs and health insurances, personal internet search, family and friends, employers as well as other sources such as federal ministries or TV advertisement were mentioned. In accordance with other studies, participants sometimes preferred to talk to friends or relatives instead of consulting HCPs because they feared stigmatization and embarrassment.<sup>34,46,47,50</sup> However, interviewees favored to be informed by their universities on dMHSs because they wished for a source that can give clear recommendations and guidance for the selection of evidence-based dMHSs. This is in line with previous research outlining that users often feel overwhelmed by the large amount of mental health apps on the market.<sup>91</sup> Similar to the results of Dederichs et al.,<sup>62</sup> students appear to be more willing to use dMHSs recommended and provided by their universities. Regehr et al.<sup>92</sup> also see the duty to inform about mental health services on the part of the universities. Due to significant levels of stress in students, they concluded that universities must employ preventative interventions to reach more students. Generally, there seems to be a lack of knowledge of existing support structures available at universities, even though some efforts have already been made by universities to alleviate mental health problems in students. For instance, there is an increasing number of services offered by student services centers at German universities, which could provide help. However, in accordance with our results, they do not seem to reach students in need.<sup>79,93</sup> Confirmatory, Liu et al.<sup>94</sup> also concluded that universities need to make more effort to develop strategies to inform those students about the prevention, detection and treatment of students’ mental health problems. However, the lack of a clear allocation of responsibilities regarding the management of these strategies on dMHSs for students’ mental health might still be a potential barrier. It needs to be discussed who is in charge of informing students in order to increase the awareness of

the low-threshold, flexible and anonymous services for individuals who fear stigmatization. Our results show that especially for medical and psychology students, the student representatives, the student services center, student working groups or the deanship are regarded as possible information sources.

Regarding preferred ways of how to receive information on dMHSs as potential users, interviewed students mentioned print media, such as flyers, brochures, or scientific literature from the university library, as well as several digital media channels, such as social media (e.g. Facebook or Instagram), websites, and newsletters. Even though social media has been used to survey and educate hard-to-reach populations, such as medical students,<sup>95,96</sup> to our knowledge there has been no study on how social media campaigns might influence the uptake of dMHSs among students. Our results indicate that, for example, targeted Instagram or Spotify formats on dMHSs, including our identified content preferences (e.g. scientific evidence base of dMHSs, developers' background, etc.) to regularly inform student populations, might be a promising tool since the majority of students have social media accounts. Furthermore, our results indicate that a website including all relevant and verified information on dMHSs targeted to the needs of psychology and medical students might be beneficial. The German Digital Health Association (German "Spitzenverband Digitale Gesundheitsversorgung") already hosts a website specifically on medical apps, so a similar tool already exists for practicing HCPs in Germany.

In the university setting, students additionally favored interactive lectures, such as seminars, as information format. Furthermore, students stated that they would prefer the topic of digital health to be an integral part of their study program, either in the form of elective or compulsory subjects. According to Mendes-Santos et al.<sup>97</sup> the absence of such structured education on dMHSs might be one factor inhibiting digital health implementation at the moment. In Germany, some efforts have been made to change this state of the art with the new version of the National Competence Based Catalogues of Learning Objectives for Medical Education (German "NKLM 2.0"). The NKLM 2.0 is a revised qualification framework for medical students that comprehensively prepares students for their everyday work as physicians with many competence-oriented learning objectives. It now also includes digital health literacy as one of the overarching competencies, which will be part of the mandatory core curriculum in medical studies starting in 2025.<sup>98</sup> However, the interviewed participants did not expect that respective courses will be about managing one's own health and educating students about dMHSs for self-management. Our results emphasize that there must be a focus on the aspects of help for self-help if one wishes to meet the needs of psychology and medical students in Germany.

Furthermore, participants gave detailed answers for content preferences regarding information strategies on

dMHSs. Interviewed students wished to be informed about other users' experiences with dMHSs, costs, anonymity and data safety, individualization possibilities, content and structure of dMHSs, their scientific evidence base and scope of application, emergency possibilities, time requirement of usage as well as possible language selection. Similar facilitators and barriers to the usage of dMHSs were identified in previous studies.<sup>62,99–101</sup> In accordance with Dederichs et al.,<sup>62</sup> information on costs of dMHSs seemed to be especially important because high costs would hinder usage. While Apolinário-Hagen et al.<sup>68</sup> found no meaningful influence of testimonials on attitudes toward dMHSs, recommendations and reviews by other groups such as users or HCPs were also perceived as essential for information strategies on dMHSs by participants. Those testimonials seemed to be more convincing if they were written in more detail and included strategies to promote the sources' similarity to the recipients, their expertise and credibility.<sup>102,103</sup> Interestingly, many interviewed students mentioned that they would appreciate information on the professional background of those who developed dMHSs, which does not seem to have been of special importance in previous research. As we interviewed future HCPs, they might potentially put a stronger emphasis on this aspect because knowing who developed such dMHSs (e.g. other psychologists or medical experts) seems to increase integrity. Further research should investigate whether including this information in information strategies on dMHSs specifically targeted at psychology and medical students might have an influence on the uptake.

Regarding questions on how information strategies on dMHSs should be visually and linguistically designed, students had different opinions, but, in general, content and information source seemed to be of greater importance for participants. Some students preferred short videos that explained dMHSs, others favored text passages with respective images or wished for interactive workshops where students can directly test dMHSs. In general, most students preferred short information including some facts about the dMHSs, such as costs and scope of application. Apolinário-Hagen et al.<sup>54</sup> found similar results, showing that there might be a positive association between the provision of general facts about dMHSs and attitudes as well as behavioral intentions to future use of such services. Lastly, some interviewed students preferred scientific language and facts, others favored cheerful, humorous language. In order to design different information strategies on dMHSs that fit the varying needs and preferences, it seems essential to determine the relative importance of each of the identified attributes and to identify segments of medical and psychology students based on their shared preferences. To do so, there are possibilities to use research designs that allow for incremental value of different information components,<sup>60</sup> such as discrete choice experiments (DCEs).



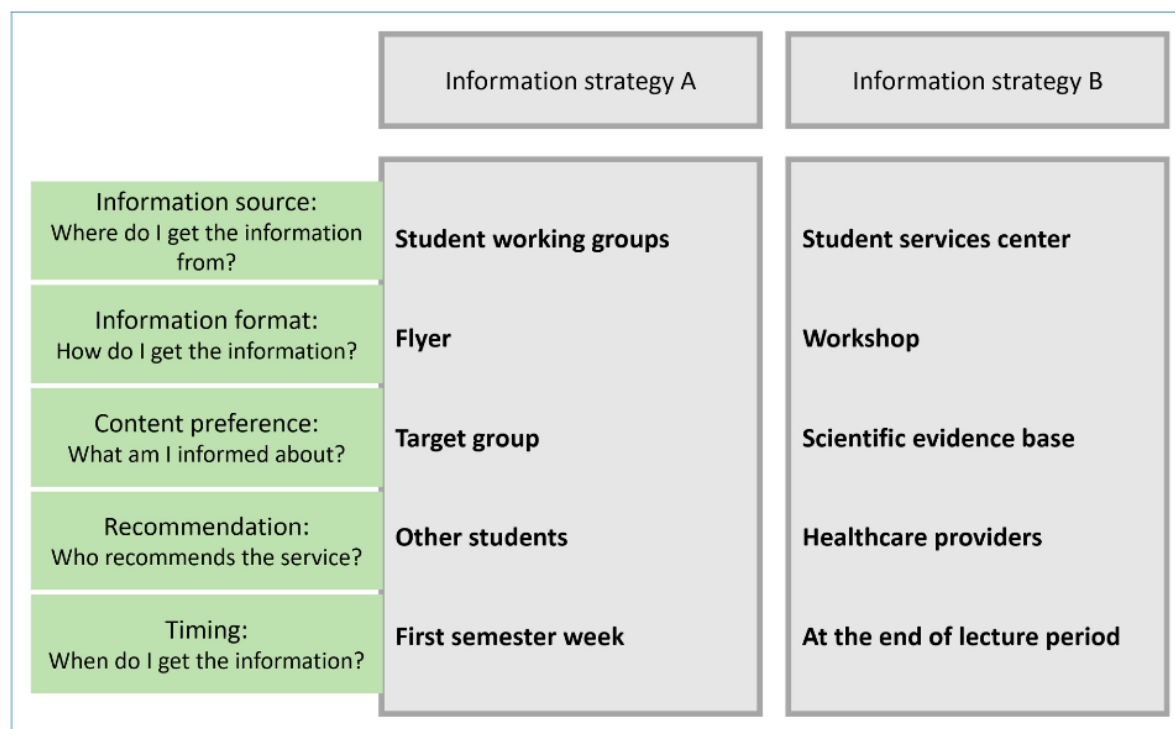
### Limitations

While this study contributed to the understanding of information preferences and needs on dMHSs among future HCPs, it also has some limitations. First, due to anonymity reasons, we did not ask which semester study participants were in. It could be possible that attitudes as well as preferences and needs might change in the course of the studies, considering that students in different years might face different barriers. A further limitation of our study is the potential selection bias in recruiting participants. Possibly, only those students that are interested in digital health might have participated in our study, as we have advertised our study with the question “Interest in e-mental-health?” Thus, the information need for dMHSs might be slightly overrated. Due to the qualitative nature of the study, results are not representative for the entire population of psychology and medical students. Additionally, the results cannot be transferred to other countries, as study programs might differ across nations and the prescription of medical apps in the German health-care system is yet unique worldwide. Furthermore, we recruited significantly fewer psychology students ( $n = 24\%$ ) than medical students. Even though we could not determine differences in needs and preferences between both groups of students, psychology students were under-represented. Psychology students as important future HCPs have barely been included in research on the prevalence of CMDs and even less concerning dMHSs’ preferences, thus future research should take their perspective into account in more detail. Moreover, AKS and PB gave a short introduction on dMHSs in the beginning of each online interview, which might have influenced participants’ answers. However, we tried to consider this bias by remaining as neutral as possible during the online interviews and by asking open questions. Nevertheless, it is possible that we still elicited some bias that we are not aware of. In addition, we did not have the resources to return to our participants to check for the accuracy of our observations (i.e. member checking) and to thereby increase our study’s credibility. Lastly, although qualitative content analysis is a well-suited approach for application in areas where information seems incomplete or not yet attainable through quantitative approaches, it may be possible that individual quotes and opinions lose meaning during formation of categories and subcategories when reducing the data material.<sup>77</sup> A further limitation might be the fact that one coder fully performed the qualitative analysis. However, a second independent coder was involved in the formation of the coding scheme. After completion of the first coding round, the scheme was further reviewed and slightly modified by two other independent coders. All coders then approved the final coding scheme. Coding by one author was therefore perceived to be sufficient.

### Implications for practice and future research

The results give first insights into information strategies on how dMHSs should be designed to meet the preferences and needs of both uninformed and possibly distressed students who will become HCPs. Through AFIs in the form of recipient-targeted information strategies on dMHSs, barriers such as low digital health literacy, information overload or concerns about the efficacy and safety of dMHSs could be overcome.<sup>37</sup> Our results are specifically helpful for, for example, student services centers as they give recommendations on how students in need could be reached and how they could be strategically informed about dMHSs, especially when the treatment demand exceeds their resources.<sup>93,104</sup> For instance, the student council could inform medical and psychology students about dMHSs by designing a social media post (e.g. for Instagram) with a short video explaining data safety, scientific evidence base and application scope of a specific mental health app for exam anxiety, using light blue or green colors. Alternatively, the student services center could send a newsletter with similar information on dMHSs to all students during the freshman week or shortly before the exam periods starts.

Knowing which attributes of information strategies on dMHSs are preferred by medical and psychology students can further help policy makers, mental HCPs as well as product developers to understand why students still hesitate to use dMHSs. Hence, promoting the awareness of dMHSs may be the first step to their adoption based on informed decisions. However, it is still unknown which attributes are most important and how these attribute levels should be combined to constitute effective AFIs. Thus, to increase the implementation of dMHSs and to give clear guidelines, further research mimicking context-sensitive real-world decision scenarios with a representative sample of medical and psychological students is needed.<sup>86</sup> The focus should be on the systematic variations of the identified attribute levels, as exemplified in Figure 2.<sup>59</sup> As students stated that they wished to be informed about the topic by their universities, further research should focus on information strategies implemented in the university setting. To identify which components are preferred by medical and psychology students in comparison to others, Ebert et al.<sup>60</sup> proposed designs that allow incremental value of different intervention components. A DCE format allows for such personalized AFIs entailing a choice between hypothetical information strategies on dMHSs. DCEs offer an empirically grounded methodology to identify important components of information strategies on dMHSs, by modeling the preference strength for a variety of attributes and attribute levels.<sup>74,75</sup> This would make dMHSs information strategies more tangible to participants compared to conventional survey techniques that do not look for possible trade-offs. Our results can be used for the conceptual development of such DCEs.



**Figure 2.** Example of information strategies with varying attribute levels.

## Conclusion

We focused on how medical and psychology students as future HCPs would like to be informed about dMHSs for two main reasons. First, medical and psychology students are potential users of dMHSs since they are confronted with high proportions of stress during their studies. Second, the Digital Healthcare Act in Germany has started to shape the professional routines of future HCPs, which calls for an early acquisition of digital health literacy as they are the gatekeepers for the use of dMHSs. Thus, our aim was to explore their information preferences and needs to design multi-component information strategies on dMHSs as AFIs. We identified various information sources (e.g. university, HCPs), information formats (e.g. newsletter, social media) and content preferences (e.g. reviews, costs) as possible components of such targeted information strategies. Informing medical and psychology students could increase awareness and overcome barriers to the broad dissemination of dMHSs such as skepticism and information overload. Future research should focus on the systematic variations of these components, for instance in a DCE.

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## **2.2 Acceptance of e-mental health services for different application purposes among psychotherapists in clinical training in Germany and Switzerland: Secondary analysis of a cross-sectional survey**





# Acceptance of E-Mental Health Services for Different Application Purposes Among Psychotherapists in Clinical Training in Germany and Switzerland: Secondary Analysis of a Cross-Sectional Survey

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**Background:** Despite solid evidence supporting the efficacy of electronic mental health (EMH) services, their acceptance among psychotherapists is limited and uptake rates remain low. However, the acceptance of different EMH services has yet barely been examined in future generations of psychotherapists in a differentiated manner. The aims of this study were (1) to elaborate the intention to use various EMH services for different application purposes and (2) to determine predictors of EMH service acceptance among psychotherapists in clinical training (PIT).

**Materials and Methods:** Our paper is based on a secondary data analysis of a cross-sectional survey. Respondents were recruited via recognized educational institutions for psychotherapy within Germany and the German-speaking part of Switzerland between June and July of 2020. The survey contained items on the intention to use different EMH services (i.e., guided and unguided programs, virtual reality, psychotherapy by telephone and videoconference) for various application purposes (i.e., prevention, treatment addition, treatment substitute, aftercare). Potential predictors of EMH service acceptance (e.g., barriers and advantages) were examined based on an extension of the Unified Theory of Acceptance and Use of Technology (UTAUT).

**Results:** Most of the  $n = 216$  respondents were female (88.4%) and located in Germany (72.2%). General acceptance of EMH was moderate ( $M = 3.4$ ,  $SD = 1.12$ , range 1–5), while acceptance of psychotherapy via videoconference was highest ( $M = 3.7$ ,  $SD = 1.15$ ) and acceptance of unguided programs was lowest ( $M = 2.55$ ,  $SD = 1.14$ ). There was an interaction effect of EMH service and application purpose ( $\eta^2 = 0.21$ ). Barriers and advantages both had a uniform influence on EMH service acceptance ( $Pr > 0.999$ ), while impersonality, legal concerns, concerns about therapeutic alliance,

simplified information provision, simplified contact maintenance, time flexibility, and geographic flexibility were significant predictors (all  $p < 0.05$ ). Results showed that the extended UTAUT model was the best fitting model to predict EMH service acceptance ( $Pr > 0.999$ ).

**Conclusions:** The intention to use different EMH services varied between application purposes among PiT. To increase acceptance of EMH services and reduce misconceptions, we identified predictors that should be addressed in future acceptance-facilitating interventions when educating PiT.

**Keywords:** acceptance, eHealth, eMental health, psychotherapists, telemedicine, unified theory of acceptance and use of technology

## INTRODUCTION

During the ongoing COVID-19 pandemic, common mental health disorders (CMDs) such as depression, post-traumatic stress disorder (PTSD) or anxiety disorders increased tremendously across the globe (1–4). High prevalence rates for CMDs can oftentimes be linked to perceived uncertainty, fear and social isolation measures that come along with this global health crisis (5–7). To offer quick, safe and location-independent help, the World Health Organization (8) has recommended to ensure access to psychosocial support services through digital systems. Consequently, the need for easily accessible, effective and flexible services as alternatives or additions to traditional mental health treatment to support vulnerable populations became even more evident during the COVID-19 pandemic (9).

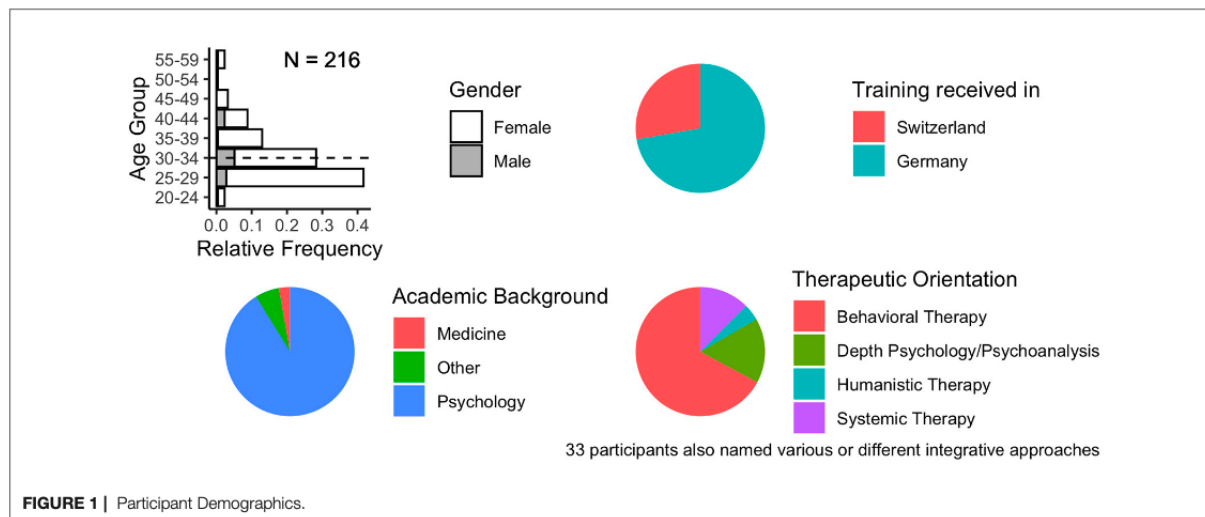
Electronic mental health (EMH) services are usually internet-delivered services that have proven to be effective in trials on the prevention and treatment of CMDs (10–13), for instance in reducing symptoms of PTSD (14), anxiety (13, 15), depression (16), panic disorder and social anxiety disorder (17). EMH services have been advancing into routine care in developed countries even before the outbreak of the COVID-19 pandemic, as they can complement and improve health care systems (10). Principally, EMH interventions have several advantages over face-to-face interventions such as time flexibility and greater accessibility because they are location-independent and thereby could conquer structural barriers (18, 19). Additionally, EMH services offer a low-threshold, anonymous option for individuals who are afraid of stigmatization (19). Other drivers include perceived acceleration of the treatment process and outcome, simplified contact maintenance (20), improved adherence, health literacy and disease management (21).

Despite these advantages and well documented efficacy of EMH interventions (22–24) the dissemination remains low in many countries at an earlier stage of digital health implementation into healthcare such as Switzerland or Germany (25–27). Efficient implementation of EMH services depends on the utilization and acceptance by potential users and health experts. According to the Unified Theory of Acceptance and Use of Technology (UTAUT), acceptance can be operationalized as the intention to use technology and serves as a direct predictor of the actual usage (9, 28). Thus, low uptake rates

can be explained by EMH acceptance being low to moderate among patients (25, 29–31) and health professionals (32, 33). The UTAUT model emerged from eight different acceptance models and was initially developed for the work context (28), but has been successfully validated and adapted to digital health care (9). It is the most frequently used model providing a theoretical framework for potential factors that predict acceptance, including performance expectancy, effort expectancy about the ease to use technical services, social influence by stakeholders and facilitating conditions, as e.g., the extent to which organizational and technical structures support the use of services (34). Performance expectancy is supposed to be the strongest predictor (9), representing beliefs of relative advantage or usefulness of the technical service. Beyond these well documented UTAUT factors, other predictors of EMH acceptance that have been suggested by research, are personal experience with EMH and electronic health (eHealth) literacy (i.e., the ability to find, evaluate, and utilize internet-based health information) (35, 36), knowledge about EMH services (30, 37) and the perceived evidence base on the effectiveness of EMH services (38).

In general, EMH acceptance seems to be even lower among health professionals such as psychotherapists compared to patients (39, 40). Barriers that are perceived by psychotherapists are diverse, including insufficient information (21) concerns about the technology itself (e.g., data security and privacy), lack of clear ethical guidelines and concerns about relational aspects (20, 37, 41, 42). Additionally, a comprehensive legal and regulatory framework for psychotherapists, along with reimbursement schemes, is often lacking even though awareness at the policy level is increasing (43). As health experts are often the primary source of health information or treatment recommendation (44), they supposedly have a large influence on patients' attitude formation and thus on the implementation of EMH services (35). Hence, research should focus on understanding both acceptability and attitudes as determinants of behavioral intentions to use and actual utilization of health experts as negative attitudes can result in slow dissemination or poorer uptake of EMH services (45, 46).

EMH is an umbrella term that includes a wide range of electronic services (e.g., self-help, psychoeducational information, virtual reality, psychotherapy via videoconference,



counselling, etc.) which are applied for different purposes, such as for prevention or treatment of CMDs (47). About a decade ago, Eichenberg and Ott (44) could show that most EMH services were used for treatment (71%), 19.1% for prevention and only 9% for rehabilitation purposes. Meanwhile, digital health applications (medical apps) for mental health such as selfapy (48), velibra (49) or deprexis (50) have been integrated into routine care in Germany in fall 2020 and are now used along the entire patient journey (51). Medical apps are guided or unguided programs which are self-directed mobile phone- or web-based programs that entail information and a fixed number of modules or exercises for (mental) health problems (12, 48, 50). Oftentimes, the basis of guided medical apps is internet-based cognitive behavioral therapy (iCBT) which involves the user following a written electronic treatment program, together with receiving synchronous or asynchronous support from a therapist via e-mail, texts or calls (52). This therapeutic approach has been shown to be effective in reducing anxiety disorders (53), depressive symptoms (23), suicidal ideation (54) or insomnia (55). In Germany, medical apps can be prescribed by physicians for self-help purposes, aftercare or relapse prevention (38, 56). In Switzerland, medical apps are similarly used, expanding their traditional health care system (57). For self-help purposes, unguided programs are most often used as they offer a possibility to monitor and better understand perceived symptoms and help users to take actions on their own to improve their mental health (12). For aftercare and rehabilitation purposes, professionally guided programs have been predominantly implemented, with health experts supporting clients in health promotion by providing some sort of synchronous or asynchronous interaction or feedback in addition to unguided services (12). Nevertheless, reducing EMH to medical apps would fall short as there are several more ways to use EMH. For instance, there is psychotherapy via videoconference or telephone which is most often used as an alternative treatment delivery service, either

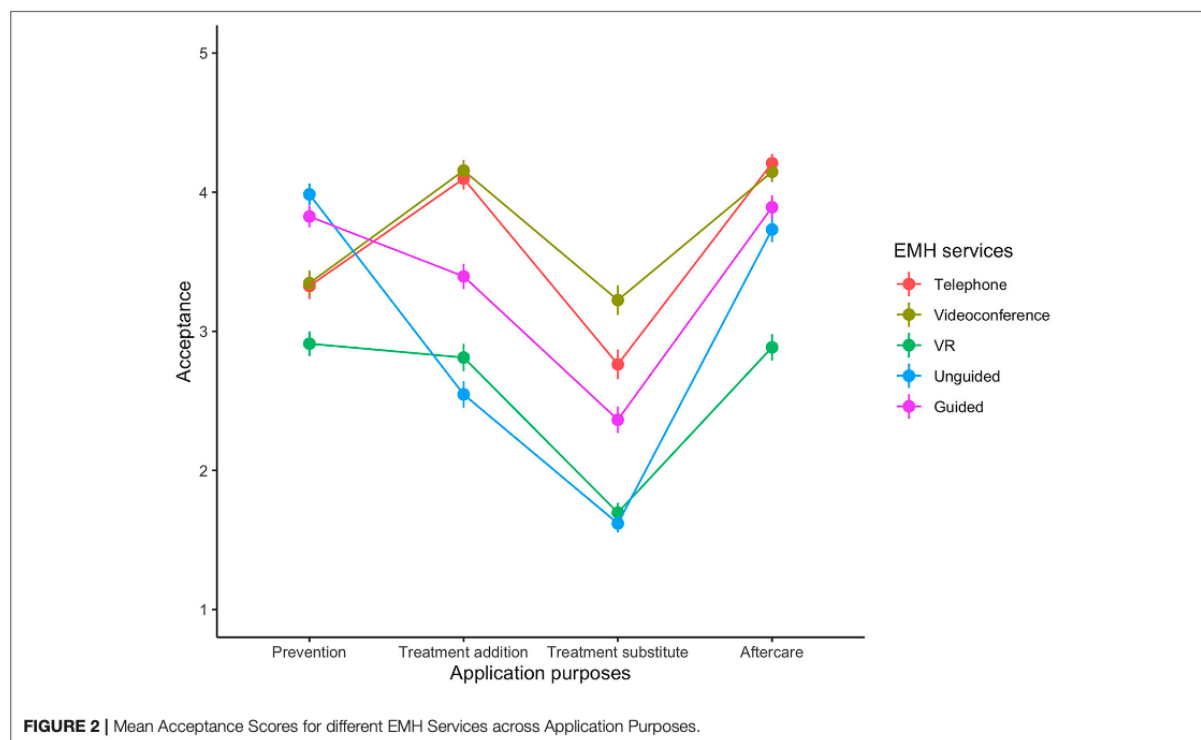
**TABLE 1 |** Means and standard deviations of EMH service acceptance.

	<i>M</i>	<i>SD</i>
Acceptance of psychotherapy via telephone	3.36	1.21
Acceptance of psychotherapy via videoconference	3.7	1.15
Acceptance of VR treatment	2.7	1.1
Acceptance of unguided programs	2.55	1.14
Acceptance of guided programs	2.88	1.14
General acceptance of EMH	3.4	1.12

as an addition to or substitute for face-to-face-therapy (58). It has been shown to be an effective and timely treatment option for depression and anxiety disorders, especially for patients living in rural areas (58). However, the evidence base of the efficacy of psychotherapy via videoconference or telephone is still scarce and researchers have only started to investigate the efficacy of this EMH service with the outbreak of the COVID-19 pandemic (59–61). Virtual reality (VR) is another EMH service that has been used for diagnostic purposes (62), for prevention (63), and the treatment of a range of CMDs in clinical settings (62, 64). For instance, VR therapy has been shown to be a valuable treatment for social anxiety (65), panic disorder (66) or PTSD (67).

Clearly, EMH services are characterized by great heterogeneity of applied methods, target groups, desired objectives and scientific evidence (68). However, EMH acceptance has yet barely been examined in a differentiated manner with regard to specific areas of application. Thus, general conclusions about EMH acceptance fall short. Instead, it is necessary to assess the intention to use various EMH services for different application purposes to get an extensive picture. Therefore, the research aim of this study was (1) to directly compare the acceptance of psychotherapy via telephone,





psychotherapy via videoconference, VR, unguided and guided programs among psychotherapists in clinical training (PiT) for different application purposes, including prevention, treatment substitute and treatment addition in acute care as well as aftercare. Additionally, factors that potentially predict EMH acceptance have most often been assessed in general and not for distinct EMH services. Thus, another aim of this study was (2) to apply an extended UTAUT model to exploit which predictors best determine EMH service acceptance. We chose PiT as our study population because they will shape the future healthcare system. In Germany and Switzerland, PiT already hold a university degree in either psychology or medicine and are now in their postgraduate clinical training which is required to obtain the state-approved permission to practice psychotherapy. Even though the advancing digital transformation of healthcare has already started to shape the professional routines and careers of PiT, their perspective has rarely been included in research.

## MATERIALS AND METHODS

### Study Design

This is an exploratory secondary analysis based on data derived from a cross-sectional survey-study that was carried out by a research team of the University of Zurich in summer 2020. For the primary analysis the acceptance and perceived barriers of EMH were calculated as an average of five different

EMH services (psychotherapy via telephone, psychotherapy via videoconference, VR, unguided and guided programs) among PiT. The current acceptance scores of EMH services were compared to pre-COVID-19 acceptance scores, which were assessed retrospectively. Results will be reported elsewhere in full length<sup>1</sup>. Participants were recruited between June and July of 2020 via recognized educational institutions for psychotherapy within Germany and the German-speaking part of Switzerland. Recruitment was administered solely via e-mail, asking the post-gradual educational institutions to forward the link to the survey to PiT. Thereby, PiT were directed to the survey, which was conducted online and completely anonymous. The survey contained 50 questions and mean processing time was 19.1 min ( $SD = 5.9$ ). As an incentive, participants could take part in a raffle of book vouchers worth 50 euros. Institutions were contacted again if they did not answer the request after 2 weeks. In total, 29 institutions in Switzerland and 232 institutions in Germany were contacted. Since only a few institutions gave feedback on forwarding the questionnaire, no statement can be made about the response rate on an institutional level. In total, the questionnaire was opened 692 times, with 228 PiT completing the survey which results in a dropout rate of 68.7 %. We could not control for multiple clicking, thus the dropout rate might appear higher than it actually is 0.12 participants

<sup>1</sup>Staeck, R., Drüge, M., Albisser, S., and Watzke, B. (submitted). Acceptance of E-mental health interventions and its determinants among psychotherapists-in-training during the first phase of COVID-19.

were excluded from analyses as they had not started the practical part of their postgraduate clinical training yet. After written consultation with the President of the Ethics Committee of the University of Zurich on 3 March 2020 and the checklist to self assess ethical safety, no further approval of the ethics committee was necessary to guarantee the ethical safety of the study.

## Measures

### Sociodemographic Characteristics

The survey contained items on sociodemographic data covering age categorized in eight subgroups (20–24 to 55–59, each category including 5 years) to preserve anonymity of respondents, sex, education, country of education (Switzerland or Germany) and theoretical orientation (i.e., behavioral therapy, depth psychology or psychoanalysis, systemic therapy, humanistic therapy). Following sociodemographic questions, the survey continued with a definition of EMH (47) and each EMH service (68).

### Primary Outcome

Acceptance was operationalized according to UTAUT (28). Consequently, acceptance was assessed using three items: “I could imagine including the following EMH services in my work”, “I intend to try out the following EMH service in my work within the next year”, and “How high is your intention to use the following EMH service in your work ever?”. The first two items were rated on a 5-point Likert scale ranging from (1) *totally disagree* to (5) *totally agree*. The third item was rated on a scale ranging from 0 to 100 and adapted from Elfeddali et al. (69) to measure the intention strength. For statistical analyses, the third item was converted into a 5-point Likert scale and a mean score of all three items was calculated for EMH acceptance.

### Secondary Outcomes

Acceptance of different EMH services for various application fields was operationalized as the intention to use psychotherapy via telephone, psychotherapy via videoconference, VR and unguided as well as guided programs for prevention, therapy substitute in acute care, therapy addition in acute care and aftercare (e.g., “Which EMH services would you use for prevention?”). All items were rated on 5-point Likert scales ranging from (1) *totally disagree* to (5) *totally agree*, with higher scores indicating elevated acceptance. The UTAUT predictors performance expectancy (e.g., “The following EMH service would be a useful extension to existing treatment measures”), effort expectancy (e.g., “I would find the following EMH service easy to use and to understand”), social influence (e.g., “My colleagues would approve the use of the following EMH service”) and facilitating conditions (e.g., “I have the necessary preconditions for using the following EMH service”) were measured each with two items that were partly adapted from previous studies (28, 33). Answers were rated on a 5-point Likert scale ranging from (1) *totally disagree* to (5) *totally agree*. Barriers (i.e., data insecurity, impersonality, irresponsibility, legal concerns, concerns about therapeutic alliance) and advantages (i.e., time flexibility, simplified information provision, geographic

**TABLE 2 |** V-statistics of EMH service acceptance for different application purposes.

	V	p
Prevention—psychotherapy via telephone	10,323.000	<b>&lt;0.001</b>
Prevention—psychotherapy via videoconference	10,859.000	<b>&lt;0.001</b>
Prevention—VR treatment	5,731.500	0.870
Prevention—Unguided EMH programs	13,156.500	<b>&lt;0.001</b>
Prevention—Guided EMH programs	11,408.500	<b>&lt;0.001</b>
Treatment addition—psychotherapy via telephone	16,788.000	<b>&lt;0.001</b>
Treatment addition—psychotherapy via videoconference	18,368.500	<b>&lt;0.001</b>
Treatment addition—VR treatment	5,649.500	0.962
Treatment addition—unguided EMH programs	3,791.500	1.000
Treatment addition—guided EMH programs	8,176.500	<b>&lt;0.001</b>
Treatment substitute—psychotherapy via telephone	7,089.000	0.991
Treatment substitute—psychotherapy via videoconference	10,608.000	0.084
Treatment substitute—VR treatment	1,059.500	1.000
Treatment substitute—unguided EMH programs	441.000	1.000
Treatment substitute—guided EMH programs	3,050.000	1.000
Aftercare—psychotherapy via telephone	19,372.000	<b>&lt;0.001</b>
Aftercare—psychotherapy via videoconference	18,352.000	<b>&lt;0.001</b>
Aftercare—VR treatment	5,176.500	0.958
Aftercare—unguided EMH programs	12,061.000	<b>&lt;0.001</b>
Aftercare—guided EMH programs	12,968.000	<b>&lt;0.001</b>

Wilcoxon signed-rank test.

For all tests, the alternative hypothesis specifies that the median is >3.

Values indicated in bold are significant.

flexibility, and simplified contact maintenance) were assessed as other possible predictors of acceptance and also based on previous studies (70–73). Additionally, the survey included three items on the knowledge about EMH services that were adapted from Hennemann et al. and Ebert et al. (e.g., “I know what I can expect when using virtual reality as a therapeutic tool”) (28, 33). Answers were rated on a 5-point scale ranging from (1) *totally disagree* to (5) *totally agree*. The item on EMH experience in their role as healthcare provider (e.g., “In percentage, how much do you already use the following EMH services in your therapeutic work?”) was adapted from previous studies (33). The item on evidence assessment of EMH services (e.g., “How would you rate the scientific evidence base of the following EMH services?”) was self-constructed. All items that we used for our analyses can be found in the **Supplementary Materials**, including the English translation.

## Statistics

Data were analyzed using IBM SPSS Statistics 26 and R (Version 4.0.0). To answer the question whether the acceptance of EMH services varies between application purposes, we used as a statistical model a 2-factor within-subject (repeated measure) ANOVA with the factors EMH services (five steps: psychotherapy via telephone, psychotherapy via videoconference, VR treatment, unguided programs, guided programs) and application purposes (four steps: prevention, treatment substitute, treatment addition, aftercare)

**TABLE 3 |** Estimates of barriers to the acceptance of EMH services.

Predictors	EMH service acceptance	
	Estimates	p
Constant	4.93 (0.14)	<b>&lt;0.001</b>
EMH service: videoconference	0.17 (0.08)	<b>0.043</b>
EMH service: VR treatment	−0.43 (0.08)	<b>&lt;0.001</b>
EMH service: unguided	−0.22 (0.09)	<b>0.010</b>
EMH service: guided	−0.28 (0.08)	<b>0.001</b>
Data Insecurity	−0.03 (0.03)	0.308
Impersonality	−0.24 (0.03)	<b>&lt;0.001</b>
Irresponsibility	−0.05 (0.03)	0.150
Legal Concerns	−0.07 (0.03)	<b>0.027</b>
Concerns about Therapeutic Alliance	−0.16 (0.04)	<b>&lt;0.001</b>

N CASE 209.

Observations 991.

Marginal R<sup>2</sup> / Conditional R<sup>2</sup> 0.298 / 0.557.

Values indicated in bold are significant.

**TABLE 4 |** Estimates of drivers to the acceptance of EMH services.

Predictors	EMH service acceptance	
	Estimates	p
Constant	0.96 (0.17)	<b>&lt;0.001</b>
EMH service: videoconference	0.26 (0.08)	<b>0.001</b>
EMH service: VR treatment	−0.51 (0.10)	<b>&lt;0.001</b>
EMH service: unguided	−0.77 (0.09)	<b>&lt;0.001</b>
EMH service: guided	−0.69 (0.09)	<b>&lt;0.001</b>
Simplified information provision	0.27 (0.03)	<b>&lt;0.001</b>
Time flexibility	0.14 (0.03)	<b>&lt;0.001</b>
Geographic flexibility	0.09 (0.04)	<b>0.012</b>
Simplified contact maintenance	0.18 (0.03)	<b>&lt;0.001</b>

N CASE 209.

Observations 991.

Marginal R<sup>2</sup> / conditional R<sup>2</sup> 0.361 / 0.578.

Values indicated in bold are significant.

and EMH acceptance as dependent variable. The model included both main effects (EMH services and application purposes), as well as their interaction (EMH services x application purposes).

To identify how different barriers to the acceptance of EMH services might differentially affect EMH service types, we adopted a two-step approach. First, we identified an appropriate model of the relation of the barriers to the different EMH services in terms of general acceptance. Specifically, we considered three candidate linear mixed-effects models in our model set. All models included a main effect of EMH service type and a random subject intercept. The random subject intercept was included as acceptance was assessed multiple times, that is once per EMH service for each participant (i.e., as a repeated measure). This is a standard procedure to account for within-subject correlation of measures (e.g., see (74), p. 29). The first model (A1) additionally included a main effect of all five barriers each (data insecurity, impersonality, irresponsibility, legal concerns, concerns about therapeutic alliance), as well as pair-wise interaction terms of each barrier and EMH service type. Hence, this model represented a differential relationship of barriers to EMH service acceptance depending on the type of service. The second model (A2) dropped the interaction terms, hence representing a uniform influence of the barriers on EMH acceptance. The third model (A3) dropped the main effect terms of the five barriers, representing no influence of the barriers on EMH acceptance. Our criterion of model comparison was based on Akaike Information criterion (AIC) weights (75), which express the probability that a model is the best in the model set conditional on the data. Second, we inspected the regression coefficients of the best fitting model specifically for the five barriers to gain insights on which barriers had a significant influence on EMH acceptance.

We followed an equivalent procedure to better understand the influence of advantages of EMH services. Again, we firstly

identified an appropriate descriptive model, considering three candidate linear mixed-effects models in our model set. All models included a main effect of EMH service type and a random subject intercept. The first model (B1) additionally included a main effect of all four advantages each (simplified information provision, time flexibility, geographic flexibility, simplified contact maintenance), as well as pair-wise interaction terms of each advantage and EMH service type. Hence, this model represented that the relationship of advantages to EMH service acceptance depended on the type of service. The second model (B2) dropped the interaction terms, hence representing a uniform influence of the advantages on EMH acceptance. The third model (B3) dropped the main effect terms of the four advantages, representing no influence of the advantages on EMH acceptance. Again, we inspected the regression coefficients of our best fitting model specifically for the four advantages, to gain insights on which of them had a significant influence on EMH acceptance.

Lastly, we aimed to put the different pieces of our data modelling together within the UTAUT framework. Specifically, we wanted to test if adding possible influences of barriers and advantages (depending on the analyses above) presented a meaningful extension to the classic UTAUT predictors and simple comparison model featuring only demographic predictors (age, gender). All models included a main effect of EMH service type, age, gender, and a random subject intercept. In addition, model C1 included the UTAUT predictors (performance expectancy, effort expectancy, social influence, and facilitating conditions), the barriers and advantages, as well as knowledge about, experience with and subjective assessment of the scientific evidence base of different EMH services as they have been shown to have an influence on EMH acceptance. Model C2 only additionally included the UTAUT predictors, while model C3 did not include additional predictors. Again, our criterion of model comparison was based on Akaike Information criterion (AIC) weights.



**TABLE 5 |** Estimates of EMH service acceptance determinants (advanced UTAUT model).

Predictors	EMH service acceptance	
	Estimates	p
Constant	0.29 (0.36)	0.414
Age: 25–29	−0.19 (0.25)	0.449
Age: 30–34	−0.15 (0.25)	0.563
Age: 35–39	−0.11 (0.27)	0.672
Age: 40–44	−0.08 (0.28)	0.770
Age: 45–49	−0.17 (0.32)	0.603
Age: 50–54	−0.47 (0.60)	0.428
Age: 55–59	−0.10 (0.35)	0.785
Gender: male	−0.16 (0.12)	0.189
EMH service: videoconference	−0.02 (0.07)	0.808
EMH service: VR treatment	−0.20 (0.10)	0.059
EMH service: unguided	−0.06 (0.09)	0.521
EMH service: guided	−0.25 (0.09)	<b>0.004</b>
Experience with EMH services	0.01 (0.00)	<b>&lt;0.001</b>
Knowledge about EMH services	0.04 (0.03)	0.181
Evidence assessment of EMH services	0.01 (0.00)	<b>&lt;0.001</b>
Data Insecurity	0.01 (0.02)	0.733
Impersonality	−0.06 (0.03)	<b>0.038</b>
Irresponsibility	−0.01 (0.03)	0.655
Legal concerns	−0.00 (0.02)	0.851
Concerns about therapeutic alliance	−0.10 (0.03)	<b>&lt;0.001</b>
Simplified information provision	0.09 (0.02)	<b>&lt;0.001</b>
Time flexibility	0.07 (0.03)	<b>0.005</b>
Geographic flexibility	−0.02 (0.03)	0.432
Simplified contact maintenance	0.07 (0.03)	<b>0.009</b>
UTAUT: performance expectancy	0.36 (0.04)	<b>&lt;0.001</b>
UTAUT: social influence	0.19 (0.04)	<b>&lt;0.001</b>
UTAUT: facilitating conditions	0.01 (0.03)	0.654
UTAUT: effort expectancy	0.08 (0.04)	0.078

N CASE 209.

Observations 991.

Marginal R<sup>2</sup> / conditional R<sup>2</sup> 0.584 / 0.738.

Values indicated in bold are significant.

## RESULTS

### Sociodemographic Characteristics

**Figure 1** provides a summary of key sociodemographic characteristics. The sample size was  $n = 216$  participants, with  $n = 60$  participants who trained in Switzerland (27.8%) and  $n = 156$  in Germany (72.2%). Most of them were female (88.4%) and between 25 and 39 years old (85.2%).  $N = 197$  respondents studied psychology (91.2%) and  $n = 6$  medicine (2.8%) before starting with their clinical training to become a psychotherapist and  $n = 13$  indicated completing other degrees (6%). Regarding the theoretical orientation, 67.1% stated that they are trained in behavioral therapy (cognitive/cognitive-behavioral), 16.2% in depth psychology or psychoanalysis, 12.5% in systemic therapy, and 4.2% in humanistic therapy.  $N = 33$  participants named various or different integrative approaches (15.3%).

### Acceptance of EMH

Based on prior research (33, 70) the mean score of EMH acceptance was categorized as low (1–2.34), moderate (2.35–3.67), or high (3.68–5). In general, results revealed that acceptance of EMH was moderate ( $M = 3.4$ ,  $SD = 1.12$ ), while acceptance of psychotherapy via videoconference was highest ( $M = 3.7$ ,  $SD = 1.15$ ) and acceptance of unguided programs was lowest ( $M = 2.55$ ,  $SD = 1.14$ ). **Table 1** gives an overview.

Among respondents, general perceived personal knowledge about EMH was moderate ( $M = 3.64$ ,  $SD = 0.86$ ), while psychotherapy via videoconference was most well-known ( $M = 4.34$ ,  $SD = 0.72$ ). Practical experience with EMH was generally low, as participants stated using EMH services in only one out of ten therapeutic cases ( $M = 10.37$ ,  $SD = 10$ , range 0–100%) between the onset of the COVID-19 pandemic and the time of data collection (June–July 2021). However, there were considerable differences between EMH services and high variance scores within psychotherapy via telephone and videoconference. Psychotherapy via videoconference ( $M = 26.55$ ,  $SD = 28.80$ ) and via telephone ( $M = 23.05$ ,  $SD = 25.07$ ) was used in about one out of four therapeutic cases. Participants indicated serving only  $M = 1.34\%$  ( $SD = 2.2$ ) of their patients with VR. Lastly, PiT recommended unguided EMH programs to only  $M = 3.38\%$  ( $SD = 10.50$ ) of their patients, while they stated that they have accompanied  $M = 4.19\%$  ( $SD = 12.95$ ) of their patients with guided programs.

### Acceptance of EMH Services for Different Application Purposes

**Figure 2** provides an overview of the key results. Mauchly tests for sphericity revealed relevant violations (all  $p < 0.001$ ) wherefore we report Greenhouse-Geisser corrected statistics. Our results confirmed the expected heterogeneity in the acceptance of different types of EMH services depending on their intended application purpose. Specifically, we found an interaction effect of EMH service and application purpose ( $F(6.229, 1283.088) = 111.497$ ,  $p < 0.001$ ,  $\eta^2 = 0.21$ ). Post-hoc tests showed that, on average, over all application purposes, psychotherapy via videoconference was the most accepted EMH service (all  $p_{\text{bonferroni}} < 0.001$ ). Further, EMH services were comparatively less accepted as a treatment substitute in acute care than for other application purposes (all  $p_{\text{bonferroni}} < 0.001$ ). Interestingly, unguided and guided programs were specifically well accepted in preventive care (more so than all other services, all  $p_{\text{bonferroni}} < 0.059$ ). VR was comparatively less accepted across all application purposes (all  $p_{\text{bonferroni}} < 0.001$ ).

Beyond comparative statements, we used one-sample, one-sided Wilcoxon signed-rank tests against test value of 3 (neutral) to test which EMH services for which application purposes were seen as a valuable addition to the therapy catalogue on absolute scale. This was the case in 11 of 20 combinations. Specifically, results show that EMH services, except VR, are seen as useful for prevention and aftercare whereas they are not accepted as treatment substitution. **Table 2** summarizes the results.

## Determinants of EMH Service Acceptance

### Influence of Barriers on the Acceptance of EMH Services

To identify how different barriers to the acceptance of EMH services might differentially affect EMH service types, we considered three candidate linear mixed-effects models in our model set. All models included a main effect of EMH service type and a random subject intercept. The first model (A1) additionally included a main effect of all five barriers each, as well as pair-wise interaction terms of each barrier and EMH service type. The second model (A2) represented a uniform influence of the barriers on EMH acceptance, while the third model (A3) represented no influence of the barriers on general EMH acceptance. Our model comparison unequivocally favored model A2 ( $Pr > 0.999$ ), suggesting that barriers had a uniform influence on general EMH acceptance.

An inspection of the regression coefficients of model A2 revealed that impersonality, therapeutic alliance, and legal concerns were significant predictors of EMH service acceptance (in decreasing order of regression weight – predictors were assessed on a common scale; see **Table 3**).

### Influence of Advantages on the Acceptance of EMH Services

An equivalent procedure was followed to better understand the influence of advantages of EMH services. The first model (B1) included a main effect of all four advantages each, as well as pair-wise interaction terms of each advantage and EMH service type. The second model (B2) represented a uniform influence of the advantages on EMH acceptance. The third model (B3) represented no influence of the advantages on EMH acceptance. Similar to our result for the barriers, our model comparison unequivocally favored model B2 ( $Pr > 0.999$ ), suggesting that advantages had a uniform influence on general EMH acceptance.

Inspecting the regression coefficients of Model B2, we found that all four, that is simplified information provision, simplified contact maintenance, time flexibility, and geographic flexibility were significant predictors of EMH service acceptance (in decreasing order of regression weight; see **Table 4**).

### Advanced UTAUT Model

Lastly, we wanted to test if adding the uniform influences of barriers and advantages (as suggested by the analyses above) presented a meaningful extension to the classic UTAUT predictors and a simple comparison model. Our results confirmed that the extended UTAUT model (C1) which included the UTAUT predictors, the barriers and advantages, as well as knowledge about, experience with and subjective assessment of the scientific evidence base of different EMH services was the best given the model set and the data ( $Pr > 0.999$ ), explaining 74% of variance. **Table 5** shows the regression coefficients, while **Figure 3** visualizes the predictive performance of model C1.

## DISCUSSION

The present study aimed at exploring the acceptance of various EMH services among German-speaking PiT shortly after the

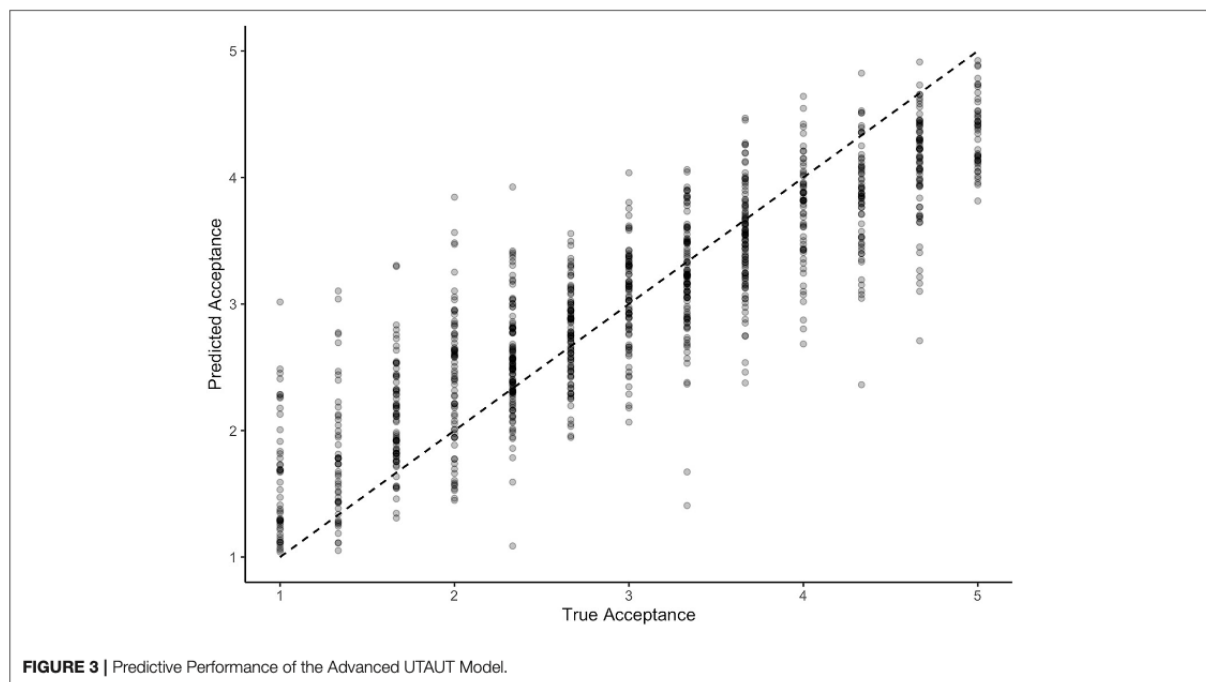
global outbreak of the COVID-19 pandemic that has forced changes in the provision of psychological support around the world for the prevention, treatment and aftercare of CMDs.

Accordingly, there was an urgent need for valid and flexible EMH services as alternatives or additions to traditional mental health in-person measures in spring 2020. In our paper, we primarily focused on the intention to use unguided and guided EMH programs, psychotherapy via telephone, psychotherapy via videoconference and VR treatment as EMH services and prevention, therapy addition, therapy substitute and aftercare as application purposes among PiT during the first wave of the COVID-19 pandemic in Germany and the German-speaking part of Switzerland. Based on an adapted UTAUT model (28, 70), we included performance expectancy, effort expectancy, facilitating conditions and social influence as potential predictors of EMH service acceptance as well as barriers (i.e., data insecurity, impersonality, liability, legal concerns, and concerns about therapeutic alliance), advantages (i.e., time flexibility, simplified information provision, geographic flexibility, and simplified contact maintenance), EMH knowledge, experience with EMH and subjective assessment of the scientific evidence base of different EMH services.

## Main Findings and Comparisons With Prior Work

### Acceptance of EMH Services for Different Application Purposes

First of all, the acceptance of EMH was overall moderate among PiT. In general, acceptance of psychotherapy via videoconference was highest, while acceptance of unguided programs was lowest. This is in line with Gerlinger et al. (38), who could show that healthcare providers are, in principle, receptive to the possibilities of such unguided programs. However, from the healthcare providers' point of view, the preconditions for a successful integration into the healthcare system are not yet fulfilled. Even though a recent survey among the twenty biggest social health insurance companies in Germany shows an upward trend regarding prescription rates of medical apps, numbers are still relatively low with projected 45.000 prescriptions (76). In comparison, according to the Scientific Institute of the National Health Insurance Schemes and the Federal Association of Company Health Insurance Funds (AOK) about 685 million finished medicinal products were prescribed in 2020 (56). Nevertheless, when looking at acceptance rates across different application purposes, our results show that guided and unguided EMH programs were specifically well accepted in preventive care, even more so than all other services including synchronous interactions between the patient and therapist via videoconference or telephone. In fact, prior research has demonstrated that unguided and guided EMH programs such as medical apps are perceived as being helpful for the promotion of patient empowerment by physicians and psychotherapists (38) which has been shown to be related to health status in the general population (77). Concerning prevention and health promotion purposes, there seems to be a greater emphasis on self-help activities (e.g., help for self-help), which could be well supported



by structured self-help programs, such as stress management trainings, mental health apps and early interventions. Moreover, primary prevention does not fall into the therapeutic field and does not require a trained psychotherapist to guide these kinds of nontherapeutic interventions. Additionally, our results show that EMH services, except VR, are also well accepted for aftercare purposes. At least for health experts, our results seem to be in line with prior research. For instance, Hennemann et al. (33) could show that acceptance of online aftercare for work-related stress was moderate among health professionals of various professional groups including physicians and psychologists in inpatient rehabilitation facilities. Similar to preventive care, EMH services seem to be promising tools to overcome barriers to the utilization of traditional aftercare, such as limited local accessibility, temporal incongruity with work and private life, concerns about anonymity or stigmatization (78–80). Thus, to support patients in health promotion and self-efficacy in their rehabilitation process, health experts tend to accept EMH services.

Furthermore, we identified the highest acceptance of psychotherapy using videoconference software for complementary treatment purposes, as well as similarly high acceptance ratings for therapeutic interactions via telephone. In contrast, EMH services were comparatively less accepted as a treatment substitute in acute care than for other application purposes. Particularly, as a treatment substitute psychotherapy via videoconference was accepted most, while all other EMH services were rated relatively low. Potentially, PiT prefer having more visible control of the acute treatment process including

the therapeutic alliance and feel more comfortable with direct synchronous communication, including the interpretation of verbal and nonverbal signals. Interestingly, the evidence base of the effectiveness of psychotherapy via videoconference or telephone is a still a growing research area (60, 61, 81, 82) and there is considerably more evidence on the treatment effectiveness and acceptance of structured EMH self-help programs such as minimally guided iCBT which also forms the basis of some medical apps for mental health (48). From the perspective of potential clients, individuals seem to generally prefer these therapist-guided internet interventions such as iCBT over videoconferencing and unguided internet interventions when they have to choose between different EMH services (25) as well as blended delivery modes combining online or telephone contact with face-to-face psychotherapeutic sessions (83). At least for acute treatment purposes, we found contrasting results for PiT which could be explained with comparatively low practical experience with EMH services and self-reported little knowledge about EMH services. Additionally, within guided EMH programs we did not differentiate between whether oneself as a PiT is guiding the client through the EMH program or another, additional therapist which could be of interest for future research.

Moreover, our results indicate that VR was comparatively less accepted across all application purposes in the sense that VR treatment did not score highest in any purpose. Again, this result can be explained by respondents indicating having almost no experience with VR, while at the same time, having at least modest experience with psychotherapy via videoconference,



which was applied in about one out of four therapeutic cases on average. Lacking knowledge about possible advantages and disadvantages of VR might have resulted in a low willingness for future use as past research has shown a link between usage experience and acceptance (28–30). Additionally, the acceptance of VR may be reduced due to technical requirements and may further depend on its yet restricted application options especially in the context of PTSD and anxiety disorders, such as specific phobia (e.g., exposure to feared stimuli via systematic desensitization).

In line with other research, our results clearly show that EMH acceptance should be assessed distinctly as it varies between EMH services, target groups and application purposes. For instance, research by Apolinário-Hagen et al. (45) revealed that self-help books, health websites and face-to-face counselling were perceived as more useful than web-based counselling and therapies within the general population. Hennemann et al. (33) found limited acceptance of EMH interventions among health professionals of inpatient treatment, while results revealed moderate acceptance of online aftercare for work-related stress. Among licensed psychotherapists in Austria, Schuster et al. (84) could show a preference for blended (face-to-face plus web-based) interventions over web-based interventions to treat CMDs. Varying results from study to study can be linked to distinct study populations, different framing including varying application purposes and other time periods of data assessment. Additionally, a lack of shared terminology limits comparability between studies (85). Furthermore, despite these evident differences, EMH is often still assessed very broadly which leads to less meaningful results. Hence, future research should put emphasis on these differences when assessing acceptance, elicit possible explanations and agree on used terminology.

### Determinants of EMH Service Acceptance

As potential advantages that influence the acceptance of EMH services, we identified simplified information provision, simplified contact maintenance, time flexibility, and geographic flexibility. Concerning perceived barriers, we found that impersonality, legal concerns, and therapeutic alliance were significant predictors of EMH service acceptance. Comparing different predictor models of the intention to use EMH services among PiT, the extended UTAUT model fitted our data best (model C1). Overall, our findings correspond to other research targeting the views and experiences of psychotherapists. Among European psychotherapists having mainly positive experiences with online consultations during the COVID-19 pandemic, De Witte et al. (43) reported several barriers that might hinder implementation, such as data security issues or concerns about relational aspects, for instance impersonality and fostering a therapeutic alliance. In a study by Sander et al. (86), German professionals reported having little experience or knowledge about internet-delivered interventions and the most frequently anticipated barriers were too severe symptoms of patients, the feared neglect of face-to-face contacts and insufficient technical equipment. The most frequently mentioned potential benefits were an optimized treatment structure and patient empowerment. Schuster et al. (84) found similar advantages

of EMH services to be of importance, such as time and geographic flexibility, simplified information provision, patient empowerment but also discretion and the suitability for young patients. To further increase acceptance of and trust in EMH services, Gerlinger et al. (38) emphasize the need for verified evidence on the effectiveness, data security and interoperability of EMH services. Furthermore, the additional workload for health care providers should be transparently available before they use or prescribe EMH services, such as mental health apps.

In summary, EMH acceptance of PiT may be explained according to the UTAUT model when coupled with their perceptions of barriers and drivers as well as their practical experience as healthcare providers with EMH, knowledge about EMH and their perception of the scientific evidence base of EMH services. Even though the UTAUT model has recently been successfully validated and adapted to digital health care (9), our results show that it is necessary to extend this model and adapt it to the context of PiT given the complex nature of EMH acceptance and its determinants. In short, we did not assess all factors that could potentially influence EMH acceptance and focused on those that we perceived as being most important for PiT, knowing that there might still be missing factors that could be relevant. Congruently, Ammenwerth (87) pointed out that technology acceptance depends on multiple factors that have yet been overlooked, such as emotional, socio-organizational, cultural or workflow aspects. Thus, future research is needed to examine additional factors and strongest predictors to gain a deeper understanding of the intention to use different EMH services, while differentiating between target groups. This would help to design acceptance-facilitating interventions (AFIs) to educate PiT about different EMH services concerning applying them for prevention, treatment or aftercare purposes.

### Limitations

While this study contributes to the understanding of the acceptance of different EMH services for various application purposes and its determinants, it also has some limitations that should be considered. First, we must consider the time point of assessment. Data were gathered during the first months of the outbreak of the COVID-19 pandemic which could explain higher acceptance rates compared to older studies (32, 33, 45). The given circumstances have accelerated the use of remote services and forced psychotherapists to rethink about digital alternatives to treat patients. Additionally, the online survey included a description of structural benefits of psychotherapy via telephone or videoconference, especially in extraordinary conditions such as the COVID-19 crisis, which could have positively influenced acceptance scores for these two EMH services. At the same time, general acceptance rates could also be lower compared to newer studies as experience with EMH was still relatively low among respondents and EMH experience has been shown to be positively related to technology acceptance (28, 35, 88). Even if we consider the early stage of implementation of EMH services in Germany and Switzerland (38, 89, 90), healthcare experts have gained experience with digital medicine during the

COVID-19 pandemic, the intention to use EMH services might increase concurrently.

In addition, the gender ratio was not balanced as more female than male psychotherapists in clinical training participated in our study which might have influenced our results. Moreover, the response rate was rather low, as on average less than one respondent per institution completed the survey. Age and gender were no predictors of acceptance in the advanced UTAUT model, which is likely due to the selection bias with few male participants and little variation in age. Female psychotherapists in some European countries like Germany have been shown to be more likely to endorse and provide digital psychotherapy during the first weeks of the COVID-19 outbreak in Europe, especially by those who were more concerned about an infection with COVID-19 (60). However, in our study we did not control for nontherapeutic reasons for providing digital psychotherapy, such as concerns regarding an infection.

Furthermore, the present study only focused on acceptance and fell short in the question of how behavioral intention and actual use behavior might be linked. Even though UTAUT describes behavioral intention as a direct predictor of the actual uptake (28), potential users do not always follow their intentions ("intention-behavior gap", (91)). Thus, we agree with Philippini et al. (9) that future research should focus on the relationship between the intention to use different EMH services and use behavior (92) and investigate whether identified predictors of EMH acceptance could potentially influence actual uptake rates.

Lastly, the operationalization of technology acceptance was slightly different to other studies focusing on acceptance toward digital interventions, thus comparability is limited. Even though we based our assessment of behavioral intention on the frequently used UTAUT, individual adaptations of the UTAUT questionnaire and the number of items can differ between studies. For instance, acceptance is sometimes operationalized with four items (32, 93) or two items (33) that are rated on a 5-point scale ranging from (1) *does not apply at all* to (5) *applies completely*. Apolinário-Hagen et al. (45) only used one item by assessing intentions to use EMH services with an abbreviated version of the procedure applied by Klein and Cook (94), asking participants how likely they would use 10 different conventional and EMH services in case of emotional problems on a 5-point rating scale ranging from (0) *very unlikely* to (4) *very likely*. In our study, we used three items to assess behavioral intentions, including two items that were also used by Hennemann et al. (33) and one item asking psychotherapists in clinical training for their intention to use different EMH services in their work ever (range 0–100) that was adapted from Elfeddali et al. (69) to measure intention strength.

## Practical Implications

To expand the uptake of EMH, there is a need to focus on increasing psychotherapists' acceptance of EMH services as they play a crucial part in patients' attitude formation and thus on the implementation of EMH services (35). Our results

provide evidence of the need to focus on informing prospect psychotherapists about advantages of various EMH services when applied in different contexts such as prevention and aftercare, but also on how potential barriers such as data security or legal concerns could be overcome. Confirmatory, a study by Humer et al. (61) revealed that several psychotherapists in Austria wished for more information on data protection and security. Even before the COVID-19 pandemic, lack of personal contact, data protection and security were already seen as most important disadvantages of online interventions to prevent common mental health disorders by stakeholders such as psychotherapists, policymakers and potential users in Germany, Switzerland, Austria and Spain (95). Thus, these aspects of EMH services should be addressed in training and further education of psychotherapists. Additionally, a clear regulatory framework is needed to reduce legal concerns of psychotherapists. Countries in an earlier stage of digital health implementation into healthcare, such as Switzerland or Germany, could learn from countries that are more advanced in the implementation of EMH services such as the Netherlands or the United Kingdom (27). As a starting point, van Daele et al. (96) have recently formulated an association with the European Federation of Psychologists' Associations (EFPA) general guidelines for mental health workers, health services, regulatory agencies as well as developers to promote the implementation of evidence-based EMH services. The strong need for training and further education also becomes visible in a recent study by De Witte et al. (43), in which participants were asked whether they received any form of training on online consultations about EMH. Results revealed that only 11% of the sample received a form of training, however, only half of these training programs were specific to EMH and lasted just <4 h in every second case. In accordance, Gerlinger et al. (38) indicate that mental health workers do not feel well informed about possible benefits and risks of EMH services, while only few have already gained practical experience with EMH services (97, 98).

To address misconceptions and knowledge gaps through information provision, AFI have been found to be an established tool in educating individuals about novel treatment options such as EMH services and in increasing their acceptance (30, 32, 45, 99). For instance, Baumeister et al. (32) could show that an AFI such as receiving a short video of blended therapy can increase performance expectancy, effort expectancy, facilitating conditions and overall acceptance toward blended therapy. In the future, similar AFIs could be integrated into the curricula of postgraduate training programs and continuous professional education to increase knowledge about our identified drivers (i.e., simplified information provision, simplified contact maintenance, time flexibility, and geographic flexibility) as well as barriers (i.e., impersonality, legal concerns, and therapeutic alliance) to the acceptance of EMH services. By making EMH an integral part of the education, PiT could gain valuable experience in integrating EMH services into their therapeutic work with patients.

Furthermore, PiT with varying theoretical backgrounds might need different education. For instance, unguided EMH



programs such as mental health apps are most often based on cognitive behavioral therapy, which could lead to the assumption that psychotherapists with a background in cognitive behavioral therapy might be more open to use such EMH services (40, 100). In line with this assumption, Baumeister et al. (32) pointed out that particularly psychodynamic oriented psychotherapists could profit from AFIs as they initially seem to be rather skeptical about unguided EMH programs. Furthermore, There are already several studies that have identified associations between theoretical orientation (e.g., psychodynamic, cognitive behavioral, and others) and attitudes toward the use of EMH services (40, 100, 101), however findings are comparatively inconsistent, thus to deduce practical implications future research in this area is needed.

## Conclusions

This study is one of few to examine the acceptance of different EMH services (i.e., psychotherapy via videoconference, psychotherapy via telephone, VR, unguided and guided programs) across varying application purposes (i.e., prevention, treatment substitute, treatment addition, aftercare) from the perspective of PiT. We could show that acceptance for several EMH services differed for application purposes among PiT. The results showed that acceptance of EMH services was best predicted with an extension of the UTAUT model, including barriers (i.e., data insecurity, impersonality, liability, legal concerns, and concerns about therapeutic alliance), advantages (i.e., time flexibility, simplified information provision, geographic flexibility, and simplified contact maintenance), EMH experience, EMH knowledge, and EMH evidence assessment. As the use of EMH services will most probably increase in the next years because they offer quick and location-independent help for the prevention, treatment and aftercare of CMDs, our results highlight the need to distinctly inform PiT about different EMH services and their possible application areas. At the same time, our results provide support for stakeholders that are planning and designing training for PiT by highlighting factors that should be addressed if the goal is to increase EMH acceptance.

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## DATA AVAILABILITY STATEMENT

The original contributions presented in the study are included in the article/**Supplementary Material**, further inquiries can be directed to the corresponding author.

## ETHICS STATEMENT

After written consultation with the President of the Ethics Committee of the University of Zurich on 3 March 2020 and the checklist to self assess ethical safety, no further approval of the ethics committee was necessary to guarantee the ethical safety of the study involving human participants. The participants provided their written informed consent to participate in this study.

## AUTHOR CONTRIBUTIONS

PB: conceptualization, project administration, and writing—original draft preparation. MD: conceptualization, supervision, methodology, and writing—reviewing and editing. SH: writing—reviewing and editing. RS: conceptualization, methodology, investigation, software, and data curation. FN: formal analysis, visualization, and writing—reviewing and editing. JA-H: supervision, validation, and writing—reviewing and editing. All authors have read, revised, and approved the final manuscript.

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## SUPPLEMENTARY MATERIAL

The Supplementary Material for this article can be found online at: <https://www.frontiersin.org/articles/10.3389/fdgth.2022.840869/full#supplementary-material>

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The remaining authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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### **2.3 Barriers and facilitators to a blended cognitive behavioral therapy (bCBT) program for depression and anxiety based on experiences of university students: A qualitative study**

## Original Paper

# Barriers to and Facilitators of a Blended Cognitive Behavioral Therapy Program for Depression and Anxiety Based on Experiences of University Students: Qualitative Interview Study

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## Abstract

**Background:** Blended cognitive behavioral therapy (bCBT) programs have been proposed to increase the acceptance and adoption of digital therapeutics (DTx) such as digital health apps. These programs allow for more personalized care by combining regular face-to-face therapy sessions with DTx. However, facilitators of and barriers to the use of DTx in bCBT programs have rarely been examined among students, who are particularly at risk for developing symptoms of depression and anxiety disorders.

**Objective:** This study aimed to evaluate the facilitators of and barriers to the use of a bCBT program with the *elona therapy* app among university students with mild to moderate depression or anxiety symptoms.

**Methods:** Semistructured interviews were conducted via videoconference between January 2022 and April 2022 with 102 students (mean age 23.93, SD 3.63 years; 89/102, 87.2% female) from universities in North Rhine-Westphalia, Germany, after they had completed weekly individual cognitive behavioral therapy sessions (25 minutes each) via videoconference for 6 weeks and regularly used the depression (n=67, 65.7%) or anxiety (n=35, 34.3%) module of the app. The interviews were coded based on grounded theory.

**Results:** Many participants highlighted the intuitive handling of the app and indicated that they perceived it as a supportive tool between face-to-face sessions. Participants listed other benefits, such as increased self-reflection and disorder-specific knowledge as well as the transfer of the content of therapy sessions into their daily lives. Some stated that they would have benefited from more personalized and interactive tasks. In general, participants mentioned the time requirement, increased use of the smartphone, and the feeling of being left alone with potentially arising emotions while working on tasks for the next therapy session as possible barriers to the use of the app. Data security was not considered a major concern.

**Conclusions:** Students mostly had positive attitudes toward *elona therapy* as part of the bCBT program. Our study shows that DTx complementing face-to-face therapy sessions can be perceived as a helpful tool for university students with mild to moderate anxiety or depression symptoms in their daily lives. Future research could elaborate on whether bCBT programs might also be suitable for students with more severe symptoms of mental disorders. In addition, the methods by which such bCBT programs could be incorporated into the university context to reach students in need of psychological support should be explored.

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**KEYWORDS**

digital therapeutics; blended cognitive behavioral therapy; bCBT; depression; anxiety; acceptance; user experiences; university students; mobile phone

**Introduction****Background**

Depression and anxiety disorders remain among the leading causes of burden worldwide and have severe consequences for those affected, impairing their mental and physical health as well as their social lives [1-3]. University students are particularly at risk for developing symptoms of depression and anxiety disorders. A systematic review by Paula et al [4] reported a prevalence of 24.5% for anxiety symptoms and 26.1% for depressive symptoms among university students. According to Kessler et al [5], two-thirds of the related symptoms emerge before the age of 25 years. Major issues that affect students' well-being and academic performance seem to be psychological instability that is due to a substantial life transition, stress, and financial uncertainty [6-8], leading to a significant increase in the demand for counseling services and therapy, such as cognitive behavioral therapy (CBT) [9]. CBT has consistently been shown to be effective in treating depression and anxiety disorders and has become the gold standard for psychotherapy in this field [10]. Barriers to the large dissemination of CBT include long waiting lists [11], stigma associated with seeking help [12,13], and low flexibility owing to difficulties in scheduling and attending therapy sessions [14].

Internet-based CBT (iCBT) is widely acknowledged as a useful and effective resource for increasing access to mental health care [15,16], especially for digital natives such as students [17]. iCBT programs comprise an electronic, standardized treatment program either with (ie, guided iCBT) or without (ie, unguided iCBT) therapeutic support via chat, email, or calls [18]. In an unguided format, the effectiveness of iCBT, including digital health apps, seems to be limited [19,20], and dropout rates appear to be greater when the intervention does not involve therapist contact [21,22]. Both guided and unguided iCBT programs normally follow a standardized course content protocol that does not leave much room for individualization according to personal needs [14], and this could be associated with patients' relatively low willingness to use iCBT programs compared with face-to-face interventions [23,24].

An evolution of iCBT is a blended CBT (bCBT) program that integrates regular face-to-face CBT sessions with digital therapeutics (DTx) such as evidence-based mental health apps to mitigate the disadvantages of iCBT while benefiting from several advantages [25,26]. The bCBT appears to be an acceptable, clinically effective, and cost-effective option for treating depression and anxiety disorders [27-32]. Given that the therapy is augmented by DTx, it has the potential to decrease the number of face-to-face sessions with therapists and increase their resources to treat more patients. In addition, research has shown that bCBT achieves similar outcomes to traditional CBT, despite reduced face-to-face time with therapists [27,33-35]. As the therapist is in charge of the therapy in bCBT, more personalized care is possible compared with iCBT, that is, by

selecting modules and exercises within DTx that are most relevant to the client's needs and goals, which might enhance motivation and compliance [36]. Tailored interventions also seem to be a prerequisite to increasing university students' intention to use mental health services because *one-size-fits-all* approaches are unlikely to be effective for everyone [37,38]. Thus, to increase treatment uptake among students with depression or anxiety symptoms, there is a need for bCBT approaches that fit therapists' as well as patients' needs and preferences [39]. A few studies have focused on therapists' perspectives regarding their expectations for and experiences with bCBT [38,40], but to date, there is little qualitative research on patients in general and with students in particular. A study by Etzelmueller et al [41] reported predominantly positive experiences with a bCBT program among patients with major depressive disorder. For the same target group, Urech et al [42] could identify different perceived advantages and disadvantages of bCBT after undergoing such a program for 18 weeks. However, for students as a promising target group, research on their experiences with bCBT is still scarce.

**Objective**

In light of these developments, we investigated experiences with a bCBT program accompanied by a novel digital health app (*elona therapy*) that offered an integrated synthesis of digital and face-to-face elements, with individualization promoted by allowing therapists to regularly adapt relevant therapeutic content that fits the symptomatology and personal needs of patients. The content could be accessed by patients' smartphones. The aim of this study was to evaluate the benefits of the app for use in bCBT through the eyes of student users with mild to moderate depression or anxiety as well as factors that might be associated with its use (and nonuse) in this sample. To date, even though young adults seem to be particularly suitable for bCBT, facilitators of and barriers to the use of these apps, such as *elona therapy*, have rarely been examined in university students.

**Methods****Design**

This qualitative study was conducted as part of a feasibility and effectiveness study addressing bCBT intervention programs for depression or anxiety in university students [32]. A total of 107 students with mild to moderate depression or anxiety symptoms (ie, Patient Health Questionnaire-9 or Generalized Anxiety Disorder-7 scores between 5 and 15) [43,44] participated in either depression or anxiety intervention programs depending on their symptomatology. Participants with both elevated depression and anxiety symptoms were assigned to one of the intervention groups based on a decision made jointly by the participant and the clinical psychologist conducting the interview (shared decision-making). The bCBT programs included weekly individual CBT sessions (25 minutes each) with a therapist via videoconferencing for 6 weeks. To support weekly therapy



sessions, students used either the depression or the anxiety module of *elona therapy* on their smartphones throughout the intervention duration. Weekly CBT sessions with therapists included interactive therapeutic tasks and joint discussions. In addition, the app gave students access to supporting digital exercises and psychoeducational resources, which could be customized by the therapist according to the students' needs. Therapy sessions and supporting digital homework were developed as a manual separately for students with depression and anxiety. This basis level of intervention, defined by manuals, was given to all participants depending on their symptomatology. In addition, therapists had the option to activate additional digital content (eg, psychoeducational tasks or therapeutic activities) for each student based on their individual needs. The depression module of *elona therapy* provided psychoeducation and techniques and interventions related to behavior, thoughts, emotions, and relationships. It also included a specific module on relapse prevention. The anxiety module of *elona therapy* provided psychoeducation techniques; interventions related to the factors that contribute to its maintenance and how thoughts and emotions are related to anxiety; and specific modules on exposure techniques,

acceptance and commitment therapy techniques, and relapse prevention. A more detailed description of the session manual and available content of the app can be found in the study by Atik et al [32]. Students who had completed the intervention program were invited to semistructured individual interviews to elaborate on their experiences with the bCBT program.

### Participants and Recruitment

All students who had completed the bCBT intervention program were invited for a final interview by their therapist. Information on the interviews was provided during the last videoconference therapy session. Participants were informed that the interviews would consist of a discussion on their experiences in the program and that it would be guided by an independent experienced interviewer who was not involved in the therapeutic process. Semistructured interviews were conducted with 102 university students. The female and male interview participants were 87.2% (89/102) and 12.7% (13/102), respectively, and their ages ranged from 19 to 38 years with a mean age of 23.93 (SD 3.63) years. Table 1 displays the sample characteristics. Interview participation was considerably high; 95.3% (102/107) of the participants in the intervention study agreed to participate in the feedback interview.

**Table 1.** Sample characteristics (N=102).

Characteristics	Values
Age (years), mean (SD)	23.93 (3.63)
Female, n (%)	89 (87.2)
<b>bCBT<sup>a</sup> program, n (%)</b>	
Depression	67 (65.7)
Anxiety	35 (34.3)
<b>University major, n (%)</b>	
Social sciences and humanities (eg, languages, sociology, education, economics, etc)	39 (38.2)
Medicine and related fields (eg, dentistry, pharmacy, etc)	18 (17.8)
Science and engineering	16 (15.7)
Psychology	14 (13.7)
Management and business administration	7 (6.9)
Recent graduates (nonuniversity student)	7 (6.9)
Sports	1 (1)

<sup>a</sup>bCBT: blended cognitive behavioral therapy.

### Interview Procedure

Interviews were conducted on the web via videoconference between January 2022 and April 2022 and were audio recorded with the consent of the participants. The interviewer (EA) informed the participants that the goal of the study was to explore their experiences with the bCBT program. EA is a graduate psychologist and researcher trained in qualitative methods. There was no relationship between the interviewer and participants before this study. The interviewer was aware that the bCBT group (depression or anxiety) participants had been assigned to in the main study. The interviews lasted for an average of 22 (SD 7) minutes. Interview recordings were

stored and transcribed anonymously. Participants did not receive any financial compensation for their participation neither in the intervention study nor in the feedback interviews.

A general interview guide was used to conduct the semistructured interviews (Textbox 1). On the basis of the responses given by the participants to the previous question, more precise interview questions were carefully chosen and addressed to the participants. EA and MS created the interview guide with the help and synthesis of interview guidelines from a number of studies that qualitatively examined user experiences in applications developed in the field of digital health [45-49].

The interview guide was adjusted to examine emerging categories and themes during the interview process.

**Textbox 1.** Interview guide for semistructured user interviews.

#### Questions

- What motivated you to participate in the blended cognitive behavioral therapy (bCBT) program?
- What were your experiences and perceptions of bCBT with *elona therapy*? (emotions, cognition, and process)
- Did the bCBT program help you?
  - If yes, how?
  - If no, why not?
- How difficult or easy was it for you to spend time with *elona therapy* regularly, that is, to integrate it in your daily life?
- What motivated you to use *elona therapy*?
- What discouraged you from using the app?
- Did the use of the bCBT program affect your knowledge about depression (anxiety disorders)? How so?
  - If yes: Do you think this increased knowledge made an impact on your symptoms and mood?
- Did the use of the bCBT program bring you any other personal gains or competencies? (as in increased knowledge)
- Did the use of the bCBT program caused any drawbacks?
- How did you perceive the quality of the modules in *elona therapy*?
  - What did you like?
  - What did you dislike?
- Did you feel comfortable providing personal information to the app?
- Do you think blended therapy offers additional value compared with usual psychotherapy? Why?
- Do you think blended therapy creates additional burden to the usual psychotherapy? Why?
- In your experience, were there any essential preconditions to make bCBT feasible? If yes, what are they?
- Would you recommend the bCBT program you have attended to your friends and family?

#### Data Analysis

The transcripts were coded based on grounded theory, a systematic data analysis methodology that focuses on inductively developing abstract theoretical conceptions from empirical data [50,51]. A qualitative study design and the use of grounded theory have been especially well suited to accomplish our research goal because they enable the examination of emergent patterns and themes directly from participant data without assumptions from prior research or theories [52]. For the coding procedure of the transcriptions, Dedoose software (version 8.0.35, 2018; SocioCultural Research Consultants, LLC) for qualitative research was used.

The coding procedure began after the interview process had been concluded. All the interviews were coded individually and chronologically. Multiple researchers conducted the coding procedures to ensure intercoder reliability. The first round of data coding was completed by a student research assistant, with EA reviewing the coding scheme. EA then performed a second round of coding. Third, PB, EA, and MS revisited the coding scheme and discussed some modifications with JAH. Finally, a third round of coding was performed by PB after the authors settled on the final categories. Because cross-checking revealed only minor changes, 3 coding rounds were deemed sufficient.

Four aggregate dimensions (use patterns of the app, factors that motivated people to use the bCBT program, benefits of the app, and the facilitators of and barriers to the use of the app) and several subcategories within these aggregate dimensions were formed by inductive category formation based on the content of the interviews and codes assigned to the different text passages.

Interview quotes in this study were translated from German into English by LG. LG has a master's degree in literary translation and is experienced in translating from German to English. In [Multimedia Appendix 1](#), we report the complete checklist of COREQ (Consolidated Criteria for Reporting Qualitative Research) [53].

#### Ethics Approval

Ethics approval for this study was obtained from the Ethical Board of the University of Mannheim (EK Mannheim 27-A/2021) and was part of a joint ethics approval granted to the main study [32].

Results

Overview

We discovered general use patterns of the app as well as the

barriers to and facilitators for the use of the app in a bCBT program in the analysis of interviews. The hierarchical representation of the categories, themes, and dimensions that emerged from the coding of user interviews are presented in Table 2.

Table 2. Hierarchical representation of the categories and dimensions according to the results.

Third order: aggregate dimensions and second order: themes	First order: categories
<b>Use patterns of the app</b>	
Common use patterns	<ul style="list-style-type: none"><li>• Several times a week</li><li>• Once a week (one day before therapy session)</li></ul>
<b>Benefits of the app</b>	
Self-efficacy	<ul style="list-style-type: none"><li>• More intensive examination of the therapy content at home</li><li>• Preparing therapy sessions with the help of the app</li></ul>
Transfer into daily life	<ul style="list-style-type: none"><li>• Work on mental health whenever and wherever the patient wants</li><li>• Patient takes personal time for their mental health beyond sessions</li><li>• Patient takes more initiative and control in their therapy</li></ul>
Psychoeducation	<ul style="list-style-type: none"><li>• More knowledge about emotions and the underlying mental health disorder</li><li>• More self-reflection owing to increased knowledge and awareness on personal problems and their origins</li><li>• Accepting and respecting mental disorder as a disease</li></ul>
<b>Facilitators of the use of the app</b>	
Usability and structure	<ul style="list-style-type: none"><li>• Good overview (good structure of courses, therapy progress, and onboarding, and good intuitive handling)</li><li>• Comprehensibility of the tasks</li><li>• Praising after task completion</li><li>• Reminder notifications</li></ul>
Content and design	<ul style="list-style-type: none"><li>• Appropriate and professionally created modules and videos</li><li>• Nice and modest design</li></ul>
Support	<ul style="list-style-type: none"><li>• App as a caring companion throughout the week</li><li>• App provides structure for the students' lives</li></ul>
<b>Barriers to the use of the app</b>	
Overwhelming emotions	<ul style="list-style-type: none"><li>• Being left alone with difficult feelings that could arise during reflections and tasks</li><li>• Compulsory tasks may create pressure</li></ul>
Time requirement	<ul style="list-style-type: none"><li>• Increased time spent on psychotherapy can be a burden</li><li>• Increased involvement with the smartphone</li></ul>
Data security concerns	<ul style="list-style-type: none"><li>• Concerns about data safety and anonymity</li></ul>

Use Patterns of the App

Overall, students self-reported that they had engaged with the app for 20 to 30 minutes in a given week. The shortest app use estimation reported by a student was 15 minutes, and the longest was 90 minutes per week. Participants also highlighted that no prior knowledge was needed to participate in the bCBT program and to work with the app.

In the program, 2 main patterns emerged regarding students' preferences for app use. The first pattern was to use the app several times a week by splitting assigned homework tasks over different days. Students who followed this pattern reported

spontaneous engagement with the app and stated that they did not plan a time slot for doing the homework and did parts of the homework at will throughout the day. The second pattern was to complete all assigned tasks just before the weekly session with their therapist, usually the day before their session. Students who engaged with the app in this manner thought that they were able to easily remember the content of the homework in sessions this way. Some students also alternated between these 2 patterns:

*Sometimes, the exercises were shorter, and then I did all of them at once. With longer ones, I took more time to think about them and to do them in more detail, so I rather split the tasks. [P72]*

## Benefits of the App

### Transfer Into Daily Life

Students indicated that they benefited from using the app because they were able to initiate changes in their daily lives. Some highlighted that the structure of the therapy module as well as the relatively short exercises were ideal for daily use and could be easily integrated into stressful periods. The content of the modules was mostly perceived as helpful to apply to themselves, such as the following exercise: participants had to think of certain deconstructive thoughts in an everyday situation and then of alternative, more realistic thoughts. These exercises were evaluated as helpful add-ons to therapy sessions because they could be performed alone at home. Students also imagined that what they had learned throughout the bCBT would be reinforced with a little practice over time:

*I think, if you keep using it, you recognize certain patterns in your daily life. Once you have more experience, you might notice, alright, this could be a cognitive bias, let's try a different perspective. Or that you do something nice for yourself even though you're not feeling quite well. I think the exercise could also help improve that. [P72]*

In addition, as the app was used in patients' own time, the more intensive examination of the therapy content was possible, and this was perceived as supportive in the preparation for the next therapy session. Some of the interviewed students highlighted that they could think about specific themes that were raised during the therapy session in more detail and that they could receive more information about their symptoms, which was considered to positively influence the therapeutic outcome:

*The blended way is definitely better, especially for taking initiative even before the actual session with the therapist, just to gather your thoughts and to get some information beforehand. [P17]*

However, some of the interviewed students wished for even more personalized care, such as daily exercises specific to their current situation and symptoms because it might more effectively help them to combat depressive or anxiety episodes in their everyday lives:

*Some more specialized help would be nice, maybe also some daily exercises beyond the app. So that you calm down a bit or recollect things, something like that. Some mental exercises to instantly combat bouts of depression. And it would be great to have it personalized, tailored at different forms of depression and states of anxiety. [P83]*

A couple of participants mentioned that the app would profit from more interactive tasks because exercises that actively involved students were often seen as particularly helpful:

*It might be nice to increase the number of interactive tasks in which you have to enter something yourself. And to have even more possibilities to interact with the app yourself...But what I liked best were the exercises where you had to become active and do something yourself. [P74]*

### Self-efficacy

Furthermore, the interviewed students highlighted the flexibility of complementing the CBT with the app. Some participants pointed out that they could work on their mental health whenever and wherever they wanted, especially in acute situations when the symptoms occurred. Actively working on their mental health, even between therapy sessions, helped some of the students to better cope with symptoms, which was often associated with greater control over the disease, increased self-initiative, and self-efficacy:

*The app gave me the opportunity to distract myself and do something in the time between sessions when I felt bad or when I couldn't get things done. At least I felt like I was actively doing something about my condition and trying to change it somehow. That really helped me. [P3]*

In addition, some participants reported that they had become much more aware of their strengths, which made them feel that they were not at the mercy of their disease. Taking time to work with the app seemed to help them reflect on and learn more about themselves:

*Well, I've realized that I actually have a lot of resources and that I'm not so helpless. I can take initiative myself and I've noticed how that's helped me. [P28]*

### Psychoeducation

Almost all participants mentioned that they increased their knowledge about depression or anxiety disorders, which included the awareness of specific symptoms as well as of biopsychosocial factors that might influence the progression of their disease. In addition, some participants emphasized that the knowledge gain was helpful in counteracting emerging symptoms. In particular, for those who did not have therapy experience yet or had little disease-specific knowledge, the app seemed to serve as a good tool for psychoeducation:

*I've never done any therapy or anything like that before, and I think it was really good to improve your psychoeducation, just to gain some knowledge about the subject. [P38]*

Furthermore, learning about the mental disorder seemed to facilitate its acceptance as a disease that can be treated and to decrease the fear of not receiving adequate help:

*It really helped me realize what was going on with me because you often criticize yourself. I also did that because I had no other explanation for my behavior...You can cope with it better if you have explanations, and that was really helpful for my environment and me. [P80]*

Moreover, some students mentioned that the content of the app modules made them feel that they were not the only ones dealing with depression or anxiety:

*So, you're not alone. There are other people dealing with the same things. And it can actually be treated somehow. Because that was something I was really scared of at the beginning; I was afraid that it*



*wouldn't get better...And that's what I liked best about the modules.* [P20]

As a suggestion for improvement, some participants wished for more personalization options, which would allow users to skip specific exercises or time-consuming tasks that were perceived as unimportant for their personal situation. In addition to the psychoeducational chapters, one participant proposed the integration of a take-home message into the app, which might help students in their daily lives when the bCBT was over:

*Well, I've really learned a lot about the disease so far. What I missed somehow was some kind of instruction at the beginning, like...you can do this and that now, when the final sessions was over, or this is how you can continue on your own. You weren't told that right away and, well, this might still be kind of nice.* [P48]

## Facilitators of the Use of the App

### Usability and Structure

Most of the interviewed participants agreed that the app was well structured and easy to navigate, irrespective of the included onboarding function and without prior technical knowledge. The standardized structure of the tasks, which always included the theoretical background of a specific topic, a general example, and the possibility of directly applying it to oneself, was highlighted as helpful. In addition, the intuitive handling as well as the appropriate, well-chosen language were mentioned as facilitators of app use:

*I'm not sure if an onboarding is really necessary, because the app is simply well-structured. You can immediately find the headings of the different subcategories, for example. Everything is designed to be very simple.* [P66]

Some participants explained that they would have benefited from an integrated therapy plan as an orientation to their therapy process. To find their way around the app more quickly, the interviewed students also indicated that it would have been advantageous to immediately see which exercises had already been completed and which were still to come:

*I think I would have liked to have an overview at the beginning, some kind of therapy plan that is displayed in the app as a schedule. So that you exactly know at which point in therapy you are right now, what is still ahead of you, what is more to come, to have a rough orientation.* [P15]

Furthermore, receiving praise after completing a task seemed to encourage some participants to continue and was perceived as a confirmation of their progress. However, a few participants criticized the lack of direct, detailed feedback on completed tasks, which could be integrated into the app and might help them develop further:

*You just answer the questions in the app, but you're kind of stuck with them and you don't necessarily get on. So, you don't necessarily get feedback that directly helps you.* [P46]

In addition, some participants proposed including additional notifications in the app that would remind users to complete tasks before the next therapy session. In their opinion, this could have increased overall therapy adherence:

*It would be nice to be reminded every now and then that you still have to do the tasks...I mean, you shouldn't get notifications all the time, I think that would be annoying, but a reminder just before the session might be nice. You should get a notification if you haven't done anything yet. I think that would be convenient for me.* [P64]

### Content and Design

Although some participants would have liked more colors in the app, most interviewed students agreed that the simple design was friendly and inviting, which facilitated the use and reduced overload. According to them, the clear structure invited users to try out many different tasks and topics offered by the app:

*It has a very appealing design, but it's still neutral. I really liked that a lot. And I really liked that there is a personal form of address, even with my name. And it's nice that you can select everything, that there are the courses, the journal or the resource kit, for example. That you don't have everything at once, but that everything is structured well and split in smaller parts.* [P49]

The multimedia components of the app, such as videos or audio contents, were considered to be professionally produced. They were regarded as neither too long nor too short but just right for daily use by most participants. In addition, some students appreciated the personal component of seeing people explain different things in the videos. Overall, most participants stated that the content was well prepared and presented:

*Well, the videos or the features where you could hear a voice, that was something that made the app really individual...Sometimes, the videos were just a couple of seconds long. Something was shortly explained, but it was really helpful for me to actually see or hear someone.* [P8]

### Support

Many participants valued the app as a caring companion or "guardian angel" (P49) because they felt that they were not left alone with their problems between therapy sessions and were able to stay on track. The app served as an anchor, providing stability, especially when there was no one else to talk to:

*Especially, when I wasn't doing well and there were no other people I could have talked to, well, for example when I was up really late because of the depression, then it's harder to reach out to a friend or someone, and it was nice to have some kind of support or anchor if you needed it. And also, to have some guidance, something that gives you hope and the tools you need.* [P39]

Whereas many participants seemed to have built a strong, personal connection to the app, others simply regarded it as a helpful tool in addition to face-to-face therapy sessions:



*I think the app is just an app. I use it as a tool to work with someone towards a particular goal, and that's it. [P4]*

Moreover, the app seemed to provide a structure for the therapy process for some users, and this was perceived as beneficial for the overall experience:

*I can definitely say that it made me feel more comfortable in therapy. It made me realize: Alright, there's a certain structure and I know what to expect. I've done therapy before, about ten years ago, and some of the things there were really annoying: I was like, okay, every time I come here, we're doing the same thing, and if there's homework, it is not even discussed. It was so annoying to have no structure at all. And here, I knew that the therapist was going to ask me if I did my exercises. I really liked that. [P45]*

## Barriers to the Use of the App

### Overwhelming Emotions

Apart from the perceived advantages of the app, some students expressed concern about being left alone with feelings and emotions that might arise when dealing with the tasks and reflections. A few participants mentioned that this could be problematic, especially in acute situations, which would make it even more important to carefully assign tasks to different users:

*In very acute cases, when it would be easiest for the person to deal with their emotions with someone else. Depending on the depth of the tasks, it might be critical if the person has to manage it alone. But I think therapists also choose tasks for their patients, if I understood correctly. And that's something that they could then pay attention to. [P6]*

Furthermore, some participants indicated that being asked to complete the exercises until the next therapy session might lead to more pressure and overload for those who already had difficulties in managing daily tasks. They noted that, in particular, students with depressive symptoms might find it taxing to work with the app in addition to face-to-face sessions. As they often had very limited energy levels and sometimes already struggle with daily tasks, they might perceive an additional digital component as an extra workload and find it overwhelming:

*Well, I can imagine that it can lead to an overload, especially in cases of severe depression, when you're struggling with lethargy anyway, and then you feel obliged to do these tasks. [P3]*

### Time Requirement

In accordance, a few participants noted that the increased total time spent with oneself might be a burden. From their point of view, the feeling of not being able to successfully complete the assigned tasks, for example, because of time constraints, could further increase users' self-doubt:

*Because you always think: Alright, I have to remember this, or I still have to do that. And then I*

*think I would feel like having failed, because I didn't get it done. And I would be really dissatisfied with it and also with myself, which is not really beneficial. [P59]*

Another individual barrier to using the app might be the increased engagement with the smartphone, which could also be perceived as a stressor for those who wanted to be less digitally involved:

*I think, and I've noticed this with myself, if you're in a relatively stressful phase and you actually want to get away from your smartphone and use fewer digital devices, and at the same time you know that you're dependent on using this app, then it's definitely a stressor. But I think that's very individual. [P15]*

### Data Security Concerns

Overall, participants did not seem to have any concerns about data security and were not worried about submitting data related to their health status because the app provided detailed explanations about how the data would be handled to maintain anonymity and confidentiality:

*I didn't have any concerns. You were always told that data were not given to anyone else, also after having finished a task. I really liked always getting an overview over my data. [P10]*

## Discussion

### Principal Findings

This study evaluated the potential benefits of a bCBT program accompanied by *elona therapy* as well as the facilitators of and barriers to its use among university students with mild to moderate depression or anxiety symptoms. The 6-week bCBT intervention comprised 6 face-to-face individual CBT sessions via videoconferencing combined with the depression or anxiety module of the app. Although there are some qualitative studies covering health care providers' [40] and patients' experiences with bCBT [41] as well as with stand-alone iCBT [54], this study is, to our knowledge, the first to investigate factors related to the use (and nonuse) of an app within a bCBT program among students.

Predominantly, students reported positive experiences with the app and listed disorder-specific knowledge gain, the transfer of the therapy content into daily life, and impulses for self-reflection as general benefits. In accordance with the results achieved by Wu et al [30], who conducted a quantitative study with patients with symptoms of anxiety or depression, our results show that using DTx in bCBT can be especially useful for psychoeducation, as it helps to reinforce the uptake of the content of therapy sessions, such as coping skills, and key concepts such as the biopsychosocial framework [55]. This result seems to be particularly important, as research has shown that students lacking coping responses may be at risk for psychopathology when faced with high levels of stress, for example, stress related to the COVID-19 pandemic [56]. In addition to prior research showing that bCBT is effective in reducing symptomology [29-32], the results of our qualitative investigation further indicate that the use of the app along with

face-to-face sessions also seems to be associated with positive feelings regarding the therapy process among students. Specifically, our results indicate that many students gained the impression that their therapy would have been less structured and less effective without the app, which was also mentioned by participants in the study by Urech et al [42]. Furthermore, the app was considered beneficial in complementing face-to-face sessions because it initiated the active management of symptoms and encouraged self-reflection. Many participants evaluated the app as a supportive tool and caring companion, which has been echoed by prior research on the ability of DTx to potentially prevent a therapeutic drift between face-to-face therapy sessions [42,45] but not yet for the specific target group of students. This implies that there might have been a clear concept of how the app was embedded in the overall therapy program. However, to increase the acceptance and dissemination of such treatment modes in low-resource settings, such as student counseling centers, further real-world research needs to focus on how bCBT programs could be incorporated to reach students in need of psychological support. Our study lays the important foundation that it may be worthwhile to embed bCBT programs in the university context because they are perceived as helpful treatment options.

Similar to the findings by Urech et al [42], the implementation of the therapy content and behavioral modifications into daily life were mentioned as facilitators of the use because this seemed to help students initiate helpful and effective changes in their lives. Some interviewed students highlighted the advantage of being able to work independently with the app at their own pace, anytime and anywhere, which seemed to match students' needs for location- and time-independent psychological support. The relatively short exercises that could be easily integrated even during stressful periods seemed to be essential for the uptake of the app. This result supports the findings of Stawarz et al [57], who claimed that the technology used in bCBT needs to provide simple, easy-to-understand content to prevent potential barriers owing to, for example, the lack of drive. No technical issues were mentioned as hindering factors. This seems important because it has been shown that technical problems result in frustration and anger, which can distract the therapy process [58,59].

Regarding the structure of the app, the comprehensive language and the clear design were mentioned as facilitators of the app use. A study by Fleischmann et al [60] showed that students might indeed feel overwhelmed by a cluttered design. Most students highlighted the intuitive handling, which made it possible to navigate through the app without prior technological knowledge. In contrast to the findings of Jakob et al [39], who found that skipping the tutorial significantly increased the chance of dropping out, the onboarding function of the app was evaluated as positive but not essential for the therapy process. This also appears to be a very important finding for health care providers because the fear that some students might have too little experience with new technologies and might not be familiar with the respective tools has been shown to be a barrier to the prescription of DTx [61,62]. In comparison to previous findings, data security concerns were rarely mentioned as potential barriers to app use [63]. This could be explained by the detailed

descriptions of how data privacy was protected that were offered in the app as well as the students being digitally native. In line with the suggestions of Jakob et al [39] regarding how DTx should be designed to increase adherence, these explanations might have potentially reduced data privacy concerns.

To combine the potentials of both treatment modalities, DTx and face-to-face therapy sessions, a few participants mentioned that the app applied in this study could have benefited from even more personalization and interaction options that are optimally targeted at the students' abilities, needs, and preferences [17]. Previous research has shown that personalization options that would, for example, allow users to skip specific exercises or time-consuming tasks, are perceived as crucial for the engagement with DTx among students [37,39], and this feature was not provided in this bCBT program. According to Stawarz et al [57], the ability to monitor the therapy progress could have potentially increased user engagement and therapy adherence, which was also mentioned by some participants. Similarly, allowing the therapist to keep track of the student's process could have helped reinforce the connection to face-to-face sessions even more [45]. To further increase the adherence, some students suggested including additional reminders in the app, and this is in line with the conclusions of the systematic review by Jakob et al [39], who mentioned that reminders in the form of customizable push notifications can increase user engagement. However, this suggestion needs to be regarded with caution, as reminders can also be perceived as possible stressors for users [45,60]. Finally, some students raised concerns that patients with anxiety or depressive symptoms might feel overwhelmed by using the app, as working with the content might force them to address their problems without direct supervision. This implies that even in a bCBT, which includes face-to-face therapy sessions, there is a need to focus on emergency options when designing future DTx for students. Accordingly, Urech et al [42] showed that there seem to be different advantages and disadvantages of bCBT depending on the severity of patients' depressive symptoms. Although patients with mild to moderate depressive symptoms mentioned no disadvantages, patients with moderately severe to severe symptoms noted the lack of an additional contact possibility through the web-based tool as well as the necessity of preexisting computer skills as possible barriers. As more pronounced depressive symptoms have been shown to be associated with lower adherence to self-management apps [39], the inclusion of personal contact options in case of emergencies and frequent guidance, especially for patients with severe symptoms, seems to be essential for effective bCBT programs. In addition, Arean et al [64] suggested including tasks that are specifically designed to target certain cognitive deficits implicit in depressive disorders, such as cognitive control, to increase adherence among patients with more severe symptoms. As we only included patients with mild to moderate depression symptoms, future research could clarify whether bCBT programs are also suitable for student groups with more severe symptoms.

Interestingly, our study showed that the perceived benefits of this bCBT program are in line with many of the explored expectations of patients receiving standard CBT but who have not yet had an experience with blended formats [38,49]. This



study confirms that inexperienced bCBT users' needs for personalization, integration into daily life, psychoeducation, and self-reflection options match the experiences of participants in this bCBT program. However, participants also called for more interactive therapeutic activities, which patients inexperienced in bCBT did not mention as a preference [38].

As a next step, it will be interesting to determine how patients, including depressed students, respond to the presented bCBT program *elona therapy depression* under real-world conditions. Since December 2022, the described bCBT program *elona therapy depression* has been listed as a digital health app (DiGA in German, so-called "app on prescription") in the DiGA directory of the German Federal Institute for Drugs and Medical Devices. This means that since then, physicians and psychotherapists can prescribe this program for patients with depression at the expense of statutory health insurance companies.

### Strengths and Limitations

The strengths of this study include the large sample size of 102 interviewed students who did not receive any financial compensation, neither for their participation in the bCBT program nor for the interview, which might be associated with a high willingness to participate and a strong need to receive quick, low-threshold support for their mental health. Moreover, our study provides the first qualitative insights into the facilitators and barriers that might influence the uptake of an app in a bCBT program among students with mild to moderate depression or anxiety symptoms. Furthermore, almost all participants completed the bCBT program; hence, the therapy adherence seems to be substantially higher than that in study designs using either only face-to-face therapy sessions or DTx alone [41,65]. This leads to the assumption that the combination of individual face-to-face therapy sessions with personalized digital components could contribute to students' motivation and engagement. Further research could investigate this hypothesis in a larger randomized controlled trial design, allowing for the comparison between bCBT and face-to-face CBT.

Our study has several limitations that need to be considered. As our data are qualitative in nature, the results are partially context specific to the *elona therapy* app for treating depression and anxiety, which was used in this study in students in Germany, and only potentially generalizable to universal bCBT topics or different contexts. Owing to the novelty of this bCBT program and the app, the focus of the interviews was

predominantly on the app itself and less so on the face-to-face aspect. Future research could investigate how to optimally design and integrate face-to-face sessions along with the app use. It might be possible that a selection bias in the recruiting process occurred and that only students who were already willing and motivated to start therapy were recruited. In addition, students who participated in our study might have had a more positive attitude toward web-based therapy than nonresponders. Furthermore, we could only interview participants who had completed the 6-week bCBT program and not the dropouts ( $n=5$ ). Therefore, it was to be expected that the opinions regarding the use of the digital health app and overall experiences with the bCBT program would be relatively positive. Moreover, most of the interview participants were female (89/102, 87.2%). Hence, our results might overrepresent the experiences of female participants in bCBT programs. In addition, we did not differentiate between students with depressive symptoms and students with anxiety disorders in the analysis of the data, although we interviewed almost twice as many students with depressive symptoms. Thus, we cannot draw any conclusions regarding whether bCBT might be more convenient for either one of the 2 groups or whether different patient groups have different needs. In addition, as the goal was to recruit only students with mild to moderate symptoms of depression or anxiety, there were no students with severe symptoms. Hence, we cannot conclude whether this target group would have reported similar experiences with the bCBT program applied in this study. Finally, face-to-face therapy sessions lasted only 25 minutes, which is shorter than typical therapy sessions and in line with the report of some of the participants who would have wished for longer sessions.

### Conclusions

Our study qualitatively investigated the potential benefits and limitations of a bCBT program accompanied by the *elona therapy* app as well as the facilitating and hindering factors to its use for symptoms of depression or anxiety among students. We were able to systematically classify the benefits, barriers, and facilitators using inductively developed themes and categories. We discussed our findings in terms of their similar and different implications for existing research in this field. These findings can be beneficial for researchers and developers of new DTx. To increase the dissemination of bCBT programs among students, further research could focus on how such treatment options could be incorporated into the university setting.

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## Data Availability

The qualitative data sets generated and analyzed in this study are not made available because publication could limit the protection of the informants, and such publication was not covered by the informed consent to participate in the study.

## Conflicts of Interest

EA declares that she is employed by Elona Health GmbH, the company that developed the app used in this study. MS is a shareholder of Elona Health GmbH. All the other authors declare no conflicts of interest.

## Multimedia Appendix 1

COREQ (Consolidated Criteria for Reporting Qualitative Research) checklist.

[[PDF File \(Adobe PDF File\), 525 KB-Multimedia Appendix 1](#)]

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## Abbreviations

**bCBT:** blended cognitive behavioral therapy  
**CBT:** cognitive behavioral therapy  
**COREQ:** Consolidated Criteria for Reporting Qualitative Research  
**DTx:** digital therapeutics  
**iCBT:** internet-based cognitive behavioral therapy

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### 3 Discussion

#### 3.1 Summary of results

In terms of well documented effectiveness but low utilization rates, the role of dMHSs in the prevention, treatment and aftercare of CMDs has been discussed in the last couple of years. Reasons for low dissemination include skepticism and lacking awareness of potential risks and benefits, which calls for recipient-targeted AFIs such as information campaigns. However, until now little has been known about information preferences of students that are comparatively at high risk for CMDs and at the same time represent digital natives. Specifically, the perspective of psychology and medical students as future HCPs has barely been included in research even though they play a critical role in shaping the future healthcare system. The aims of this dissertation were thus to gain in-depth understanding of factors associated with acceptance of dMHSs to inform the design of recipient-targeted AFIs for this target group.

The first qualitative study (study 1) aimed at exploring information preferences related to dMHSs among future HCPs (i.e., medical and psychology students) as potential users of dMHSs to close knowledge gaps in this target group. The quantitative study (study 2) investigated the intention to use various dMHSs (i.e., telephone, videoconference, VR, unguided and guided dMHSs) for different application purposes (i.e., prevention, treatment addition, treatment substitute, aftercare) and applied an extended UTAUT model to explore which predictors best determine acceptance of dMHSs among future HCPs (i.e., psychotherapists in clinical training) as potential prescribers and recommenders of dMHSs. The second qualitative study (study 3) examined factors that might be associated with the actual use or non-use of a dMHS for mild to moderate depression and anxiety symptoms in students that participated in a bCBT program. Non-use refers to users that did not or only barely use the dMHS as addition to the digital psychotherapy. The main results of all three studies and a brief description can be found in table 2.

Table 2. Main results of studies included in this dissertation

Study details	Aims	Sample	Results
Braun et al., 2023 (study 1)	1) to explore information preferences and needs regarding dMHSs among future HCPs as	n = 16 medical students and n = 5 psychology students. Students were m = 25.5 years old and studied in 5 different	In total, four attributes were deductively derived from the data, including inductively formed levels of attributes that could together constitute AFIs which were either considered as facilitating or hindering dMHSs' acceptance:



	potential users of dMHSs 2) to identify attributes and levels to design AFIs on dMHSs	federal states of Germany	<ul style="list-style-type: none"> <li>• information source (i.e., university, HCPs, internet search, family and friends, employer, other sources)</li> <li>• information format (i.e., newsletter, social media, website, print media)</li> <li>• content preference (i.e., reviews, costs, composition, individualization, anonymity and data safety, developers' background, scope of application, languages selection, time requirement, emergency contact)</li> <li>• design preference (i.e., visual design preferences, linguistic preferences)</li> </ul>
Braun et al., 2022 (study 2)	<p>1) to assess the intention to use various dMHSs for different application purposes</p> <p>2) to apply an extended UTAUT model to explore which factors best determine acceptance of dMHSs</p>	n = 216 participants (n = 197 studied psychology, n = 6 studied medicine, n = 13 indicated other degrees), with n = 60 who did the training in Switzerland and n = 156 in Germany. Most of them were female (88.4%) and between 25 and 39 years old (85.2%)	<p>There was an interaction effect of dMHSs and application purpose, confirming the expected heterogeneity in the acceptance of different types of dMHSs:</p> <ul style="list-style-type: none"> <li>• psychotherapy via videoconference was the most accepted across all application purposes</li> <li>• as a treatment substitute, dMHSs were comparatively less accepted in acute care</li> <li>• unguided and guided dMHSs were specifically well accepted in preventive care</li> <li>• VR was comparatively less accepted across all application purposes.</li> </ul> <p>Furthermore, the following barriers were identified as significantly reducing the intention to use dMHSs among future HCPs as providers of dMHSs:</p> <ul style="list-style-type: none"> <li>• impersonality</li> <li>• therapeutic alliance</li> <li>• legal concerns</li> </ul> <p>As significantly facilitating the intention to use dMHSs, the following factors were identified:</p> <ul style="list-style-type: none"> <li>• simplified information provision</li> <li>• simplified contact maintenance</li> <li>• time flexibility</li> <li>• geographic flexibility</li> </ul>
Braun et al., 2023 (study 3)	To evaluate factors that might be associated with the actual use or non-use of a dMHS in a bCBT program for mild to moderate depression and anxiety symptoms in students	n = 102 students, with a mean age of almost m = 24 years, n = 14 studied psychology and n = 18 studied medicine or related fields. 65,7% showed symptoms of depression and 34.3% symptoms of anxiety	<p>The following facilitators to the actual usage of the dMHS among students were inductively derived from the data:</p> <ul style="list-style-type: none"> <li>• usability of dMHSs</li> <li>• structure of dMHSs</li> <li>• content within dMHSs</li> <li>• design of dMHSs</li> <li>• support within dMHSs</li> </ul> <p>As barriers to the actual usage of the dMHS, the following emerged:</p> <ul style="list-style-type: none"> <li>• overwhelming emotions</li> <li>• time requirement</li> <li>• data security concerns</li> </ul>

The following general benefits of the dMHS were identified as part of a blended program:

- self-efficacy
- transfer into daily life
- psychoeducation

### **3.1.1 Attitudes towards dMHSs**

In general, future HCPs reported positive attitudes towards dMHSs and mentioned to be open towards the use of dMHSs in all three studies, independent of whether they were asked as future providers of dMHSs or users of dMHSs. Furthermore, the majority reported having low to moderate knowledge and little experience with dMHSs, which is in line with prior research among other target groups, such as general practitioners (88,93,108), psychotherapists (109) and patients in general (110,111). For instance, several recent studies presented at the 22<sup>nd</sup> German Conference for Health Services Research have shown that the integration of DTx into the German healthcare system still does not appear to be sufficient even years after the start of reimbursement of DTx as there is a lack of information and clear recommendations for action (109). In the latest report on DTx, authors come to the same conclusion, stating that a nation-wide information campaign on DTx is needed to educate HCPs and patients about the new care options and enable them to make informed decisions (112).

In study 1, participants noted that the subject of digital health had received minimal attention during their medical or psychology studies. Despite perceiving its significance as high for their future roles as HCPs and personal needs, such as coping with stressful periods in their student lives, the topic was scarcely addressed during their studies. Almost all interviewed students reported that they were open towards the use of dMHSs, ensuring low-threshold access before CMDs develop. More precisely, students wished to be informed about dMHSs right in the beginning of their studies, e.g. during freshmen week. Furthermore, participants of study 2 stated using dMHSs in only one out of ten therapeutic cases. However, there were considerable differences between the services, showing that psychotherapy via videoconference and via telephone was used in every fourth therapeutic case. In study 3, none of the interviewed students had participated in a bCBT program for the treatment of depression or anxiety before. In line with prior research, study 2 showed that acceptance of blended programs was greater compared to unguided stand-alone dMHSs. Moshe et al. (113) could show significantly higher effect sizes in interventions incorporating human

therapeutic guidance as opposed to unguided self-help programs. In fact, acceptance of unguided dMHSs, such as DTx, was lowest, while acceptance of psychotherapy via videoconference was highest among future HCPs. However, when looking at the intention to use dMHSs across different application purposes, we found that unguided as well as blended programs seem to be specifically well accepted for the prevention of CMDs, even more so than all other services. In comparison, future HCPs accompanied just 4.2% of their patients with blended programs during acute care while they recommended unguided dMHSs to only 3.4% of their patients. This finding is consistent with the still low prescription rates of DTx in Germany, even if the numbers have risen steadily yet slowly in recent years as already explained above (67). Although future HCPs do not seem to have fundamentally negative attitudes towards dMHSs, they do not accept them as a replacement or substitute to standard psychotherapy programs, but primarily for preventive purposes as well as in aftercare. This finding seems to be new, as past research has not specifically focused on the comparison of acceptance towards different kind of dMHSs for different application purposes.

In the same vein, study 3 showed that dMHSs can indeed provide an effective alternative to traditional psychotherapy treatment if embedded in such a way that it fits into the life of students. Most participating students suffering from either depression or anxiety that took part in the bCBT program reported positive experiences and high acceptance of the dMHS, which was also shown in 94% of participating students finishing the program. The quantitative results of this study also provide preliminary evidence of the feasibility and efficacy of the bCBT program for the treatment of mild to moderate depression and anxiety symptoms in students (57). Generally higher acceptance towards blended programs among both users and providers show that a gradual integration of technology into routine care could be very promising (114). Thus, blended programs that offer an integrated synthesis of digital and face-to-face elements seem to have the potential to find their way into the healthcare system and therefore become an integral element of the support system at universities if the appropriate framework conditions are given.

### **3.1.2 Facilitators and barriers across groups**

Across all three studies included in this dissertation, there are some factors that have consistently been perceived to facilitate or hinder the intention to use or the actual uptake of dMHSs which should be considered when designing AFIs for students. In the following sections, identified facilitators and barriers across studies are

summarized in person-specific influencing factors (e.g., prior knowledge, concerns) and factors that are associated with the intervention itself (e.g., usability, individualization options). Even though this categorization seems crucial to design context-sensitive AFIs that are specifically targeted at respective target groups, this distinction has been barely made in research yet. This distinction might be especially helpful for the German Federal Ministry of Health or educational institutions (e.g., universities) to plan effective multi-level information strategies specifically for students, but also for medical-technology companies in regards to the development of dMHSs for this target population. Thus, another contribution of this dissertation is not only to gain an in-depth understanding of these factors, but also to structure obtained findings. Figure 1 gives an overview over identified factors.

Person-specific	Intervention-specific
<ul style="list-style-type: none"> <li>• Facilitating conditions (knowledge, experience, affordability, infrastructure)</li> <li>• Effort and performance expectancy (time requirement, flexibility, usefulness)</li> <li>• Social influence (reviews)</li> <li>• Concerns (data security, mental health status, therapeutic relationship, legal)</li> </ul>	<ul style="list-style-type: none"> <li>• Features (individualization options, information provision, contact options)</li> <li>• Usability (user-friendliness, clear design)</li> <li>• Development (scientific evidence base, scope of application, developers' background)</li> </ul>

Figure 1. Factors associated with the intention to use and actual uptake of dMHSs

### 3.1.2.1 Person-specific influencing factors

#### **Facilitating conditions**

As hypothesized, one of the most frequently reported barriers mentioned by future HCPs as users was a lack of knowledge and experience with respect to dMHSs (study 1), which was also shown as a significant predictor of technology acceptance among potential providers (study 2). A comprehensive overview of the availability, relevance, and effectiveness of digital tools for the clinical context appears to be lacking, while the number of available services is expanding steadily and rapidly (90). Accordingly, many participants wished for the opportunity to receive information and education on dMHSs (study 1). When students were asked what they would like to be informed about regarding dMHSs, answers were similar to prior research focusing on how dMHSs should be designed among users in general (115), medical students (116), and young adults (117). Participants indicated that if universities provided dMHSs as a preventive service free of charge, they would be receptive to utilizing



them. Accordingly, information on costs were most often mentioned as crucial because high costs were perceived to impede utilization of dMHSs due to students' limited financial resources, which is inconsistent with a systematic review published in 2021 among users in general. In this review, other factors, including severe mental health symptoms, a lack of personalization options and technical problems were identified more often as barriers (115). In regards to how they would like to be informed about dMHSs, most future HCPs stated that the university as a source of information could facilitate access to dMHSs through appropriately prepared information materials or courses. Due to the vast array of available health apps and telemedicine services, participants expressed a desire for guidance from their university which is in line with prior research (116). They wished for assistance both as potential users of dMHSs and in relation to their future roles as HCPs. Furthermore, many students highlighted a lack of awareness regarding the psychological support services offered by their university. The lack of awareness was not mentioned as a main barrier to seeking help in previous studies among medical students. In Australia, for instance, not enough time and concerns regarding stigma, including disclosure and peer judgement were reported as hindering (118), while students of the University of New Mexico School of Medicine indicated they would not want to disclose their psychological health status on a New Mexico Medical Board license application. The most mentioned reasons for non-disclosure were fear of stigmatization, fear of consequences, and the impression that such disclosure was not appropriate (28).

Participating students of study 1 also emphasized the importance of being informed about these services at the beginning of their studies, as part of preventive measures, indicating a need for proactive information strategies. Especially in regards to their future role as HCPs, some participants suggested that the topic digital health should be introduced as an integral subject of their studies. In fact, the lack of organized educational programs on dMHSs has been viewed as a barrier to the implementation of digital health (119). Even among practicing HCPs, there appears to be limited digital health literacy and experience, as only 11% have undergone any form of training in digital health (92). Moreover, only half of these training programs specifically addressed dMHSs, emphasizing the need for structured education and additional training initiatives (90,91,120). As a result, the updated version of the National Competence Bases Catalogues of Learning Objectives for Medical Education (German "NKLM 2.0"), a revised framework for qualifying medical students for their roles as healthcare professionals, now incorporates digital health literacy as one of the comprehensive skills.

Consequently, digital health literacy will be integrated into the mandatory core curriculum starting in 2025, at least for medical students in Germany. However, interviewed participants of study 1 emphasized that they do not only want to be informed about how to search for, access, scrutinize and recommend dMHSs in their role as HCPs (121), but they especially wished to be educated on how to manage one's own health and perceived this to be important for every student. It seems reasonable to enable students to gain experience early in their studies through using dMHSs for the management of their own well-being, as, according to the results, experience has been shown to be a predictor of technology acceptance, leading to the UTAUT model (122). Additionally, Cao et al. (123) showed that individuals perceive using dMHSs as easy once they have developed more resources and knowledge to use dMHSs. Future HCPs also imagined the management of one's own health with dMHSs to be a mandatory course for all students independent of the study program. Moreover, they mentioned several other formats that they believe would facilitate the retrieval of information on dMHSs, highlighting the importance of social media. Even though students had varying opinions about personalized advertisement on, e.g., Instagram, they agreed that if information is scientifically prepared and presented by a credible channel (such as the profile of their own university), the information on dMHSs provided is also more likely to be accepted. For instance, some of the interviewed students reported discovering information about the interview study through a Facebook group related to their course of studies. Similarly, they expressed the possibility of receiving information about dMHSs by student council groups or other fellow students in such groups. In this manner, students outlined that social media could serve as an effective and low-threshold way to connect with individuals acquiring help. Interestingly, participants did not prefer information strategies on dMHSs that were exclusively tailored for medical or psychology students. Instead, they prioritized information strategies centered around dMHSs that addressed the general needs of all students, because they perceived no distinctions between student groups regarding stress and mental health issues.

Specific to medical and psychology students as future providers of dMHSs (study 2), the degree to which participants believed that organizational and technical infrastructures are available to support the use of dMHSs (122), was also shown to be significantly influencing acceptance. This seems reasonable because if HCPs do not have the capability to integrate digital health solutions into their treatments and daily working routine, it appears likely that dMHSs will have difficulties to find their way in routine care. Indeed, a recent systematic review among practicing HCPs has shown

that infrastructure and technical barriers were the most frequently outlined barriers to utilizing digital health applications (115), including insufficient technical equipment (124), no information on the potential additional workload for HCPs, shortage of devices, connectivity speed, harmonized systems across different facilities (125) and limited technical interoperability and interconnectedness (90).

The interoperability has certainly become critical to improve timely and secure access as well as the integration and use of EHRs to optimize health outcomes for patients and reduce costs for the healthcare system. In the United States, the use of EHRs has increased immensely throughout the past years (126) and even though Germany is still lagging behind, there has also been some progress. For instance, the new Digital Healthcare Act is intended to enable telemonitoring for DTx in future by interlinking various components, i.e., digital solutions are to be increasingly integrated into HCPs' systems and it should also be possible in future to make appointments for medical services from DTx (127). With the help of cross-provider care platforms including medical aids, DTx, EHRs and other applications of the telematics infrastructure, telemonitoring programs and other telemedical care scenarios for various application purposes will be able to be mapped through Germany (128).

### **Effort and performance expectancy**

Furthermore, having time pressure and the inability to integrate therapy in everyday life due to time constraints were identified as personal factors lowering the help-seeking intentions among students and future HCPs (study 1, 2 and 3). Thus, the opportunity to use dMHSs at any time and anywhere, avoiding waitlists and having to put relatively little effort in the process were mentioned both as facilitating the actual use of dMHSs among students (study 3) as well as important benefits that students like to be informed about (study 1) and increasing the intention to recommend dMHSs to patients (study 2). At the same time, students stated that these newly developed technologies would require additional workload and dedication from the perspective of future HCPs to get familiar with those new inventions (study 1). Time- and workload-related factors were similarly reported as most common barriers to use dMHSs among HCPs that already show a lot of work experience (92,125).

The opportunity to communicate from the comfort of one's own home without having to make an effort was perceived as increasing the acceptance and use of dMHSs, mitigating stress and anxiety associated with in-person interactions or unfamiliar environments (study 1 and 3). In line with previous research among HCPs (92)

and adolescents as patients (129), the degree to which individuals believed that dMHSs will help maintain or regain psychological wellbeing and the perceived usefulness of the intervention to address patients' and HCPs' needs were shown as major facilitating factors in all three studies. For instance, in a recent systematic review among young people aged between 10 and 24 years of age, usefulness and connectedness were perceived as the most common facilitators of user engagement with web-based mental health interventions. Perceived usefulness for young people was also noted by both HCPs and parents as the most common facilitator, whereas concerns about performance expectancy and data privacy were listed as barriers (129).

### **Social influence**

With respect to whether dMHSs are worth engaging with, participants reported that their personal usage intention also depended on the reviews of other users (study 1) and the recommendations of other HCPs (study 2). For instance, results of study 1 revealed that students appreciated when dMHSs were previously tested and approved by friends, other students or university lecturers, helping them to reflect on whether a specific dMHS could be helpful or not. Congruently, from a perspective of a future HCP, a significant facilitator influencing the intention to use dMHSs in clinical practice was social influence by other HCPs (study 2). Feeling the perceptions of others on the willingness to use digital solutions seems to socially effect HCPs' adoption and the use of dMHSs (130). Possible explanations are that HCPs feel that using technological innovations might make them attain the same or an even higher status than their colleagues, trying to adapt their behavior to comply to social norms (131). Additionally, feeling the encouragement and support from their employers in using digital tools could also have a positive influence (92). Especially when individuals face uncertainty, the influence of others' opinions has been shown to reduce perceived risk of using dMHSs (123). This seems especially important regarding concerns that have been raised among participants, including data security concerns (study 1 and 2), concerns regarding the mental health status of patients (study 1, 2 and 3), concerns about the therapeutic relationship (study 2) and legal concerns (study 2).

### **Concerns**

When asked about potential barriers to the usage of dMHS, concerns regarding data security were identified in study 1 and study 2, which have been consistently shown as hindering uptake in prior research among HCPs (132,133). However, when



asked as users (study 1), anonymity seemed to be even more important than data security. In study 3, the majority of participants appeared unconcerned about data security and expressed no apprehension about submitting health-related data. They reported that this lack of worry stemmed from the detailed information provided by the dMHS regarding the handling of data, assuring anonymity and confidentiality. In support of this finding, research has shown that a moderation of the intervention, meaning a person monitoring and moderating the content such as in bCBT programs, is perceived as a facilitator to create a safe environment (134). As a provider, data security seemed to have a higher priority (study 1), even though insecurity was not shown to be a significant predictor of dMHSs' acceptance among future providers (study 2), thus it did not significantly influence future HCPs intention to use dMHSs in clinical practice. In conclusion, other concerns had a stronger impact on usage intention. For instance, across all groups, dMHSs were evaluated as more acceptable for milder forms of CMDs and severe mental health symptoms have been identified as a barrier. In study 3, certain students expressed concerns about being left alone in acute situations, for instance if negative emotions would arise when working on specific reflection tasks. Furthermore, participants mentioned that the request to complete exercises before the next therapy session as part of the bCBT program could potentially create additional pressure and overload for students already struggling to manage their daily tasks. They emphasized that individuals with depressive symptoms, in particular, might find it challenging to engage with the dMHS. Given their frequently constrained energy levels and existing difficulties with daily tasks, incorporating an extra digital component might be perceived as an added workload, leading to a sense of overstain. Controversially, in needs assessment studies, participants expressed a greater willingness to utilize dMHSs when their symptoms were more severe (135–137). Simultaneously, evaluation studies have revealed that intensified symptoms impede effective engagement with digital interventions (138,139). For emergency situations, future HCPs of study 1 expressed a desire for dMHSs capable of promptly delivering appropriate emergency contact information as reliable and quick assistance for individuals in acute need. To date, this feature seems to be barely included in dMHSs, especially not in those that are not tested and validated by federal institutions, such as the German Federal Ministry of Health. In such situations, the significance of anonymity would even diminish. Regarding HCPs' perspective as providers and recommenders, there seems to be a perceived need for face-to-face contact in terms of more severe symptoms due to feelings of high responsibility towards patients (102). The chance of having no possibility

to intervene due to less human interaction has also been identified as a personal barrier (125). Correspondingly, the results of study 2 showed that impersonality had the strongest impact on the intention to use dMHSs among future HCPs in clinical practice. This also explains that acceptance of guided interventions was higher for most application purposes in comparison to unguided dMHSs (see 3.1.1), even though it was not listed among the most prominent barriers to using digital health technologies in a recent review by Borges do Nascimento (125).

In the same vein, doubts as to whether it is possible to build a trusting therapeutic relationship when using dMHSs was identified in study 2 as a significant concern influencing usage intention. One fundamental element of psychotherapy involves the establishment of a therapeutic alliance between the patient and the HCP, as it is acknowledged as a main factor contributing to the effectiveness of psychotherapy (140). The therapeutic alliance includes three components, including the bond between the therapist and the patient as well as the agreement on the tasks directed toward improvement and on therapeutic goals (141). With regards to digitalization, the therapeutic alliance has been controversially discussed, while results are still inconsistent due to the broad variety of dMHSs and the role of this concept in the digital context is still unclear (102,142,143). For instance, results of a narrative review from 2020 demonstrated that a therapeutic alliance can indeed be built in digital interventions for patients with CMDs but that the therapeutic alliance seems to be less directly associated with outcomes in comparison to face-to-face therapies (144). Specifically, it seems reasonable that empathy, which is associated with therapeutic alliance, is more difficult to build in unguided dMHSs that do not involve personal guidance. Confirmatory, the results of study 2 showed that specific application purposes would hinder the intention to recommend dMHSs. For example, in study 2 dMHSs were relatively less accepted as a treatment alternative compared to other application purposes in acute care settings. This discrepancy could be attributed to future HCPs preferring to have more immediate control over the therapeutic relationship in acute situations. In acute situations, they might find greater comfort in direct synchronous communication, encompassing the interpretation of both verbal and nonverbal cues in patients. Additionally, future HCPs may experience a compelling professional duty to attain expertise in a particular subject before recommending or implementing it in daily clinical routines (102). Thus, lacking familiarity and awareness of possible benefits and risks of dMHSs for acute care might have resulted in low willingness for future use for this specific application area.

Specifically for future HCPs, results of study 2 have further shown that legal concerns among future HCPs represent a significant barrier to the acceptance of dMHSs. In the literature, legal- and ethical-related factors were also shown as predominant barriers for already practicing HCPs, including national laws, jurisdiction and the presence of ambiguous legal liability (125). To provide psychologists with clear recommendations, the European Federation of Psychologists' Associations have formulated general guidelines (120) to promote the dissemination of evidence-based dMHSs as a starting point. For physicians, the German Society for Digital Medicine is involved in the development of guidelines and standards for digital medicine. It promotes scientifically sound education, training and continuing education in studies, clinics and practice in the form of scientific programs, events and information (145). So far, however, these measures appear to have reached only very few physicians in Germany (72).

### 3.1.2.2 Intervention-specific influencing factors

#### **Features of dMHSs**

A common factor influencing the intention to use dMHSs was the features of dMHSs in contrast to.... In all three studies, participants wished for personalization options within dMHSs, which would, e.g., allow users to skip specific exercises that are perceived as not matching to their personal situation (study 3) or change the design of dMHSs according to own preferences (study 1). To decide whether dMHSs fitted personal needs, some students mentioned that they would like to know whether they could choose between modules and exercises that were offered within dMHSs in study. Even though psychoeducational exercises could be customized by the therapist tailored to students' needs in study 3, e.g. by activating additional content based on individuals, the content was not always perceived as matching with one's personal situation. However, most interviewed participants reported that the bCBT program was overall perceived as a good solution to enhance engagement motivation because it allowed for a more personalized care as just a face-to-face therapy or the use of dMHSs alone. The dMHS was regarded as advantageous in supplementing in-person sessions since it promoted self-reflection and prompted proactive symptom management. As the level of guidance was perceived as relatively high due to the blended format, participants further felt that it held them accountable to consistently interact with the content of the dMHS. However, some disapproved the lack of direct, detailed feedback on finished tasks. They further wished for additional reminders that would notify users if they did not complete tasks that were necessary for the next therapy session and a

personalized representation of the intervention as both could have strengthen therapy adherence. This is in line with Jakob et al. (146) who could show that push notifications were identified an effective technique of improving adherence to dMHSs, if they were customizable to individuals' schedules. However, push notifications have also been reported to be perceived as a barrier because they are considered as annoying or unsuitable (116), thus, individualization of these reminders customized to one's own preference seems crucial. In regards to multimedia components, participants agreed that both for information materials on dMHSs (study 1) as well as for dMHSs (study 3), a mix of different formats (e.g., videos, texts, audio files, etc.) was favored as the variety was perceived as matching with different preferences and more engaging. Likewise, Garrido et al. (147) could show that users appreciate interventions with gamification elements and relatable, interactive content that matches with own preferences.

With regard to future HCPs, there were some students who additionally expressed that they would like to be informed about whether specific dMHSs were available in different languages so that they could be recommended to patients with mother tongues other than German (study 1). Furthermore, simplified contact maintenance and information provision, e.g. through integrating chat options or reminders to transfer therapy content into daily life, were identified as significantly facilitating the intention to use dMHSs in clinical practice (study 2). Especially with regards to the simplified information provision, the results of study 2 and study 3 show that using dMHSs in bCBT can be specifically helpful for psychoeducation purposes by reinforcing the uptake of the content of the face-to-face sessions. In conclusion, customized interventions appear to be essential for enhancing the dissemination of dMHSs among both students and HCPs, as one-size-fits-all approaches seem improbable to yield effectiveness for all individuals (96,148). In this regard, the bCBT approaches that align with the requirements and preferences of both therapists and patients again seem promising (146).

## **Usability**

According to the International Organization for Standardization (ISO), usability refers to the degree to which a software can be used by specific consumers to achieve quantified objectives with effectiveness, efficiency, and satisfaction in a quantified context of use (149). As technical issues have been shown to be a common barrier to engaging with dMHSs (115), it seems crucial that users need to feel a high level of convenience when using innovations such as dMHSs to increase acceptance (77). In line, the results of study 1 and 3 showed that the handling of dMHSs was of special



importance for users, implying that the degree to which dMHSs can be easily used was associated with the usage intention (study 1) as well as actual usage of dMHSs (study 3). In study 1, future HCPs wished to be informed about whether dMHSs are perceived as user-friendly, including technical stability and an interface that allows for an intuitive, structured and reliable user experience. In study 3, almost all participants agreed that the dMHS had a clear design and was easy to navigate, self-explanatory and well structured, so that it could be effortlessly used without prior technical knowledge which could be associated with overall positive experiences that were reported. This seems to be of special importance as participants not having the resources required to use an intervention was shown as primary barrier to engagement with dMHSs in previous studies (150–152). In contrast to past studies among other target groups, participants barely had problems with the login or in finding information or navigating within the dMHS (153,154).

Moreover, the findings of study 3 suggest that numerous students held the view that their therapy would have been less organized and less impactful without the dMHS, which was also expressed by participants in previous studies on blended formats (155,156). Also in line with past research in other populations (155,157), many participants appraised the dMHS as a helpful tool to prevent therapeutic drift between face-to-face therapy sessions. However, some participants wished for an integrated therapy plan as an even better orientation throughout their therapy journey, indicating which exercises had already been successfully finished and which were yet to come.

### **Development**

Future HCPs (study 1 and 2) were highly interested in the scope of application and the development process of dMHSs. Regarding the scope of application, participants of study 1 wished to know for which disease, target group and application purpose (i.e. prevention, acute treatment or aftercare) a specific dMHS was developed before using or recommending it. This was confirmed by results of study 2, which showed that there was an interaction effect of dMHSs and application purpose, confirming the expected heterogeneity in the acceptance of different types of dMHSs among future HCPs. In addition, most students highlighted that the scientific evidence base was essential in order to decide whether to use a dMHS (study 1) or recommend it to patients (study 2). Interestingly, the scientific evidence base was not listed among the most prominent facilitators in a recent review by Borges do Nascimento et al. (125) on factors influencing the use of digital health technologies among practicing HCPs.

Other facilitators, such as training and education possibilities, usefulness, usability or adherence promotion campaigns seemed to be more important for this more experienced target group. In study 1, however, the scientific evidence base was one of the most mentioned that students wanted to be informed about and results of study 2 showed that the assessment of the scientific credibility was significantly influencing the intention. Almost all students wished to know whether there is adequate empirical evidence supporting dMHSs, such as whether specific interventions had undergone clinical trials demonstrating effectiveness and efficiency. Without such validation of a guideline-based development process, future HCPs expressed a reluctance to use dMHSs (study 1). In comparison to other target groups (158,159), some medical and psychology students did not just wish to be informed about the quality, safety and effectiveness of dMHSs, but asked for more details on the scientific background (e.g., which research group conducted the study, how many participants were included?).

In combination with the scientific evidence base, future HCPs frequently wished to be informed about the professional background of dMHSs' developers because it would increase the level of trust in interventions and long-term attachment. For instance, they would prefer using or recommending dMHSs that were developed by other medical experts, such as psychotherapists and physicians, than only by business economists. Interestingly, the developers' background did not appear to carry particular significance in prior research among other target groups including experiences HCPs (e.g., 125), indicating that future HCPs might place greater importance on this information. As research has shown that if individuals perceive more trust in product developers, it can significantly influence their behavioral intention to use dMHSs (123), further research should investigate whether including this information in AFIs might increase actual uptake.

Overall, the results from study 1 and 2 on the development process of dMHSs indicate that, for instance, a website hosted by an official association (e.g., the Professional Association of German Psychologists) or public institution (e.g., the Federal Ministry of Health), including a short description of the most important and relevant information on dMHSs might be beneficial for medical and psychology students to make informed decisions. A similar tool already exists for practicing HCPs on DTx, hosted by the German Digital Health Association, but for students, such an overview is missing.

### 3.2 Strengths and limitations

This dissertation contributes to the understanding of barriers and facilitators related to the acceptance and utilization of dMHS among students as well as the design of recipient-targeted AFIs to close knowledge gaps among future HCPs in Germany. However, there are a few aspects that should be regarded with caution when analyzing the results of the studies.

First, the quantitative study (study 2) focused on psychotherapists in clinical training, which means that the study population already held a university degree in either psychology or medicine and were then in their postgraduate studies to obtain a state-approved permission to practice psychotherapy in Germany or Switzerland. The qualitative study investigating information needs and preferences regarding dMHSs (study 1) focused on medical and psychology students that were comparatively less advanced in their professional careers, thus results cannot be compared to experienced HCPs. Additionally, study 2 focused on future HCPs as potential users of dMHSs, while the study 1 focused on future HCPs as potential providers or recommenders of dMHSs to get a broader picture of this promising and important target group. Furthermore, in the qualitative study on barriers to and facilitators of a dMHS for depression and anxiety within a bCBT program (study 3), the focus was on students as actual users, not specifically differentiating between study programs. However, to promote the integration of dMHSs into the healthcare system, both perspectives, potential users and prescribers, are deemed to be necessary. Thus, gaining insights into both perspectives is considered a strength of this dissertation.

Secondly, the studies were conducted at different times, respectively in the summer of 2020 (study 2), in August and September of 2021 (study 1), and in January and February of 2022 (study 3). For instance, the COVID-19-pandemic surely reshaped the next generation of healthcare (160), which forced both users and HCPs to face new approaches to the management of CMDs. This could have potentially lead to different levels of experience with and acceptance of dMHSs at the timing of data collection. Thus, results are not directly comparable and respective conclusions are limited.

Thirdly, acceptance is a multifaceted concept and there has been a lack of standard measures in research (161). Even though the UTAUT model originated from an extensive review and synthesis of various theoretical models related to technology acceptance and is still a widely recognized framework, it has some limitations in explaining variance in behavioral intention and usage behavior (162). For instance, it

excludes some constructs and contextual factors that may be of high importance for explaining technology acceptance and use, which led to researchers starting to incorporate variables from alternative theoretical frameworks (84). Confirmatory, Venkatesh et al. (122) indicated that many studies in the field of technology research employed either just a subset of the UTAUT model and included other moderators than the ones proposed. Even though we operationalized acceptance according to the UTAUT model in all three studies included in this dissertation as the intention to use dMHSs, we adapted the questions to the context, focusing on individual characteristics, such as attitude and study background. Attitudes have been demonstrated as a partial mediator for the impacts of performance expectancy, effort expectancy, facilitating conditions, and social influence on behavioral intention. Additionally, attitudes directly influence usage behavior (162). Thus, including questions on attitudes in all three studies was considered as necessary.

Moreover, the results of this dissertation focusing mainly on young adults should be interpreted with caution, as research has shown that younger people are often more open to dMHSs (163) and that older patients and HCPs with extensive professional experience often exhibit greater skepticism (86). This is also accompanied by a potential selection bias, as possibly, only those students that were interested in the topic of digital health might have participated, which could have led to slightly overrated results and potentially less identified risks or barriers. In addition, all materials used to gather data for the three studies of this dissertation, included a brief description of dMHSs, which might have positively influenced acceptance. Furthermore, people with lower education seem to prefer more frequently face-to-face settings (163). However, we only included participants that were either already finished with their studies or on their way obtain a university degree. As Perski and Short (161) have argued that what people find acceptable is strongly context-sensitive and interlinked with prevailing cultural and social norms, active provision of more information and further promotion of acceptance for dMHSs specifically targeted and tailored at different groups of population seems necessary. For future research, it is thus crucial to further include user-centered approaches in the design of information strategies, just as we did.

As a strength of all studies included in this dissertation, the diverse sample can be mentioned, which ensured that a broad range of perspectives and experiences could be considered from both users and providers. For instance, in study 1, interviewed students studied in five different federal states of Germany and about half of them had already completed at least one educational program or study program. In



study 3, data from students with both symptoms of depression as well as of anxiety could be gathered and perspectives of students from different study programs (i.e., social sciences and humanities, science and engineering, management and business administration, sport, psychology and medicine and related fields) were obtained. However, we did not specifically compare psychology and medical students' experiences with the dMHS with those from students of other programs, which might have been particularly interesting for this dissertation. In general, the proportion of female participants was higher than that of men. This may however reflect the actual gender distribution among medical and psychology students in Germany (164,165). Additionally, the number of 21 students that were interviewed for study 1 might seem relatively small, however, no new relevant content was being obtained from further data collection which indicates that thematic saturation (166) in this qualitative study was reached.

Finally, the results of this dissertation should not be transferred to other countries, because we focused on the German healthcare system with its specific regulations, while study 2 also included psychotherapists in clinical training from Switzerland. For instance, the prescription of DTx in Germany with costs reimbursed by all statutory health insurances is yet still very innovative worldwide, while European countries such as Belgium (167) and Austria (168) have just started to introduce a similar system. Thus, attitudes and preferences might differ across nations.

### **3.3 Practical implications and future research**

Until today, many attempts to implement dMHSs in real-world settings in Germany have not been successful and there is a strong need for AFIs that convey knowledge on dMHSs to various target groups (169). To identify and select appropriate dMHSs' implementation strategies, the Exploration, Preparation, Implementation, and Sustainment (EPIS) framework will be used as theoretic orientation for this section on practical implications (170). The focus of this dissertation can be categorized in the first phase, the exploration phase, which is proposed as a stage in which needs and preferences among a specific target group are accessed to determine person- and intervention-related factors that can be addressed in AFIs. The results of this dissertation lay an important foundation for the next phase, the preparation phase. Here, the focus is on the exploration of different information strategies that address the identified factors to see which strategy is best suited to target users and providers. The implementation phase demands not just activities to deploy AFIs on dMHSs, such as

facilitating conditions, but also measures that monitor the success of such AFIs. In the last phase, the sustainment phase, potential progress should be maintained or, if not successful, AFIs need to be adapted. Figure 2 shows an illustration of the EPIS framework.

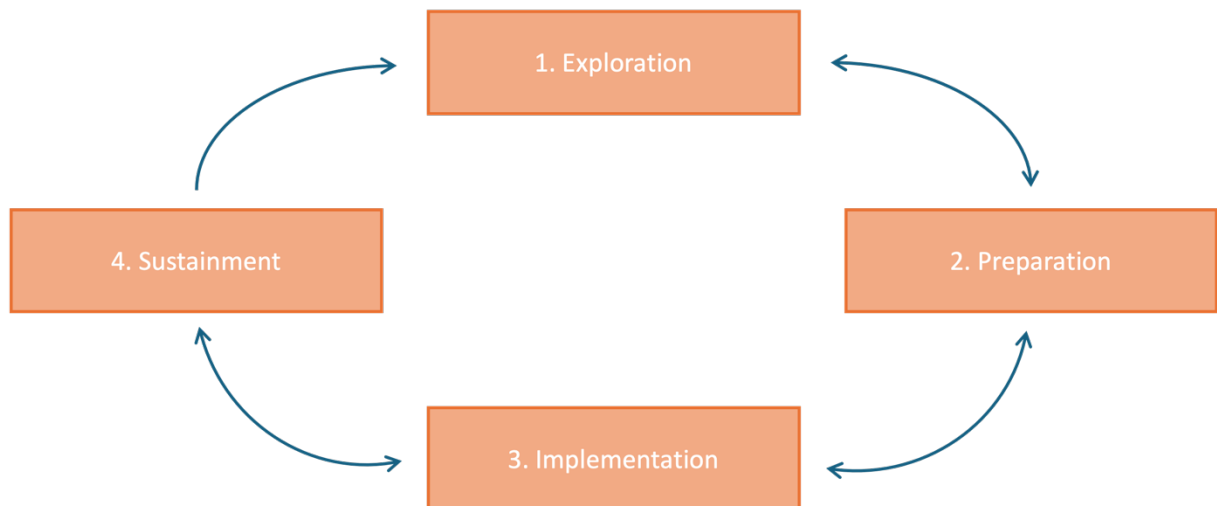


Figure 2. Own representation of the EPIS framework based on Moullin et al. (170)

### 3.3.1 Users' perspective

By exploring factors that are associated with dMHSs' acceptance among users, the results of study 1 and 3 can now be used to design AFIs for potential users of dMHSs and prepare implementation. To initiate measures aimed at preventing CMDs and inform about dMHSs, educational environments such as university settings appear to be the most appropriate according to potential users, given that this life stage aligns with a period of elevated risk for the onset of CMDs. As 1 out of 4 aged between 16 to 24 years has experienced at least one CMDs in the past year (171), the objective of educational institutions like universities should encompass not only to offer avenues for personal development and cultivating outstanding professionals, but also to foster the well-being of individuals. Especially in resource-limited settings, like student counseling centers, there is the strong need to enhance the acceptance, dissemination and adoption of digital therapeutic approaches that do not always require guidance. The results of this dissertation suggest that there is a need for well-defined assignments of responsibilities concerning the implementation and sustainment of information strategies on digital services for students' mental health. Addressing identified barriers and leveraging facilitators require coordination and understanding students' needs as well as preferences on dMHSs can help to design specific implementation strategies to support the implementation process. For instance, as a first step embedding bCBT

programs within the university setting could be valuable, as they are recognized as beneficial interventions for addressing anxiety and depression among students (study 3). However, even the best interventions are not effective if students are not properly informed about the available offer (study 1). Thus, for a sustainable implementation in the university setting, continued research on applicable information campaigns including the identified factors in study 1 and 3 seems crucial to increase awareness as well as improve uptake and user engagement with dMHSs (66).

Furthermore, especially the results of study 1 indicate that social media could be an effective tool to address hard-to-reach populations, such as medical and psychology students. As far as I am aware, there had not been any research on the potential impact of social media campaigns on the adoption of dMHSs among students. The findings suggest that utilizing targeted formats on popular platforms like Instagram or Spotify to disseminate information about dMHSs, addressing identified barriers and facilitators, could be a promising strategy for universities given the widespread use of social media among the student population and their preference for recommendations on dMHSs by public bodies. For instance, an Instagram post could be used to refer to a university-hosted website, containing an overview on verified and comprehensive information on various dMHSs tailored to the specific needs of students.

In line with previous research (116,118), the results of this dissertation also show that universities should try to offer dMHSs free of charge or think about alternative acceptable payment models, such as including costs for dMHSs in semester fees to increase uptake. Overall, facilitating conditions, such as financial and technical support as well as guidance from the university, will be needed to ease the dissemination of dMHSs among students.

### **3.3.2 Future healthcare providers' perspective**

The degree to which individuals believe that organizational infrastructures are given to support the use of dMHSs was also shown to be significantly influencing acceptance specifically among future HCPs (study 1 and study 2). Overall, care systems are still being viewed as not being ready for internet-based treatments by HCPs (90). To counteract, the German Federal Ministry of Health published the Digitalization Strategy for Health and Care (German “Digital-Gesetz”, DigiG) in March 2023, which was developed with varying stakeholder groups, including patients and HCPs (37). It outlines the development of digital healthcare and long-term care applications, such as dMHSs, as essential elements of digitally supported healthcare procedures.

Furthermore, there are intentions for DTx to incorporate comprehensive telemedicine treatment plans, with the active participation of healthcare professionals (37). It remains to be seen whether this strategy will pave the way for widespread dissemination of dMHSs in Germany.

To further close the large research-to-practice gap regarding digital interventions in healthcare, cost-effectiveness has been shown to be the primary reason for the successful integration of treatments into routine care (87), such as incentives from government agencies. Thus, different governmental strategies are needed to financially support dMHSs adoption. Yet, financial incentives as e.g., those of the HITECH Act in the USA (172), are perceived as lacking in European countries such as Germany (173). However, there are reimbursement schemes such as a German regulation that allows HCPs to charge a fee of about two euros for the initial prescription of DTx and about seven euros for the monitoring and evaluation of DTx that are used for the treatment of CMDs (174). It could be hypothesized that physicians and psychotherapists are either not yet aware of this regulation or perceive the remuneration as too low, which discourages them from prescribing DTx.

In general, the results of this dissertation show that future HCPs still have limited knowledge about and experiences with dMHSs. Among others, HCPs' concerns about increased workload and general effort were identified as limiting factors for the broad dissemination of digital technologies. The fear of HCPs seems to be that such digital solutions are too time-consuming and complex to integrate in daily working routines or could even potentially decrease the quality of delivered care. However, research could show that with sufficient training, technical support, and collegial support, those worries can be reduced, especially when monetary incentives are offered (125). Important facilitators that could be implemented include AFIs such as Continuing Medical Education (CME) seminars for HCPs or written guidelines and videos on official websites, e.g. hosted by professional associations or the Federal Ministry of Health. As results of study 2 showed significant acceptance differences between dMHSs (i.e., telephone, videoconference, VR, unguided and guided), consideration should be given to designing information strategies that focus on specific services, for example only on guided programs or only on DTx. Thus, stakeholders planning to design information strategies or training programs on dMHSs should focus on distinctly informing future HCPs about all kinds of dMHSs and their possible application area, including possible risks and benefits. The results of this dissertation can be used to design such AFIs.



Additionally, there seems to be one more essential factor that might help in overcoming infrastructure hurdles, which is the active involvement of HCPs in the development and implementation of dMHSs (125). This active involvement has been shown to enhance HCPs' capacity to handle applications such as dMHSs and foster independence from colleagues and support centers. Notably, the literature underscores the critical importance of user engagement and collaboration with product developers or pertinent stakeholders throughout the entire process, including design, development, deployment, and continuous utilization. This guarantees that, e.g., dMHSs, are tailored to their intended purpose, with a focus on understanding and meeting the needs and expectations of HCPs (125).

Finally, the results of study 1 and 2, including the identified person- and intervention-related barriers and facilitators, are specifically helpful for universities and education centers for HCPs to design AFIs as they give clear recommendations on how future HCPs could be reached. Even though we expected that future HCPs might have different concerns and preferences regarding dMHSs, the results of this dissertation show that perceived barriers and facilitators to the usage of dMHSs are similar to those that have already been identified in research among other target groups. However, there seems to be some interesting differences that should be considered. For instance, the importance of the scientific evidence base as well as the background of dMHSs' developers were previously not identified as that important in influencing the intention to use dMHSs, thus being specific to future HCPs. Additionally, anonymity seemed to be of higher importance than data security, while the option to get in contact with experts in case of emergency was perceived as crucial before recommending dMHSs to patients. AFIs explicitly designed to convey information on dMHSs to future HCPs should specifically focus on these factors. As a practical example, the student services center could inform medical and psychology students about dMHSs by designing an Instagram post with a short video explaining the advantages of dMHSs such as time and geographic flexibility and reducing concerns by referring to the scientific evidence base and emergency regulations of a dMHS specifically designed for exam anxiety, developed by practicing psychotherapists. Alternatively, a lecture on dMHSs could be held for all students during the freshman week or during a related course shortly before the exam periods begin.

However, although studies have shown that AFIs can increase intention to use dMHSs, effects are on average small. Thus, in order to enhance the effectiveness of interventions, two adjustments are crucial: First, future studies should be targeted more

specifically at a particular dMHS and a specific target population, potentially using the results of this dissertation for a more personalized approach with an intervention that is tailored to barriers and facilitators that are perceived by future HCPs. For instance, further research is needed to examine the optimal ways in which these interventions are able to connect medical and psychology students with dMHSs and how these interventions might enhance prevention in a manner that potentially diminishes the necessity for crisis care. Secondly, it is important to develop and evaluate AFIs using designs that have the capability to assess the incremental value of various intervention components. As it is still unknown which of the identified factors should be combined to design impactful AFIs, methods such as discrete choice experiments (DCEs) are needed. DCEs commonly use stated preference methods and provide the opportunity to investigate complex hypothetical choices of AFIs, by involving combinations of various information components (i.e., attributes), while controlling for interactions (175). For instance, participants are forced to decide between information strategy A and information strategy B, thus having to make trade-offs when engaging in a decision by choosing an information strategy on dMHSs that offers them the greatest benefit (176). Figure 2 provides an example of how such a DCE setting could look like.

	Option A	Option B
<b>Format</b> (how is information delivered?)	<b>Video</b>	<b>Brochure</b>
<b>Features</b> (what are the specific features of the dMHS?)	<b>Individualization options</b>	<b>Emergency contact options</b>
<b>Development</b> (how was the dMHS developed?)	<b>Scientific evidence base</b>	<b>Developers' background</b>
<b>Concerns</b> (which concerns are targeted?)	<b>Data security concerns</b>	<b>Legal concerns</b>
<b>Recommendation</b> (who recommends the dMHS?)	<b>Healthcare Providers</b>	<b>Patients</b>
<b>Which information strategy would you choose?</b>	<input type="radio"/> Strategy A	<input type="radio"/> Strategy B

Figure 3. A potential DCE-setting to design recipient-targeted AFIs

As studies have shown that there is a relationship between the perceived facilitators and barriers and the extent to which HCPs have adopted digital health (102), recipient-targeted AFIs are expected to increase dissemination across Germany significantly.

## **4 Conclusion**

This dissertation investigated factors (i.e., barriers and facilitators) related to the acceptance of dMHSs to deduce recipient-targeted AFIs for future HCPs in their special role as both potential users and future recommenders. Additionally, it is one of the first to exploit experiences related to the use or non-use of a dMHS within a bCBT program among students. Identified facilitators and barriers across studies were summarized and structured in person-specific (i.e., facilitating conditions, effort and performance expectancy, social influence, concerns) and intervention-specific factors (i.e., features, usability and development of dMHSs), which allows for more effective public health interventions. Generally, positive attitudes towards dMHSs were reported from both users and future providers, while higher acceptance towards blended programs in comparison to other forms of dMHSs indicate that a gradual integration of technology into routine care could be very promising. In summary, the insights gathered from this dissertation can be used for the design of information strategies to reduce skepticism as there seems to be a strong need to convey knowledge on dMHSs to various target groups. Specifically, the results are helpful for universities and education centers for HCPs as they give clear recommendations on how students and future HCPs could be reached. In regards to the EPIS framework, the focus of this dissertation was on the first phase, the exploration phase. Next, the preparation phase can be used to explore the effectiveness of different recipient-targeted information strategies that address the identified factors to conclude which strategies are best suited for students as users on the one hand and future providers on the other.

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