Private vs Professional Context: How does social Context affect the Stigmatization of mental Health App Users?

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Abstract

Despite the many benefits that mental health apps offer in the treatment of mental illness, the stigmatization of users discourages many patients from taking advantage of them. In this paper, we aim to clarify what exactly prevents people from using mental health applications. Our emphasis is on the comparison of private and professional social contexts. To examine the impact of these contexts, we extend the Unified Theory of Acceptance and Use of Technology (UTAUT) model by incorporating measures of mental health-related stigma. The results of our quantitative study consisting of 257 respondents, suggest that users' perceptions of the app's performance have the greatest impact on their intention to use it. Social context did not prove to be a predictor for app usage. We therefore conclude that the focus should be on educating people about the benefits of mHealth apps and working together with mental health patients and healthcare professionals to develop apps that truly meet the users' needs.

Introduction

Mental Illnesses

According to a 2014 study by the Robert Koch Institute sponsored by the German Federal Ministry of Health, one in three women and one in four to five men aged 18-79 have been diagnosed with a mental illness in Germany [33]. Exacerbated by the impact of the Covid-19 pandemic, the consequences of mental disorders are placing an increasing burden on patients and employers [58]. For example, patients diagnosed with a mental health problem in the past 12 months have nearly 3 times as many sick days compared to individuals without mental health problems. This results in an enormous financial strain, estimated at 600 billion euros per year in the European Union, from the cost of medical care and indirect consequences such as lost productivity [46]. Despite this, only a small proportion of those affected are in contact with the healthcare system (11 % of those with at least one diagnosis). One reason for this is the long waiting times for a psychotherapy place. According to the Federal Chamber of Psychotherapists in Germany, the time between diagnosis and the start of treatment was at least three to nine months for 40 % of patients in 2019 [13]. To address this ever-growing problem, experts are developing so-called e-mental health applications designed to help patients better manage their health conditions.

E-Mental Health Applications

E-mental health apps are digital solutions designed to support or improve the treatment of mental health conditions. To do this, they rely on a number of features that the affected patient can make use of independently in order to mitigate the negative consequences of their illness. These include methods such as self-monitoring and self-management, which, according to the definition of Barlow et al. refer "[...] to the individual's ability to manage the symptoms, treatment, physical and psychosocial consequences and lifestyle changes inherent in living with a chronic condition. Efficacious self-management encompasses the ability to monitor one's condition and to affect the cognitive, behavioral and emotional responses necessary to maintain a satisfactory quality of life." [7]. The use of e-mental health apps offers a number of advantages over conventional methods, which are briefly outlined in the following. Due to the high accessibility of the applications they can provide effective support for a high number of people in times when there is no access to psychotherapists [14]. Smartphones are already an integral part of daily life, and the aforementioned apps can be easily downloaded by anyone from the app store without the need for a prior psychological diagnosis by a medical professional. This, in turn, results in a lowered barrier to entry, and patients who are hesitant to seek professional care are more likely to do so because of the non-threatening nature of an app. In addition, the use of e-mental health apps is not time-limited, as is the case with an appointment with a therapist. Instead, they can be used at any time the patient wishes to take advantage of the immediate supporting
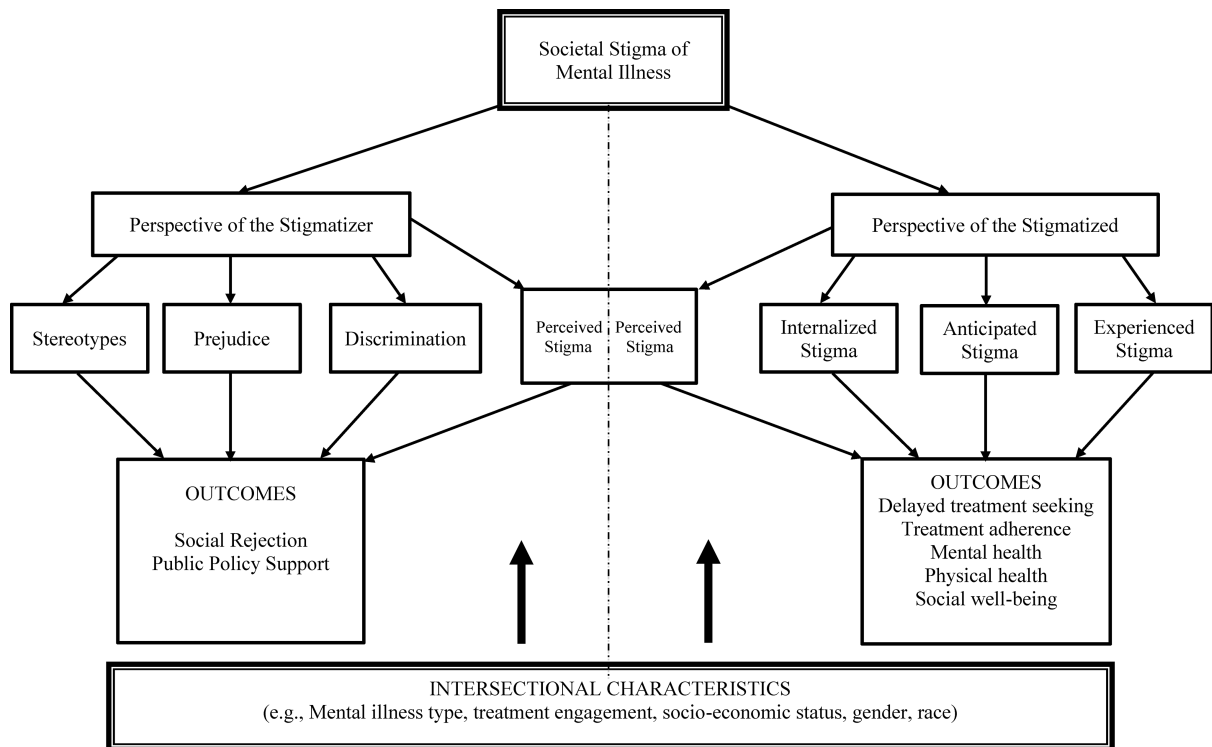
Figure 1: The Mental Illness Stigma Framework [20]

features of the app, providing real-time feedback and care. However, there is still one major obstacle that has a direct negative impact on the usage behavior of mental health app users - the general stigmatization of mental illness in society. Where this stigmatization comes from, in what forms it occurs, and what its consequences are, is explained in the following paragraph.

Stigmatization

Our paper addresses the stigma surrounding mental illness. The study of stigma is divided into the perspectives of the stigmatizer and the stigmatized [20]. We examine the latter perspective, which is further subdivided according to the Mental Illness Stigma Framework depicted in Figure 1. This declares four aspects of the stigmatized person's perspective: experience, anticipation, internalization, and perception. For our purposes, we will focus on experience and anticipation. Experienced stigma (ES) summarizes all events associated with stereotyping, prejudice, and discrimination that happen to a person with a mental illness. This includes everyday experiences such as unkind or unfair interpersonal treatment or offensive portrayals of mental illness in the media. It also includes acute events, such as being fired from a job or being shunned by others once one's mental illness becomes known. Sources of stigma may extend to family members, the work environment, caregivers, and the general community [60]. Anticipated stigma (AS) describes the fears of a person with a mental illness of being the subject of experiences of stigma and discrimination, as just listed. People may conceal their mental illnesses, but they are aware of the relevant stereotypes and draw conclusions or fear unfair or offensive treatment by others. Anticipated stigma is thus the logical consequence of experienced stigma [49].

Private and Professional Context

We aim to compare different social contexts in which an individual can be subject to stigmatization. For our purposes, the distinguishing feature is whether a context is to be considered private or professional. We define a private context as all situations that individuals experience in their leisure time, in particular time spent with friends and family. By professional context, we mean all situations that individuals experience in relation to their work, study, or school. These two contexts differ in whether their social interaction is rather voluntary or not. Put simply, we assume that people choose their private relations, such as friends and partners, more freely than colleagues and fellow students. We further assume that this voluntary basis in private relations could lead to fewer experiences of stigma and more support than in professional relations. Of course, there are more nuances to this:
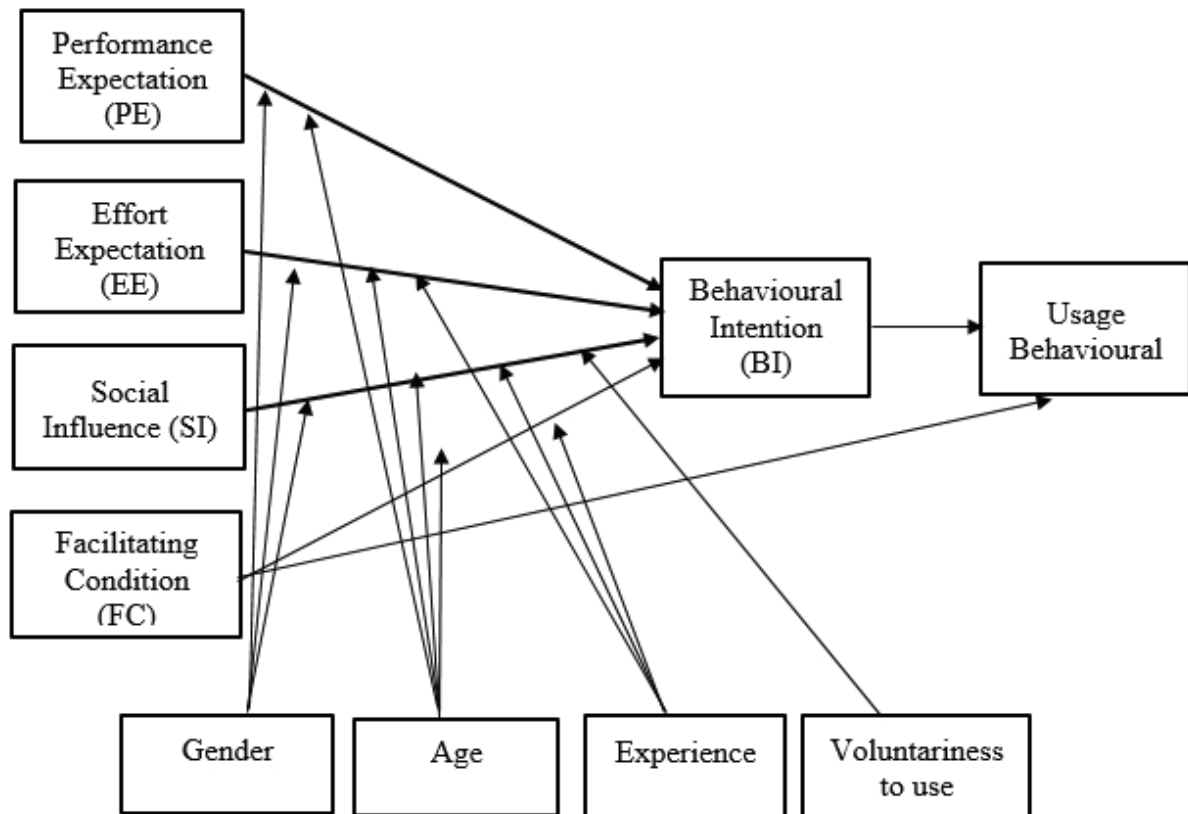
Figure 2: The unified theory of acceptance and use of technology [56]

close family members such as parents are not chosen freely, and their potentially negative conduct toward mental illness could have a major impact. On the other hand, employers could positively contribute to mental illness recovery through communication and support. In the following, we will integrate our distinction between private and professional contexts into established theory of technology acceptance in order to examine the adoption of mental health apps in both contexts.

Theory

The theoretical basis for our study of the stigmatization of mental health app users is the unified theory of acceptance and use of technology (UTAUT) [56]. The UTAUT model, which can be seen in Figure 2, explains how individuals accept and use new technologies, by integrating and extending several previous models, including the Technology Acceptance Model (TAM) and the Theory of Planned Behavior (TPB), and has been widely used in research on technology adoption. This makes it the perfect basis for our study to investigate the intention to use a mental health application. The framework establishes the following four key factors that influence an individual's intention to use a certain technology: Performance expectancy (PE), effort expectancy (EE), facilitating conditions (FC) and social influence (SI). Performance expectancy refers to an individual's belief that using the technology will facilitate them in certain activities. Effort expectancy means the degree of ease associated to the use of the technology. Facilitating conditions refer to an individual's belief about available support and resources for using the technology for a certain activity. Finally, social influence is the influence of important others, such as friends and family, on an individual's intention to use the technology. For our study of the use of mental health apps, we adapted the factor of social influence and replaced it by two factors measuring anticipated and experienced stigma, respectively (see Figure 3). In this way, we can gain a more detailed understanding of social influence and the specific factors that lead to changes in app usage intentions. The UTAUT model further includes the factors gender, age, experience and voluntariness of use as moderating variables. For our study of the use of mental health apps we combine the factors of experience and voluntariness of use to tech affinity. Furthermore, we embedded the social contexts "private" and "professional" into "Mental Health Application Usage" to validate contextual changes in use.
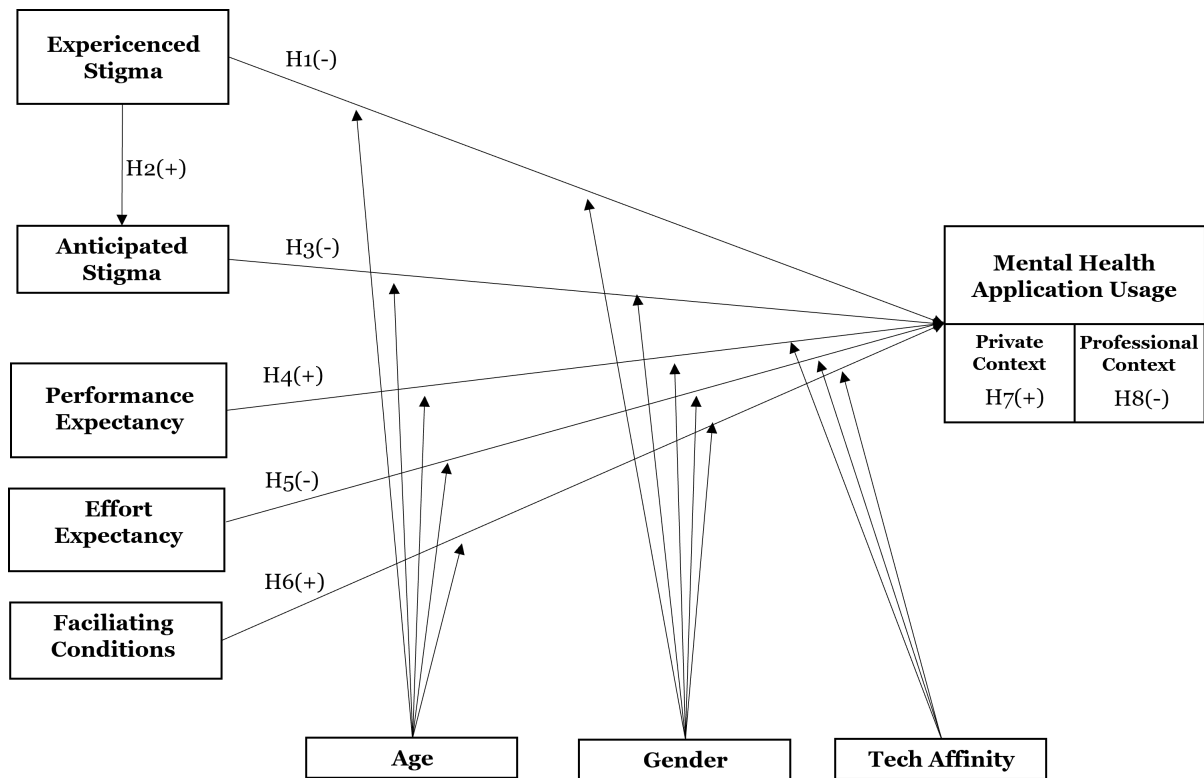
Figure 3: Our proposed Model including the Hypotheses H1 - H8

Hypotheses

We construct our hypotheses starting from our adapted UTAUT model that can be seen in Figure 3. All hypotheses set up in the following are noted in the model by their ID above the arrow of the influencing constructs. Constructs that enhance an effect are represented by a plus after the hypothesis ID and by a minus if they have a negative effect on the target construct. A summary of all the hypotheses raised can be found in Table 1.

In a 2022 study, Alluhaibi et al. examined the impact of stigma on the use of psychological help among Saudi adults [1]. The researchers were able to show that there was a significant relationship between attitudes toward professional care and the stigma experienced by participantsand concluded that this, along with psychological stress, were the biggest factors in under-utilization of mental health care. When individuals have been stigmatized for their mental health problems in the past, they consider it likely that they will experience similar stigma in the future once they disclose their condition. This is true even when the interlocutors are trained healthcare professionals, which resulted in less help being sought. Overton et al. came to a similar conclusion when they conducted a systematic literature review on how prior experiences of stigma influence intentions to seek psychological help [47]. Both studies focused on conventional treatment approaches in the form of personalized, one-on-one diagnosis and therapy by a trained medical professional. Based on these results, we deduce that the same relationship between experienced stigma and intention to seek help can be found in the use of mental health applications. By being able to use these apps in public settings where others can potentially see private information of patients, even more people could be subject to stigmatization, which in turn could make them less willing to use them. We therefore propose the hypothesis

> *H1: Experienced stigma will have a negative effect on the behavioral intention to use a mental health application.*

Experienced stigmatization can also affect the individual's perception of how others view mental health conditions. If they have experienced negative attitudes and behaviors from others in the past, they may believe that others hold similarly negative views about mental health conditions. This can lead to a self-fulfilling prophecy, where the individual expects to be stigmatized and therefore acts in ways that may elicit stigmatizing reactions from others. This idea is supported by Vogel et al. whose study found that the expected risks of talking to a psychologist increased with the amount of stigma experienced, while the expected benefits decreased [59]. Therefore our second hypothesis postulates a positive relation between experienced stigma and anticipated stigma.

H2: Experienced stigma will amplify a person's anticipation of being stigmatized in the future.

Anticipated stigma can make individuals feel self-conscious and worried about being judged by others. They may worry that using a mental health app will signal to others that they have a mental health condition or that they are "weak" for needing help. This fear of judgment can lead individuals to avoid using mental health apps altogether. In a systematic literature review of studies on anticipated stigma among young people Gulliver et al. identified perceived stigma as one of the main barriers to seeking help through traditional psychological therapy [23]. We hypothesize that this negative relation also persists in the use of mental health apps, regardless of the social context in which they are used. This leads to the hypothesis

H3: Anticipated stigma negatively impacts the intention to use mental health applications.

In 2016, researchers from the field of nutritional sciences investigated the effects of fitness and diet apps on sedentary behavior and diet quality in women [51]. The authors found that the usage of fitness and diet apps is positively associated with diet qualityand that performance expectancy is a key factor that influences the usage of these apps. We suspect a similar relationship for mental health applications and hypothesize that people affected by mental health issues are more likely to take advantage of an app if they perceive that using it will have positive outcomes, such as improved mental health or reduced stress. As already described in 1989 in a seminal work by Fred D. Davis "[...] no amount of ease of use can compensate for a system that does not perform a useful function." [15]. Davis therefore implies that increasing the performance of a system should be one of the maxims in the design process, rather than the ease of use of the system, which has often been overemphasized by developers in the past.

H4: A higher level of performance expectancy positively affects the intention to use mental health applications.

Although, as described in the previous hypotheses, the usability of a system is of secondary importance compared to the performance expectancy, it is still a key factor in the intention to use a digital system. The concept of effort expectancy refers to the perception of usability and ease of use of a digital system [57]and there are a number of studies that have proven that perceived ease of use is strongly correlated with the use of digital systems [15, 56]. In the case of mental health applications, effort expectancy refers to how easy or difficult users perceive the application to be for managing their mental health. The expected effort involved in using a mental health application could similarly have a significant impact on users' intention to use it. We hypothesize that if the user perceives the app to be easy to use and navigate, they are more likely to have a positive attitude towards the app and be motivated to use it. On the other hand, if the app is perceived as complicated and difficult to use and a slow learning curve is anticipated, the user may have a negative attitude towards the app and be less inclined to use it.

H5: An increased level of perceived effort expectancy for using a mental health application has a negative effect on the intention to use.

Next, we want take a look at how external factors that enable or hinder users' convenient adoption of mental health apps in their daily lives influence usage intentions. Venkatesh et al. defines facilitating condition "[...] as the degree to which an individual believes that an organizational and technical infrastructure exists to support use of the system." [56]. This includes factors such as availability, affordability or accessibility. Lawrence et al. identified that increased accessibility of websites via search engines directly leads to increased usage [37]. Gregorio et al. found that the lack of accessibility of mobile apps for the visually impaired is a major barrier that prevents app publishers from reaching more consumers and creating a larger user base [16]. Big tech companies like IBM therefore already require specific accessibility requirements for all newly developed software to ensure a wide-range adoption [32]. Furthermore a survey with 392 questionnaires has confirmed that usage of mobile apps is influenced by the cost [65]. From this we postulate that if a mental health application is accessible on multiple platforms and devices and is affordable or covered by insurance, it is likely to be more widely adopted.

H6: High levels of facilitating conditions positively impact intentions to use mental health applications.

Lastly, we will discuss the impact of social context on the stigmatization of mental health app users. Research has shown that the social environment has a profound impact on our physiological and mental well-being, with individuals that are supported by friends and family being better able to cope with a wide range of health conditions [52, 64]. Close family members and friends are believed to be more invested in the personal problems, feelings and needs of the affected person, which allows them to better understand their situation and thus provide them with better support. Based on this deeper understanding, we hypothesize that users will be less concerned about being stigmatized for using a mental health application in a social setting where they are surrounded by friends and family and therefore be more inclined to use the app.

Hypotheses	Relation
H1: Experienced stigma will negatively affect the behavioral intention.	ES → −BI
H2: Experienced stigma will positively affect the anticipated stigma.	ES → AS
H3: Anticipated stigma will negatively affect the behavioral intention.	AS → −BI
H4: Performance expectancy will positively affect the behavioral intention.	PE → BI
H5: Effort expectancy will negatively affect the behavioral intention.	EE → −BI
H6: Facilitating conditions will positively affect the behavioral intention.	FC → BI
H7: Private social context will positively affect behavioral intention.	Private → BI
H8: Professional social context will negatively affect behavioral intention.	Professional → −BI

Table 1: Summary of Hypotheses

> *H7: Individuals who are in a private social setting show a higher behavioral intention to use a mental health application.*

On the other hand, workplace relationships are generally of a more professional nature, focusing on the success of the company rather than the success of the individual [41]. Although work friendships exist, they are not the norm and studies have shown that they can even have a negative impact on work performance and personal well-being as the lines between personal and professional life become blurred [44]. Establishing and maintaining friendships requires investments of support and attention and over time, these extra investments may be fatiguing. Similarly, the potentially conflicting expectations of "friend" and "coworker" roles can result in incompatible goals and misunderstandings, further depleting energy and personal resources. With limited understanding of each other comes issues of stereotyping and stigmatization of people with mental illness. Research has shown that especially coping strategies which are for example seen in patients of schizophrenia such as social withdrawal and secrecy as well as bad social skills like little eye contact or inarticulate speech, are perceived as "strange", which can lead to social distancing of coworkers and consequently impair job performance [11]. To avoid these potential consequences we therefore hypothesize

> *H8: Individuals who are in a professional social setting show a lower behavioral intention to use a mental health application.*

Methodology

To evaluate our hypotheses we conducted a quantitative survey designed to reproduce all of the aforementioned factors influencing the stigmatization of mental health users in the private and professional context. We deliberately decided against a qualitative method and in favor of a quantitative approach, as this offers some advantages in relation to the research question considered in this paper. Due to the lower effort involved in collecting the data, we can study a large number of people and thus better identify accurate correlations in the data. This is particularly necessary to verify the validity of the research hypotheses we have established and to make a generally accurate statement about the influence of the behavioral manipulators under consideration. Furthermore, a quantitative study allows for high reproducibility and is able to scale the identified relationships to a larger set of people while maintaining their significance [35].

Quantitative Survey

To conduct the survey, we used the free survey application "Lime Survey", which is hosted by the Technical University of Munich and the Chair of Business Informatics of the Faculty of Computer Science and thus also complies with German data protection laws regarding the liability of survey content and copyright. Using the application, we created an online questionnaire and published and distributed it to the participating subjects via a hyperlink. Since the target group of our study is not limited by factors such as age or place of residence, our recruitment strategy was to contact as many people as possible via direct messages and posts in groups on social media such as WhatsApp, Telegram or Instagram. As an incentive for participation, two 15€ Amazon vouchers were raffled among all those who have completed the survey in full. The survey was completely anonymous and recipients were free not to participate or to drop out at any point. However, only fully completed questionnaires were taken into account in the subsequent evaluation. Participants were informed of this fact at the beginning of

the survey in the form of a disclaimer. In total, 257 people completed the questionnaire in full, constituting the final data set for our study. To ensure the validity of all scales used in the survey, it was offered exclusively in English.

Measurement

The survey scales for the manipulators experienced stigma, anticipated stigma were adapted from the UTAUT model [57] and, like the scales of the original influence factors (performance expectancy, effort expectancy, social influence, facilitating conditions and behavioral intention) of the Venkatesh et al. paper, break down into a seven-point Likert scale ranging from "strongly disagree" to "strongly agree." Age was measured by the participants' date of birth. Gender was recorded using the four options "male," "female," "other," and "Prefer not to say". We decided against integrating the survey categories of employment status, education level, income and occupation, nationality, racial and ethnic identity and country of residence. These demographic dimensions were not part of our adapted UTAUT model and were not relevant to our research question, but were intended for two other research teams using the same survey.

Evaluation with SmartPLS

We conducted our evaluation using partial least squares (PLS) regression. For this we utilized the software tool SmartPLS and based our assessment on the book "A Primer On Partial Least Squares - Structural Equation Modeling (PLS-SEM)" by Joseph F. Hair, Jr [25]. For the assessment with SmartPLS, we preprocessed the survey data and uploaded it into the software. All questions in our survey had textual answer options wherefore, we converted all answer scales from their textual unit of measurement to a numerical unit of measurement. In the next step, we defined how SmartPLS interprets the numerical answer scale of each question. All questions with a response scale from "strongly disagree" to "strongly agree" are interpreted on an ordinal scale. Ordinal scales refer to measurements where an increase or decrease gives meaningful information [25]. We specified the question about age to be interpreted on a metric scale. This kind of scale is similar to an ordinal scale, but uses precise and equal distances between each value [25]. For the following sections, we will refer to the survey questions as "indicators". Each indicator belongs to one of the factors in our model, such as experienced stigma or anticipated stigma. Furthermore, we will now refer to the factors in the model as "constructs". This terminology is in accordance with SmartPLS and Hair et al. To give an example: The first question is: "I would use mobile mental health apps in my daily life", with answers ranging from "strongly disagree" to "strongly agree". For the analysis, this question is now an indicator with a specific ID and with values ranging from 1 to 7. Several questions related to tech affinity were phrased negatively, so we reversed the scale of the respective indicators in order to achieve higher reliability and validity. In order to make use of the gender data in the PLS calculation, we however had to convert the data of this category to a binary scale of "male" and "female" as no reasonable ordinal scale or categorical analysis was possible with this answer set. Only few participants had chosen the answers "other" and "Prefer not to say" and we used the mean value of the remaining data to fill and fit them on the binary scale.

After preparing the data and uploading it into SmartPLS, we constructed our model in the software. We modeled our constructs, such as experienced stigma, as consisting of their respective indicators. We rebuilt our theoretical model by connecting these constructs. In order to increase reliability and validity, we subdivided the constructs of experienced and anticipated stigma into second-order constructs with coherent indicators. We therefore grouped the indicators of experienced stigma into the categories of personal relations, privacy, professional context, public services and authorities and medical context. The remaining indicators formed another second-order construct. We grouped the indicators of anticipated stigma in the categories of private context, professional context, public services and authorities and in the group of remaining indicators. Additionally, we deleted the indicators with lowest outer loadings in accordance with Hair et al. [25]. The affected indicators concerned marriage, parenthood, religion, neighbourhood and housing. We received responses from our participants that these sections of the survey in particular were perceived as vague and ambiguous. After finishing these steps, we used the PLS and Bootstrapping algorithms and let the software calculate our analysis. Our PLS calculation converged after two iterations. In the following, we will assess the reliability, validity, significance and and the outcome of our analysis.

Results

Reliability and Validity

Reliability refers to the consistency of a measure. A measure is considered reliable when it produces consistent results under consistent conditions [25]. In order to assess reliability, we used the measures of Cronbach's Alpha, Composite Reliability (Rho-A and Rho-C) and Indicator Reliability. Cronbach's Alpha and Composite Reliability focus on the constructs of our model. For each of these measures,the value should be above 0.7 for each construct according to Hair et al. Almost all of our constructs fulfill this requirement for Cronbach's Alpha and Rho-A except for a few of the ES and AS second-order constructs as can be seen in Table 2. This indicates light reliability deficits and that the questions should be more coherent, but is very close to the desired threshold. The Rho-C measure reaches sufficient values for all our constructs. Finally, indicator reliability looks at the outer loadings of each indicator [25]. Most of our indicators' outer loadings exceed the minimum value of 0.7. However, the indicators related to ES and AS mostly do not reach the minimum value. These measures indicate that the questions of ES and AS were perceived by participants as too ambiguous as it was reported in many responses. Validity refers to the extent to which the indicators of a construct measure what they intend to measure [25]. We assessed the validity of our results with the concepts of Convergent Validity. This concept evaluates the Average Variance Extracted (AVE) for each indicator and can be seen in Table 2. The minimum value is 0.5 and all of our constructs fulfill this threshold except for ES. This is again a result of the fact the related survey questions were viewed as too vague. Initially, the same applied to the construct AS, but we could increase the AVE value sufficiently by subdividing the construct into second-order constructs.

Construct	Cronbach's alpha	Composite reliability (Rho-A)	Composite reliability (Rho-c)	Average variance extracted (AVE)
AS	0.918	0.921	0.930	0.508
AS / Other	0.779	0.794	0.859	0.606
AS / Private	0.695	0.695	0.868	0.767
AS / Professional	0.845	0.845	0.906	0.763
AS / Public services and authorities	0.832	0.834	0.889	0.666
BI / General	0.811	0.819	0.888	0.727
ES	0.921	0.925	0.931	0.446
ES / Medical	0.696	0.696	0.868	0.767
ES / Other	0.735	0.746	0.849	0.653
ES / Personal relations	0.711	0.733	0.838	0.634
ES / Privacy	0.609	0.621	0.835	0.717
ES / Professional	0.726	0.727	0.845	0.646
ES / Government	0.690	0.692	0.829	0.618
EE	0.870	0.888	0.910	0.718
FC	0.743	0.743	0.854	0.661
PE	0.902	0.907	0.939	0.836
Tech Affinity	0.865	0.870	0.887	0.550

Table 2: Construct reliability and validity

Outcomes

We conducted a Bootstrapping algorithm with a sample size of 5,000 and a significance level of 0.05 in order to measure significance [25]. The resulting path coefficients and P-Values can be seen in Table 3. The significant relations are: AS has a relatively strong positive effect of 0.540 on ES with a clear significance of 0.000. ES has a light positive impact of 0.223 on BI in general contexts with a significance of 0.022. Finally, PE influences BI moderately positively with 0.354 for professional contexts, 0.434 for private contexts and 0.583 for general contexts, all with a clear significance of 0.000. All other relations did not reach the significance thresholds. The values for the moderators age, gender and tech affinity are not included in the Table 3 as they also did not reach significant levels.

Construct	Path Coefficients	P values	Significant	Hypothesis supported
AS → BI / General	-0.095	0.297	No	No (H3)
AS → BI / Private	-0.019	0.862	No	No (H3, H7)
AS → BI / Professional	0.003	0.974	No	No (H3, H8)
ES → AS	**0.540**	**0.000**	**Yes**	**Yes (H2)**
ES → BI / General	**0.223**	**0.022**	**Yes**	**No (H1)**
ES → BI / Private	0.094	0.397	No	No (H1, H7)
ES → BI / Professional	0.129	0.226	No	No (H1, H8)
EE → BI / General	0.012	0.893	No	No (H5)
EE → BI / Private	0.048	0.662	No	No (H5, H7)
EE → BI / Professional	0.119	0.230	No	No (H5, H8)
FC → BI / General	0.059	0.415	No	No (H6)
FC → BI / Private	-0.026	0.782	No	No (H6, H7)
FC → BI / Professional	-0.042	0.652	No	No (H6, H8)
PE → BI / General	**0.583**	**0.000**	**Yes**	**Yes (H4)**
PE → BI / Private	**0.434**	**0.000**	**Yes**	**Yes (H4, H7)**
PE → BI / Professional	**0.354**	**0.000**	**Yes**	**Yes (H4, H8)**

Table 3: Significance and Outcomes

Discussion

Performance

In H4, we assumed performance expectancy to have a big impact on the intention to use mental health apps. This hypothesis was not only supported, but we saw that performance expectancy is by far the solely most decisive factor. PE was the strongest predictor for BI for professional contexts (0.354), private contexts (0.343) and general contexts (0.583). This indicates that recovery and achievement of therapy goals are the main drivers for the adoption of mental health applications. Literature review strongly confirms this finding. Most research on the UTAUT model identified PE as the strongest contributor to technology acceptance. Taiwo and Downe conducted a meta-analysis to evaluate the findings of 37 empirical studies on the UTAUT model [6]. They state that the relationship between PE and BI is the only strong relationship within the UTAUT model. Dwivedi et al. conducted a meta-analysis based on 162 prior studies and identified PE as the strongest factor as well [17]. Williams et al. support this finding in another meta-analysis of 174 UTAUT-based studies [62]. These three meta-analyses looked at various contexts and innovations. Most research affirms that PE is also in the field of eHealth services the main driver of technology acceptance. Hennemann et al. showed in a cohort study of German employees that PE is the most decisive factor in the acceptance of occupational e-mental health technology [29]. Hoque and Sorwar showed that PE is the most important factor of the acceptance of mHealth for the elderly in Bangladesh [31]. Apolinário-Hagen et al. stated that PE is also decisive for mobile health apps among people with multiple sclerosis [4]. Hennemann, Beutel and Zwerenz showed in a cross-sectional study that social influence and PE are the strongest factors of technology acceptance for different eHealth services [27]. In another study, Hennemann, Beutel and Zwerenz stated that social influence and PE are decisive among health professionals in the adoption of eHealth in inpatient routine care [28].

We now want to examine the actual performance expectations of mental health app users according to literature. Research indicates that public perspectives on PE of mental health apps is mixed. Apolinário-Hagen, Vehreschild and Alkoudmani conducted a pilot study to assess expectations toward internet-based psychotherapy in the general population in Germany [5]. They state that the perspectives on usefulness, helpfulness and advantage were mostly negative. Further, a majority of the participants was not even aware of the existence of internet-delivered therapies. In another study Apolinário-Hagen et al. compared public attitudes toward different forms of psychotherapy [2]. They showed that face-to-face therapy was perceived as the most useful format, followed by therapist-guided internet interventions. Unguided internet interventions were viewed as the least useful. A majority however perceived internet-based therapy formats as useful in general. Gun, Titov and Andrews stated that users of internet based mental health therapy were viewing it as more useful if they had previous experiences with internet treatments or if their symptoms were rather moderate [24]. The researchers stress the need for further eHealth education in order to target common misconceptions as studies show that high-quality mental health apps are effective in the recovery of different mental illnesses. Research shows that the actual quality and performance

of mental health apps is high compared to public expectations. Firth et al. stated the positive performance results in a meta-analysis of apps targeted at anxiety [19]. Firth et al. showed in another study similarly positive performance evaluations of depression-related applications [18]. Heber et al. supports these findings for applications targeted at stress reduction [26].

Evidently, there is a clear indication in our results and an overwhelming consensus in research on the impact of PE. Consequently, users of mental health apps are motivated to adopt the technology if their perceptions of the performance of the apps is high. The opposite applies if their beliefs about the efficiency and outcome of the apps is low. Public attitudes toward the effectiveness and performance measured are rather low in contrast to the actual performance results of high-quality applications. We interpret these findings to show that users are still sceptical of mental health apps and would want them to be scientifically profound and, consequently, useful in their recovery. In summary, performance expectancy is the main driver of the adoption of mental health apps. In order to facilitate the successful utilization of mental health apps developers should transparently integrate scientific foundations of psychotherapy. It is hard to influence public beliefs about the usefulness of mental health apps in general, but educators should aim to resolve negative perceptions about their usefulness. Future research could make use of a revised UTAUT model. Several studies stated that a further adaption of the UTAUT model is better suited to measure technology acceptance by the introduction of the construct of "attitude" that is also influenced by PE. Dwivedi et al. proposed this on a general level, Apolinário-Hagen et al. showed this in the specific context of mental health applications [17, 3]. They stated that the construct "attitude toward mobile health applications" was an even better predictor for BI than PE in the extended UTAUT model.

Stigma

In H2 we assumed experienced stigma to have a positive effect on anticipated stigma and this hypothesis was clearly supported by our findings. Research confirms the strong effect of ES on AS. Budhwani et al. did so in the context of HIV patients, Milačić-Vidojević et al. showed the relation among people with physical disability [12, 43]. Van Boekel et al. supports this correlation in a study concerning substance abuse disorders [55]. We consider this correlation to be the expected logical consequence of past stigmatization. People with mental illnesses or other disorders who experienced discrimination and stigma towards them are very likely to expect and anticipate similar events in the future. In H1 and H3 we expected experienced stigma and anticipated stigma to both have a strong negative effect on the intention to use mental health apps. Both hypotheses were not supported. Anticipated stigma had no significant effect on the behavioral intention. We identified experienced stigma to have a lightly positive relationship with behavioral intention in general contexts. Unexpectedly, the measured influence of ES and AS was very low. We see the reason for this in the fact that users of mental health apps are primarily interested in their performance. Users perceive anticipated stigma not as a barrier to use mental health apps. We interpret the slightly positive correlation between ES and BI to mean that people with a history of discrimination due to a mental illness have a greater connection to the topic and are therefore more likely to see the possible benefits of such an app. On the other hand, individuals who have not had any experience with mental health problems are less able to imagine using an mHealth app in everyday life. Research on the impact of stigma on the adoption of mental health apps comes to mixed results. Several studies confirm that stigma has no strong effect on the intention to use mental health apps. Golberstein, Eisenberg and Gollust state that there is no significant association between mental health help-seeking behavior and public stigma among university students [22]. Borghouts et al. assessed in a study of college students that stigma had no statistically significant effect on the intention to use mental health mobile apps [10]. Levin, Krafft and Levin showed in another study that college students' intention to use self-help for mental health including mobile apps was unrelated to stigma [38]. Stoll et al. performed a study concerning the acceptance of an app targeted at anxiety reduction for children [53]. They detected low signs of stigma and suggested high social acceptability.

We suggest that the missing effect of anticipated stigma on the use of mental health apps can be explained with the discrete self-help character of their use in contrast to traditional face-to-face therapy. Consequently, it is useful to compare the stigma related to mental health apps with other formats of psychological interventions and therapy. Research is divided or differentiates on whether stigma leads to a preference of traditional face-to-face therapy or the use of mental health applications. Lamela et al. stated that internet-based psychological interventions exhibited lower acceptance than face-to-face therapy among Portuguese participants due to stigma [36]. Bird, Chow and Yang support this finding among US university students [8]. Kim, Xu and Wang however stated that higher levels of stigma lead to a preference of internet-based therapy methods over traditional therapy among US college students [34]. Levin et al. showed mixed findings in another study among US university students [39]. They stated that stigma was a barrier to online mental health self-help, but that the reluctance toward face-to-face therapy was even greater. In a further study, Levin showed that greater stigma among university students related to lower intentions to seeking face-to-face therapy, but had no effect on seeking self-help [38].

However, there are also examples of studies where mental health app usage was related to higher levels of stigmatization. Ribanszki et al. found in a study that British adolescents had high awareness of the stigma surrounding a selected mental health app [50]. Participants perceived it as a risk to be seen while using the app among family, friends and in public. They were also cautious about whom to speak to about the the app. In general, the presence of other people was a barrier to using the app. Mental health was perceived as a "private matter that belonged behind a closed door". Participants described the term "mental health app" as loaded and suggested alternative terminology such as "stress-reduction" and "well-being". Examples of stigmatization of mental health in work contexts are given in the next section, [61, 48, 63, 42]. As a result of the mixed findings, we suggest that the stigma related to mental health apps exists to some degree in relation to contexts or other individual factors. But as stated in the next section, we did not succeed in identifying how private or professional context influence it.

Context

Our findings indicated that there are no significant differences of mental health app use intention in different contexts due to stigma, but only in relation to performance expectancy. However, the design of the study was not well-fitted for the evaluation of factors in different contexts. The survey contained various context-related questions, but our adopted UTAUT model was not suited to measure stigma in relation to context and did initially not include a specific construct for context. Consequently, it was difficult to integrate context measurements in the evaluation of the survey and model. The survey contrasted private and professional context to some extent, but not sufficiently. Instead, many questions concerned other contexts such as family, public services or religion. We received several responses from our participants that these questions were viewed as too vague and ambiguous. Some questions concerning parenthood and marriage were not applicable to many of our participants. Further, the survey did not sufficiently enquire the stigma related to mental health apps, neither in general or in specific contexts. More general limitations are discussed in the following section. As a result, our approach to measuring the effects of context and associated stigma in mental health app use was unsuccessful and needs to be revised for future research. We recommend to integrate a specific construct to measure context. Its indicators should extensively measure private and professional factors in order to achieve a better comparability.

In the following we show perspectives of relevant research on the topic. There is broad evidence in literature for workplace stigma and discrimination toward mental illnesses. Hipes et al. showed significant discrimination against job applications that indicated a history of mental illness [30]. Bjornshagen supports this finding [9]. Stuart showed that people with mental illnesses experience various forms of direct and indirect discrimination from employers and coworkers that ultimately lead to employment inequity [54]. However there is only little research on different levels of stigma of mental health topics in relation to specific work contexts. Wesemann et al. found that awareness for stigma related to alcohol use disorders was significantly higher for colleagues in military-specific contexts than in civilian workplace contexts [61]. They state that military personnel could be more inclined to view their alcohol use disorders as a personal weakness and develop higher levels of shame and secrecy. Yamawaki et al. conducted a study among US military personnel and found that workplace environments played a crucial role in mental health help seeking [63]. Gender, rank, workplace hostility and satisfaction toward leaders and coworkers were identified as indicators for stigma related to mental health within the military work context. Peters et al. conducted a study in male-dominated workplaces and found that participants viewed the term "mental health" as highly stigmatized [48]. They recommended to use language with a smaller stigma burden, such as "wellbeing", "resilience" and "mental fitness". Participants further expressed insecurity about how to talk about the topic. Michaelis et al. conducted a study among German employees and found light to moderate fear of stigma related to the use of mental health apps in work contexts [42]. These studies show that work contexts can have a strong impact on the perception of stigma related to mental health. Our goal was to compare work contexts with private contexts as we assumed higher levels of stigma in professional and work contexts than in private contexts. Research however comes to mixed findings concerning private contexts. Moses found in a study that US adolescents experience the most stigma related to mental health among their peers, followed by stigma in family contexts [45]. School staff was rather reported to be supportive than to be a source of stigmatization. Gaddis, Ramirez, and Hernandez, in a study of 60,000 U.S. college students, showed that mental illness stigma in the school context was related to medication use and therapy or counseling visits, and that students had negative attitudes toward talking about their mental illnesses both to school officials and in personal relationships [21].

Lindsey, Joe and Nebbitt found that among African Americans, the role of family support related to mental health is significantly more important than the role of both professional and peer support [40]. These studies show that the comparison of mental health stigma in private and professional contexts is not simple, but complex and multifaceted. Private contexts may not necessarily be more supportive and encouraging to the use of mental health apps than professional contexts. Future research on this topic can use our work as a starting point and can

incorporate our results and suggestions in order to develop a more effective approach to measure the impact of contexts.

Limitations and Future Work

We acknowledge that our study has limitations that need to be addressed in future work. These are described in the following. After the surveys were completed, we received feedback from several respondents that they often felt overwhelmed by the questions asked and did not know how to answer them. To avoid a partially incomplete data set, we required respondents to provide an answer to each question and to complete the questionnaire to the best of their ability. As some of the questions, such as "Have you been treated unfairly by mental health staff?" or "Have you been treated unfairly in your role as a parent to your children?" already inferred that every respondent has experience with a mental health problem or is a parent, there was no clear way for them to answer these questions, resulting in some selecting the "Neither Agree nor Disagree" option and others choosing options at the edges of the Likert scale. This in turn led to inconclusive results and low validity and significance for certain questions. In the future, respondents should either have the option to skip questions they cannot answer, or questions must be edited to avoid making assumptions about the interviewee. To better identify differences in the influence of context on the stigmatization of mental health app users, these contexts need to be better partitioned in the underlying research model and survey. By asking questions that target only a specific context setting, we could be able to produce a more expressive result than we were able to in this study. This could be achieved by including two separate blocks in the questionnaire that examine stigma factors in the private and professional context separately. In this way, clear correlations can be established between the contexts in which mental health apps are being used and the stigma faced. The survey we used to evaluate our research question was designed to provide data for two other research groups working on similar issues of mental health app stigma. While this helped us collect more data overall by combining data sets from all the individual research groups, it also meant that the questionnaire was not perfectly tailored to our specific topic. Because of this we ended up with a lot of data that was not relevant to our study and at the same time, we lacked data in areas that directly concerned our topic. In the next work, a more condensed version of the survey should be created to better understand specific social contextual factors. We also consider it useful for future work to include a greater focus on the presumed user base of mental health apps - people who have experienced mental health problems in the past or are currently living with a psychological condition. Individuals with a mental health condition have first-hand experience of the stigma and discrimination associated with mental illness. This means that they offer a unique view of mental health stigma and can provide a more nuanced and accurate answer to the question of what factors drive mental health stigma in various contexts. Their opinion is crucial, as healthcare apps should be designed specifically to help their needs and generate the maximum benefit factor for users with a mental illness.

Conclusion

With an increasing need for e-mental health technologies to tackle the problem of limited resources in conventional psychological therapy and the shift towards mental health applications, we aim to better understand how stigma affects the use of mHealth apps. In this study, we theorized that the extent of stigmatization faced by users of mental health apps in everyday life is highly dependent on the social context in which they find themselves. In order to verify this hypothesis, important factors influencing users' intention to use a mental health application were explored through a quantitative survey with 257 participants based on an adapted version of the UTAUT model. The results of our study suggest that there is no strong correlation between the social context in which a person finds themselves and the behavioral intention to use a mental health application in that setting. Rather, the expected performance of the application is the driving factor that determines whether or not a person would use it. This implies that the limited use of mental health apps is not necessarily because people fear being stigmatized by others for using the app, but because they feel the technology does not provide them with the desired benefits and therapy they are looking for. Therefore, developers need to focus even more on working with healthcare professionals and patients with mental illnesses to design apps that can truly help users. In doing so, we could immensely relieve the burden on the healthcare system while helping a growing number of patients by providing them with immediate, affordable and effective care.

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