

# Usability Evaluation of Mental Health Apps – A Quantitative Examination

## Masterarbeit

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# 1 Introduction

## 1.1 Relevance and Motivation

Major depressive disorder (MDD) is the most common and impactful mental illness internationally (Klein and Berger, 2013; Melchior, Schulz and Härte, 2014). According to the World Health Organization (WHO) 3.8% of the world population is affected by MDD and suicide is committed by over 700.000 people annually (WHO, 2021). The estimated lifetime prevalence<sup>1</sup> averages 16% to 20% worldwide (Melchior, Schulz and Härte, 2014; Otte *et al.*, 2016). Additionally, crises like the global COVID-19 pandemic that emerged in 2020 exacerbate the public mental health (Bujard *et al.*, 2021).

Consequences of MDD are not only shown by the sufferings on the individual level, but also by high economic costs. Researches show independently of the willingness to work that adults with the diagnosis MDD experience more frequently fluctuation and tend to be more often unemployed than adults without MDD (Evans and Repper, 2000; Harvey *et al.*, 2009; Greenberg *et al.*, 2021). In 2018 the economic burden<sup>2</sup> in the United States amounts to 326.2 billion USD, which is an increase of 37.9% compared to 2010 (Greenberg *et al.*, 2021). In Germany the estimated economic burden amounts to 15.6 billion EUR per year (Krauth *et al.*, 2014). The majority of the economic burden are workplace costs (Greenberg *et al.*, 2021). It is evident that “[e]ffectively treating MDD could reduce the economic burden in the workplace by reducing presenteeism and absenteeism” (Greenberg *et al.*, 2021, p. 661).

Substitutional, or in addition to psychopharmacological medication MDD patients should receive professional treatments by psychotherapists (DGPPN, BÄK, KBV, AWMF and ÄZQ, 2015). However, there is a significant gap between supply and demand of psychotherapy (Bundespsychotherapeutenkammer, 2013).

Internet-based cognitive behavioral therapy (iCBT) programs which are often offered by health insurances can replace the face-to-face therapy for the treatment of mild to moderate MDD, as it is evident that the overall effects of both are comparable (Mathiasen *et al.*, 2016). Besides the iCBT programs there are many more applications that target the mental health and well-being. In general, online-healthcare services (OHS) have potential to facilitate and enhance mental

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<sup>1</sup> Risk of falling ill during a person's lifetime

<sup>2</sup> The economic burden is a composition of direct costs, suicide-related costs, and workplace costs. Direct costs include average medical and pharmaceutical costs. Suicide-related costs are estimated based on the human capital method and stratified by age and sex. Workplace costs imply costs due to days of absence (absenteeism) as well as costs due to lower productivity while at work (presenteeism).

health care. The great advantages of OHS compared to face-to-face treatments are the time and location independence as well as the unlimited availability, cost-effectiveness and stigma avoidance (Neary and Schueller, 2018).

## **1.2 Objective, Research Question and Structure of Work**

Although it has been proven that OHS, respectively iCBT programs can be clinically effective forms of psychotherapy, the actual usage is quite low. The uptake rates of MDD patients using OHS vary between 3% and 25% (Kaltenthaler *et al.*, 2008; Woodford *et al.*, 2011; Lillevoll *et al.*, 2014; Whiteside, 2014; Ebert *et al.*, 2015). Despite the growing cases of mental illness, the state of research of usability and technology acceptance of OHS in the context of mental health is still expandable. Furthermore, the literature frequently relies on the effectiveness of iCBT programs (Kaltenthaler *et al.*, 2008; Woodford *et al.*, 2011; Whiteside, 2014) but neglect other available mental health apps.

Previous research aimed to evaluate the usability with the use of qualitative approaches. User reviews in app stores have been analysed (Alqahtani and Orji, 2019), interviews have been conducted (Sinclair *et al.*, 2013; Taiminen and Saraniemi, 2018; Wong *et al.*, 2021) or literature has been systematically reviewed (Inal *et al.*, 2020; Chan and Honey, 2022). Quantitative databases, which could bring further insights and knowledge, are very limited. Moreover, the results of usability evaluation have rarely been put in the context of technology acceptance. Acceptance research in mental health apps is also insufficiently developed. There are many studies that apply the technology acceptance model (TAM) by Davis or that conduct research at TAM on electronic health (eHealth) and mobile health (mHealth) applications (Mohamed *et al.*, 2011; Alloghani *et al.*, 2015; Kalayou, Endehabtu and Tilahun, 2020) but not in the domain of mental health. A fortiori, usability and technology acceptance of mental health apps were never investigated in combination.

For this reason, this thesis aims to evaluate the usability of general mental health applications by using a quantitative approach and to investigate whether the user's usability perception has a significant influence on the acceptance of this technology.

This leads to the following research question:

**In which way does the usability of mental health apps influence the intention to use mental health apps?**

To answer this research question, a survey is conducted, and the empirical data is analysed by applying partial least squares structural equation modelling (PLS-SEM).

This thesis is divided into x sections, which build on each other in terms of content and methodology. In the first chapter an overview of the relevance, motivation and objective has already been given. To generate fundamental knowledge for the further research work, the theoretical foundation is stated in chapter 2. For this purpose, a brief overview of the illness MDD is provided in section 2.1. It is shown what causes MDD, how MDD is diagnosed, how the course of MDD and how the mental health care situation looks like. In section 2.2, the current situation of OHS acceptance and usability research is explored. The terminology user acceptance and usability are defined in section 2.3 and after that, fundamentals regarding the TAM, the Delone and McLean IS Success Model (D&M IS Success Model) and the Health Information Technology Evaluation Model (Health-ITUEM) are provided. Chapter 3 presents the research model of this thesis and the developed hypotheses which are based on the previous theoretical foundations. In chapter 4, the research methodology is explained, including the operationalization of the latent variables in section 4.1, the survey design and data collection in section 4.2, and the applied methods to analyse the empirical data in section 4.3. The actual empirical analysis is presented in chapter 5. The analysis is divided in two steps. Primarily, the measurement model is evaluated in section 5.1, and secondly, the structural model is estimated in section 5.2. In chapter 6, theoretical and practical implications are stated before the study limitations were reflected. The conclusion of this thesis is presented in chapter 7.

## 7 Conclusion

Major depressive disorder is a serious condition, that causes sufferings on the individual level but also costs economies several billion euros annually. Regarding crises like the COVID-19 pandemic, one can assume that the cases of MDD will increase. The health care situation is already tense as the demand for psychotherapy exceeds the supply. Merely a quarter of the people who have MDD and are willing to get a treatment receive treatment in an appropriate time period. On average the waiting time for psychotherapy is three to six months which is too long for an acutely affected person.

Although, studies on OHS such as iCBT programs confirm evident positive effects of mental health applications on the recovery process, only a small fraction of MDD diagnosed people who are in need of treatment uses eHealth or mHealth programs. As the implementation of those IS is in many respects beneficial, this master thesis addresses substantial research on technology acceptance and usability. A quantitative examination has been conducted to answer the research question: In which way does the usability of mental health apps influence the intention to use mental health apps?

A higher-order research model has been developed based on TAM, D&M IS Success Model and Health-ITUES and an adapted questionnaire was used to collect data. PLS-SEM has been applied to analyse the empirical data. The analysis results to the following response of the research question. Within the proposed research model usability does not influence the intention to use mental health apps directly. The analysis revealed a weak influence which however is not significant. Since usability determines the constructs user satisfaction and perceived net benefits which in turn determine the intention to use, indirect impacts of usability on the intention to use are found. The analysis results show significant positive effects. Consequently, one can say that usability is important to evaluate, as it influences the technology acceptance of mental health apps positively via detours.

For practice, this means that software developers must examine the needs of potential mental health app users and respond to it adequately to increase actual usage. Nonetheless, the results of this study must be viewed with caution as limitations are present. Further research should be less restricted by the sample and theoretical approach. In addition, cross-cultural investigations could bring added value for research on technology acceptance as well as for the practical implementation of mental health applications.