

Exploring the relationship between the mental health status of young adults and their willingness and engagement in Digital Mental Health Interventions: A Mixed-Methods Study

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Abstract

Digital Mental Health Interventions (DMHI's) face low adoption rates and lack of engagement and mental health issues may pose a barrier to start or engage. This research aims to examine the relationship between mental well-being and willingness of and engagement in young adults to use DMHIs. A Mixed-Method Study was conducted, with a qualitative interview study (n = 10) and a quantitative cross-sectional survey study (n = 47), all between the ages 18 to 29, fluent in English and explicitly granted written and/or verbal consent to utilize their data. The interview study (males = 4, females = 6), aged 18 to 23 (M = 21.5, SD = 1.5) and in the survey (males = 25, females = 22) aged 18 to 29 years (M = 23.27 SD = 2.66). Data was analysed using thematic and statistical analysis such as correlational and regression analysis.

As for the results, the interview study provided insights into the barriers and facilitators of digital well-being tools and the way to target the needs of young adults. Examples were increased personalization and tailoring features, incentives, and simplicity. Additionally, it was found that users view DMHI's as an entry-level tool to conventional therapy. Survey results showed a relationship between willingness/engagement in DMHI's and mental health in young adults, in so far, that higher anxiety was associated with higher engagement (B = 19.88, t (2.42), p = .02, SE = 8.21). No significant results were found for Depression and Stress disorders. Higher general mental well-being (Warwick-Edinburgh) was positively correlated with willingness/engagement (r = .101). In conclusion, both hypotheses were rejected. Contrasting results in present literature highlight that additional research is needed. The main barrier to engagement was a lack of a user-centered design and providing more configurability and other aspects to promote engagement.

Keywords: Young adults, mental well-being, digital tools for well-being, DMHI, willingness, engagement

Exploring the relationship between the mental health status of young adults and their willingness and engagement in Digital Mental Health Interventions: A Mixed-Methods Study

The technology revolution has drastically changed the everyday lives of society especially younger generations (Hillyer, 2020). This growth of technology use also resembles the increasing mobile phone users, with more mobile phones existing than people on earth (Hillyer, 2020). However, though beneficial in many aspects, technology has drastically changed society and ways of living and comes with certain drawbacks, such as its contribution to mental health issues, such as depression and self-harm (Jurewicz, 2015).

The prevalence of such disorders has grown worldwide (Twenge & Campbell, 2019), especially for depression and anxiety, reaching into the hundreds of millions of individuals globally (Teepe et al., 2023). This prevalence was further intensified through the COVID-19, exacerbating a digital life, high unemployment rates, financial problems and reduced social interactions, substance abuse and other conditions, which may lead to a subsequent rise in suicidal behavior (Gega & Aboujaoude, 2021; Sher, 2020). This was also confirmed by the World Health Organization (WHO), stating that depression and anxiety rates increased by 25% alone in the first pandemic year, further expanding the gap for access to treatment (World Health Organization, n.d). As this shift towards digitalization occurred so rapidly in the past few years, this new digital revolution has changed the way individuals communicate, led to a decrease in face-to-face interactions and social support, possibly negatively affecting mental health (Twenge & Campbell, 2021). Thus, a solution for this, ‘digital therapeutics’ emerged (Gega & Aboujaoude, 2021).

The so-called “Digital-Revolution” significantly influenced society, including their mental health, highlighting the importance that digital technology is used in a conscious and creative manner to improve its user’s mental health (Hoehe & Thibaut, 2020). Since today’s

society relies heavily on technology, especially after the COVID-19 pandemic, digital interventions as an alternative for mental health issues has increased (Weir, 2021), with more than 100 new DMHI's being launched annually (Roland et al., 2020). Examples of such tools are mental health apps, educational programs, progress monitoring, medication reminders or even screen time limits, and other digital tools that supports individuals to improve their mental health and self-manage important daily tasks. Great advantages of DMHI's are anonymity, increased access to the worldwide population, flexibility, reduced cost, time, and stigma as compared to conventional therapy sessions (Gan et al., 2021). However, low adoption rates, reluctance to pay and little support from healthcare professionals has been observed over the past years (Gega & Aboujaoude, 2021).

According to a study from 2018, including mental health apps' effectiveness in treating anxiety and depression, researchers noted that engagement was an important factor in its effectiveness and stated, "High drop-out rates or low compliance may limit the effectiveness of computerized therapies" (Andrews, et al., 2018). Individuals with mental health conditions, who could benefit most from such digital intervention tools, often experience symptoms such as lack of motivation to use and engage in such well-being apps (Ebert et al., 2018), though they are the target group and should benefit from such tools. In many cases, DMHIs rely on self-motivation and self-discipline to use them effectively and individuals with mental health concerns may struggle even more to prioritize their mental health owing to other demands and stressors in their lives (Lyzwinski, 2019). Researchers and designers have been addressing the challenges of low engagement to increase effectiveness and user-friendliness through gamification, behavioral nudges as well as user-centered design, by involving users in design processes (Friederichs et al., 2016). However, research suggests that DMHIs still have high dropout rates or limited users, especially among individuals with serious mental health concerns (Lattie et al., 2019). Current literature suggests that while digital tools for well-being have the potential to be effective and to possibly revolutionize

healthcare, further research is needed to improve engagement and retention among individuals with mental health concerns.

Goal of Research

This thesis aims to better understand user perspectives and the relationship between mental health status of young adults and engagement with DMHIs. The goal is to tailor and better support individual's needs in terms of such digital tools, to develop effective interventions in the future, especially for those struggling with mental health.

The research will employ a mixed-methods approach, including interviews and an online survey, with the research question being: "*Is there a relationship between the mental health status of young adults and their willingness to use and engage in DMHIs?*" The interview will be conducted first since the questionnaire builds on them to identify gaps in the survey. Great focus for this research question will be put on the Technology Acceptance Model (TAM) to study acceptance and use of DMHIs. The TAM includes perceived usefulness and perceived ease of use, which drive users' intention and motivation to use technology (Manz, 1986; Gagné & Decis, 2005), which is related to the objective of this paper.

Next, two hypotheses were formulated based on the literature review:

H1: *There will be a significant relationship between the mental health status of young adults and their willingness to use and engage in DMHIs.*

H2: *Young adults who report high levels of anxiety, depression, and/or stress will be less willing and engaged to use DMHIS compared to those who report low levels of anxiety, depression, and/or stress.*

Method

Design

The Mixed-Methods research design made use of qualitative and quantitative data. The two forms of data collection were conducted separately and participants taking part in

one of the studies were not expected to participate in both. In addition, the research comprised of a correlational study, investigating for a possible negative or positive relationship between mental health and willingness/engagement in the context of DMHIs.

Firstly, the researchers collected qualitative data in the form of digital interviews with individuals that have experience with the use of digital tools for mental health (Study 1). The interview included largely open-ended questions about the participant's perceptions and opinions concerning such tools, to gather more in-depth information on participants' experiences, attitudes, and perceptions related to mental health and technology use. In the end, a total of 10 interviews were held, consisting of 4 males and 6 females. Building on this qualitative data, a survey questionnaire was designed, extracting interesting themes into the survey.

The quantitative component of the study included demographic questions, multiple-choice questions, and Likert scales, mainly concerning mental health and the use of, and perception of certain aspects of digital tools for well-being (Study 2).

The integration of both types of methods of data collection was valuable to gain a deeper understanding of important aspects to explore, since the quantitative data built on the qualitative data.

Due to the study's dual nature, the method section will consist of two separate sections, consisting of Study 1 for the qualitative component and Study 2 for the quantitative component of this research paper. For each section, the relevant participants, materials, method, and data analysis will be described in detail, making use of the COREQ checklist (Tong et al., 2007) for the qualitative study section and the STROBE checklist for the quantitative part (Vandenbroucke et al., 2007), which can be found in Appendix A and A.1 of this paper.

For the ethical approval of this study, the BMS Ethics Committee at the University of Twente in Enschede was contacted and approval was granted (#230516). Before participation

of Study 1 or Study 2, participants were provided with informed consent including all about the study's objectives, procedures, risks, and benefits. In addition, they were informed that they have the right to withdraw at any time. Before proceeding with a participant, written and/or verbal consent was obtained.

Qualitative Part - Study 1

Participants

This study recruited a total of 10 participants for the interviews and they were mainly recruited through social media platforms such as WhatsApp and Discord, meaning convenience and snowball sampling was used. Such platforms were chosen as the main form of recruiting participants since they made the targeting of young participants relatively easy and cost-effective as well as allowed to reach a wider pool of diverse participants and avoid a high number of convenience-sampling participants ("Social media recruitment advantages and disadvantages", n.d). In addition, the SONA platform was used to recruit student participants, as it offers an incentive to student-participants, namely, credit points. As for the inclusion criteria, participants had to be above the age of 18, be a sufficient English-speaker as well as have experience with the use of DMHIs. Exclusion criteria was not being between the ages 18-29, not having experience with DMHIs for the interviews or being a non-English speaker. The 10 participants consisted of 4 males and 6 females between the ages of 18 and 23 ($M = 21.3$). Their nationalities were mainly German (70%), with a total of 7, 2 participants (20%) from the Netherlands and 1 (10%) was from Kyrgyzstan.

Materials

Firstly, the interviews were constructed by the researchers, consisting of a total of 16 open-ended questions with probes, ranging from questions addressing previous experience with a digital tool, and reasons for using it, to thoughts on, benefits and problems experienced using digital tools aiming to increase well-being. The structure of the interview questions, can be seen in Appendix B. The transcriptions of the interviews thereafter were done with

Descript and mistakes were corrected by hand, to ensure accuracy and to already gain an analytical impression.

Procedure

For the qualitative part of this study, the participants were asked to contact the researchers through their student mail. In total, 10 participants were recruited using convenience and snowball sampling. The interviews were conducted online to maximize availability of participants, using Zoom or Microsoft Teams. Prior to the scheduled time of the interview, the participants received an email with an invitation link from Zoom or Microsoft Teams. Prior to starting the interview, the participants were informed that the interview would be audio-recorded which would be preserved for a two-year period and were asked for verbal confirmation for doing so. In addition, they had to read and accept the conditions of, and sign a consent form, which was sent to them via mail. Starting the interview, the participants were given a short greeting and introduction to explain the study and procedure as well as the purpose of the research. The interview sessions had an approximate duration of 25-35 minutes, apart from one of the interviews lasting over 60 minutes. After thanking the participant for participation, the audio recording would be stopped, and SONA credits were granted for student-participants. This process was repeated with ten participants. The interviews were conducted by all 3 researchers, with two researchers conducting 3 each and one researcher conducting 4 interviews. This collaboration was important to increase interrater reliability and enhance objectivity and efficiency in the data collection. The interviewers consisted of 2 males and 1 female, all current bachelor students of Psychology at the University of Twente, without extensive experience or training in data-gathering methods. One researcher interviewed fellow students. However, no prior knowledge about the researcher, aim of research, or relationship had been established. The researchers did not consider data saturation and the final transcripts were not provided to the

participants for revision or feedback. This was done to explore a broad range of perspectives on the topic and not limit the data collection.

Data Analysis

After the data from the interviews were collected, the responses were transcribed and coded to organize and make sense of the qualitative information from the participants. The transcription process was done separately by the researchers. Yet, the coding of the transcripts was done by all 3 researchers simultaneously, working together in a Google Drive document. Next, themes were established prior and some whilst examining them, such as themes which were mentioned most often or seemed important for the researchers to examine. Each theme was discussed by the researchers and sub-themes were added as needed. This process deviates from the typical approach in thematic analysis in which themes are derived without predetermined themes. However, the researchers adopted a reversed approach due to the specific research objectives and need of a more structured analysis. When disagreements occurred, they were resolved by discussing alternatives and adjusting the themes. Finally, 10 themes were extracted from the thematic analysis was, and will be elaborated on in the results section. In addition, important topics of the interview were formulated into further questions to be added to the online survey.

Results

Qualitative Part - Study 1

To gain a general overview of the participants, their demographical data was accumulated in Table 1. The participants consisted of 4 males (40%) with a mean age of 22.5, and 6 females (60%) with a mean age of 20.5. In total, 70% of the participants were German, 20% were Dutch and 10% were Kyrgyzstan. Together, their ages range from 18 to 23 years ($M = 21.5$, $SD = 1.5$). In addition, nine participants are university students, eight of them

being a Bachelor student, one being a Master student and one is a High School student. An overview of this demographical data can be seen in Table 1.

Table 1

General overview of participants' demographical data

Participant	Gender	Age	Nationality	Education Level
1	Female	21	German	Bachelor
2	Male	22	Kyrgyz	Bachelor
3	Male	23	German	Bachelor
4	Male	23	Dutch	Bachelor
5	Female	22	German	Bachelor
6	Male	22	German	Master
7	Female	21	German	Bachelor
8	Female	21	German	Bachelor
9	Female	20	German	Bachelor
10	Female	18	Dutch	High School

Thematic Analysis

The thematic analysis was conducted in a shared Google Drive document for which all researchers had access to. This was done to maximize the identification of potential themes of relevance and gain an alignment and mutual understanding of the analysis between the researchers. A total of 9 themes and 17 subthemes were examined in the transcriptions and is summarized in Table 2 below. In addition, the total frequency of each theme was documented. Further definitions, explanations of themes and sub-themes, and quotes of participants will be elaborated on below Table 2.

Table 2

Overview of the results of the Thematic Analysis' themes, subthemes, their frequencies, and percentages

Theme	Subtheme	n	%
Features	Minimalistic	10	70
	Maximalistic	26	80
Time	Time Consuming	12	80
	Forced Use	21	80
Monetary Cost	DMHI Cost	19	70
	Cost of Healthcare	4	20
Personalization		24	80
User Interface (UX)	Positive UX	14	70
	Negative UX	11	70
Effectiveness	Effective	46	100
	Ineffective	27	80
	Neutral	6	40
Motivation	Internal Motivation	45	90
	External Motivation	21	90
Reason to Use	Curiosity	14	80
	Other Motive	15	90
Variety	Diverse Content	9	40
	Repetitive Content	9	30

Features

To begin, the theme 'Features' will be looked at. It can be defined in this context as features of a DMHI related to its effectiveness of functionalities and useful properties which were expressed by the interviewees.

Minimalistic. The subtheme ‘Minimalistic’ concerns expressions of interviewees which state that they experienced or preferred a more simplified DMHI, with only few features, to reduce complexity (N = 10, 70% of participants). Two example statements are:

“think that the apps that I don't tend to use are the ones that are very complicated or have too many features too many buttons to push, where I have to make a lot of decisions.”

Maximalistic. The subtheme ‘Maximalistic’ can be termed as interviewees stating the preference of a DMHI exhibiting many useful features and functionalities or yearning for more features and functions such as a progress tracker or incentives (N = 26, 80% of participants). Interviewees mentioned:

“And maybe also getting some sort of reward like I don't know, growing some plants or whatever. If you just can get something out of it.”

Time

Further, the theme ‘Time’ was defined as participants mentioning the amount of time needed for the use of the tool, time constraints experienced and opinion thereof.

Time Consuming. This subtheme covers all mentioned aspects regarding time constraints participants experienced during the use of DMHI’s, such as not having enough time in their day to complete certain tasks or preferring a DMHI which is less time consuming (N = 12, 80% of participants)

“...don't want to spend more than like, maybe 20 minutes out of my day on it, to go through something.”

Forced Use. The other subtheme for Time is *Forced Use*, which concerns expressions made by the users regarding feeling forced to use the tool, due to demanding or intrusive features or exercises, making it feel like a burdensome obligation (N = 21, 80% of participants)

“And, I think mainly it was because it felt like a chore more than anything you know, because you had to do all these things or, fill out all these questions and to me it started to feel like a chore. It didn’t feel like actual help...”

Monetary

Next in line is the theme ‘Monetary’ which can be defined as participants expressing concerns when using DMHI’s, regarding the costs, subscriptions to make payments or cost of healthcare.

DMHI Cost. This theme implies that some participants expressed the opinion that payments or subscriptions for such digital mental well-being tools posed as a barrier to start or continue its use (N = 19, 70% of participants). Statements that support this are:

“I would definitely not want to pay for it”

Cost of Healthcare. The *Cost of Healthcare* subtheme concerns statements participants made regarding high costs of healthcare and therapy, which made DMHI’s seem like a more attractive, cost-effective alternative (N = 4, 20% of participants)

“... because one of the biggest problems of therapy is that it's unaffordable, and not and unavailable for a lot of people. And that was probably one of the reasons internet therapy, and like app therapy was becoming popular in the first place.”

Personalization

This theme refers to the extent of personalization functionalities a DMHI offered, such as being able to make individual adjustments to the content or goals in the tool, instead of a ‘one-size-fits-all’ approach. For this theme, no subtheme had to be included since all participants expressed mutual requirements regarding personalization of DMHI’s (N = 24, 80% of participants). As can be seen in the following statements, some interviewees mentioned that therapists can provide more tailored and specific interventions and expressed doubts in individualization in DMHI’s.

“...most of the times you talk to a psychiatrist, or a therapist may the issues people come to those people with are very tailored to the actual person it's coming with and very tied to the background of the person and the life experiences that person has had.”

User Interface (UX)

This theme focuses on the visual and interactive elements the users experienced utilizing the DMHI application. In more detail, all statements users made regarding the layout, user-friendliness, menu, settings, and other functionalities of the app.

Positive UX. *Positive UX* concerns the statements that users made referring to positive observations they made of the User Interface or what they thought should be included to improve the UX (N = 14, 70% of participants). A demonstration of such statements is:

“The apps were really well made, and really well designed.”

Negative UX. *Negative UX* on the other hand, focused on the statements that users made about negative observations or difficulties they experienced regarding the User Interface of the tool. Participants often mentioned an unclear structure of the tools interface leading them to feel overwhelmed and hindering the use of it (N = 11, 70% of participants).

“Yeah, because I have an app that is very, very overwhelming. The user interface is so bad. Now. It's, I don't even want to open the app. It's just too much to handle it”

Effectiveness

Moving on, the *Effectiveness* theme refers to the general impact that the DMHI had on its user and whether they achieved their goals or not.

Effective. This subtheme refers to all positive experiences regarding the effectiveness of the tools, meaning they achieved their mental well-being goals or recognized the potentiality of its usefulness (N = 46, 100% of participants). Some users also expressed that the use of a DMHI solely served as the first step towards actual in-person therapy:

“I feel like, it's pushed me to get more therapy later, because that was what the app told me at the end of the day, and that they are not a qualified entity or something like that,

then, you know, at the end of the day, I have to seek therapy, lets you tell me that and that was one of the contributing decisions towards me seeking more therapy. So I feel like it did have a small impact on my life, but that was about it.”

Ineffective. This subtheme refers to the opposite, meaning that the participants expressed a failure of expected results or just an insufficient performance of the DMHI in general (N = 27, 80% of participants). Another mentioned aspect was that it does not serve as a substitute to conventional treatment.

“Ah, well, based on my very limited experience, I didn't find that to be very helpful.”

Neutral. The last subtheme of *Effectiveness* covers statements by users who did not have a strong negative or positive opinion on DMHI's but wanted to try them out (N = 6, 40% of participants).

“Um, well, I was definitely open to the experience, I wasn't completely sure how helpful it would be.”

Motivation

The *Motivation* theme concerns the underlying reasons that drove participants to start or continue the use of DMHI's. The motivational factors were divided into two subthemes, internal motivation, and external motivation.

Internal Motivation. This subtheme refers to having an intrinsic motivation, driving individuals to actively participate or not participate in a DMHI. Some users put forward that they lacked an internal drive, others stated the opposite, that they saw it as a self-motivational opportunity to willingly make a change in their mental well-being (N = 45, 90% of participants).

“But another reason was that I thought it might just be pretty interesting to reflect on one's own mental health and learn ways to deal with it should there be times of struggle. I basically saw it as an opportunity to get more self-awareness. But also, skills to manage my own mental health.”

External Motivation. This subtheme concerns motivation from external sources that drove the engagement with DMHI's, such as rewards, a recommendation of a friend, and other influences (N = 21, 90% of participants). Example statements are:

“So one motivator was helping out by participating in this study.”

Reason to Use

The theme *Reason to Use* can be described as the purpose or cause leading the participants to start the use of a DMHI. Two subthemes were identified, being using it out of curiosity or using it for some other motive.

Used out of Curiosity. This subtheme, as the name reveals, concerns statements of users indicating that beginning the use of a DMHI was due to being curious about its effect and features in general (N = 14, 80% of participants).

“I was I was purely just trying to test it yes, I was. I didn't have a mental health crisis going on or anything like that. I was just very curious about how far I could go with the app.”

Used out of other Motive. This subtheme refers to reasons other than curiosity as to why the users started with a DMHI, focusing more on external factors such as wanting to help a friend out or gaining needed incentives for study purposes, or wanting it to assist in a specific mental health concern (N = 15, 90% of participants).

“Not really, it was more so because of the credits for the Sona thing. Not because it was specifically chosen that one.”

Variety

The last theme *Variety* can be described as the need for more diversity in DHMI's. A great number of participants demanded more variety in content and tasks so that monotony can be reduced.

Variety in Tasks. This subtheme refers to the statements of users addressing the need of increased variations in the tasks and content of the DMHI. Interviewees mentioned that

more diversity in this context would enhance the experience and engagement in such tools (N = 9, 40% of participants).

“And I think it helps if there's a lot of different things combined in one app, because then you don't have to keep track of using a lot of different apps for different things...”

Repetitiveness. The *Repetitiveness* subtheme concerns the statements of users addressing the need for less repetition in the content or tasks of the DMHI, as this led to decreased engagement (N = 9, 30% of participants). Some users stated they had to complete the same questionnaire daily:

“I think one main thing would be variety. If I had to do the same tasks over and over again, for a prolonged period of time, I would probably quit using the tool

Enhancing Quantitative study through inclusion of Qualitative Methods

The findings of the Thematic Analysis were implemented to create useful and significant questions for the survey. Important findings such as the themes and subthemes were integrated resulting in an additional 18 new Survey questions (Appendix R).

The questions were based on key contents such as monetary barriers, time constraints, longevity, variety, personalization, features, usability, and motivation.

In addition to uncovering these important themes for the survey, this contributed to measure relevant study-related items including willingness and engagement, but also perception, attitude, and subjective norm. The Survey and its questions will be further elaborated on in the Quantitative Study section of this paper.

Quantitative Part - Study 2

Participants

In sum, a total of 81 participants filled in the survey, which were recruited through SONA, WhatsApp, Instagram, Discord and Reddit. Participants recruited through SONA received 0.25 credits as an incentive. However, by checking for inclusion criteria, a total of 32 Participants had to be excluded from the study. Finally, a data set of 47 participants were

analyzed for the study. The demographical information will be elaborated on in the results and was gathered through the demographical questions in the survey which can be seen in Appendix H.

Materials

The questionnaire was created with the online survey tool Qualtrics, using several standardized questionnaires and models about mental well-being and perceptions regarding digital well-being tools.

First, *Beck's Depression Inventory (BDI)* (Beck, 1961), measuring the severity of depression, in the form of 21- multiple-choice, self-reporting questions, scored on a Likert scale from 0 to 3 (Appendix I), with the lowest score being 0 and the highest being 3. Scores range from 0-63, with higher scores indicating higher severity of depression. The score is then compared to a standardized key to determine the severity of depression. The cut-off scores are as follows: scores of 1-10 = Normal mood, 11-16 = Mild mood disturbance, 17-20 = Borderline clinical depression, 21-30 = Moderate depression, 31-40 = Severe depression and a score over 40 = Extreme depression. The BDI seemed like a good fit, since especially depression was reported to have increased in young adults over the past decade (Twenge, 2020). In addition, the BDI is the most widely used, has good reliability and validity and a good test-retest reliability, meaning that scores show consistency over time (Cronbach $\alpha = .82$), making it more comparable to previous research (Richter et al., 1998).

The *General Anxiety Disorder-7 (GAD-7)* in Appendix J, is a standardized questionnaire used to assess anxiety levels with a 7-item scale (Spitzer et al., 2006). The scoring of the GAD-7 Anxiety severity was done by assigning scales from 0-3. The total score from the 7 items ranges from 0 to 21, with higher scores indicating greater severity of anxiety. The standardized key with its cut-off scores looks like the following: a score of 0–4 indicates minimal anxiety, 5–9 indicating mild anxiety, 10–14: moderate anxiety and finally 15–21 indicating severe anxiety. Similar to the BDI, the GAD-7 seemed suitable due to its common

use and known reliability (Cronbach $\alpha = .85$, $n = 9721$) according to a study by Hinz et al. (2017).

Next, the *Perceived Stress Scale (PSS)* was used, consisting of 10 items scaling from 0 (never) to 4 (very often), assessing perceived stress levels (Cohen et al., 1983). The total score can range from 0 to 40, with higher scores implying higher stress levels (Appendix K). The PSS is a widely recognized self-assessment tool and was chosen due to its established validity and reliability (Cronbach $\alpha = .83$) by Huang et al., (2020), and relevance to the research objectives, assessing mental health.

Lastly, the Warwick–Edinburgh Mental Well-being Scale (WEMWBS) is a self-report questionnaire that measures individuals' overall sense of well-being (Tennant et al., 2007). Its scale consists of 14 items that measures various aspect of mental well-being, using a Likert scale ranging from 1 (none of the time) to 5 (all of the time) and is visualized in Appendix L. This questionnaire was used to be able to ensure consistency with the prior mental health assessment tools used and due to its popularity, validity, and reliability (Cronbach $\alpha = .91$), established from Tennant et al., (2007).

The survey also included questions created by the researchers based on TAM such as *Perceived usefulness*, with ten items on a five-point Likert scale. An example is:

"*I believe using well-being digital tools would help me manage my mental health more effectively*". This study showed a high level of reliability with a Cronbach's α of .81.

Also *Perceived ease of use* was integrated, with six items on a five-point Likert scale. An example is: "*Using well-being digital tools would be easy for me to learn.*" This study showed poor reliability with a Cronbach's α of .42.

Next to that, *Attitude, Behavioral Intention and Subjective norm* were included due to being relevant for the other researchers' objectives. Also, the TPB (*Attitude, Attention,*

Willingness, and Engagement) with 3-6 questions about each variable and measured on a five-point Likert scale.

Lastly, the 17 questions derived from the interviews were included in the survey, measured on a five-point Likert scale.

Procedure

Convenience and snowball sampling were used for recruitment of the participants, which signed up through SONA, via the link on the social media advertisements or an anonymous Qualtrics link for non-students. The survey started with an introductory text (Appendix G) to the study, a consent form page (Appendix F), which they had to agree on, and demographical questions (age, gender, education level and employment status). Thereafter, participants filled out the standardized mental health assessments, followed by the presentation of information about DMHI's, some example tools and their intention and is presented in Appendix M. This was done to ensure participants mutual understanding of digital tools for mental well-being. Participants then filled out the questions regarding their perceptions, use of, willingness and engagement and further questions. Lastly, the participants filled out the 18 remaining questions that were obtained from the thematic analysis. Completing the survey took approximately 15 to 20 minutes, and after, student-participants received SONA credits. After closing the access to the survey, data was coded and analysed, using an item coding function in Qualtrics and RStudio. The relevant items were coded and checked for reverse coding. Due to a technical issue with the Qualtrics survey link, 21 participants filled out an older version of the survey and had to be excluded from the study.

Data Analysis

To analyze the data of the questionnaire, codes were assigned to each question of the questionnaire in the Qualtrics Software, using a 5-point Likert scale and was checked for reverse coded items. The coded data was downloaded as a .csv file and imported to RStudio. The initial raw data included 83 respondents with 81 being valid. A smaller data set was

created by removing 2 participants who did not fall into the age range and 10 participants that did not complete the survey. In addition, 21 survey responses that were derived from the incomplete survey, as explained in the procedure, were omitted as well. Lastly, one respondent was omitted for not indicating gender, which not specifically necessary for this research study yet was important for one of the researcher's study topics, investigating differences in males and females. To ensure consistency, all 3 researchers used the final set of 47 respondents for analysis.

After, statistical analyses were run in the RStudio programming software, such as descriptive statistics to provide a summary of the data, correlation analysis to explore the relationship between the variables mental health and willingness/engagement. Moreover, the Pearson correlation coefficient as well as several regression analyses were conducted to examine the significance of the relationship of mental health as the predictor variable on willingness/engagement as the dependent variable.

Results

Quantitative Part - Study 2

Descriptive statistics

After the survey data was imported into RStudio, the data cleaning was conducted. First, the participant's demographical data was checked for the eligibility criteria 'age', showing 2 participants over the age of 29 and were excluded from the dataset. Further, the data was checked for outliers by running an analysis to visualize the data with a box plot to look for outliers or extreme values, however, no outliers of relevance for this study were identified.

As a means of gaining a general impression of the data ($N = 47$), the final participant's demographical data is listed in Table 3. The sample consisted of 25 males (53.2%) and 22 females (46.8%) and was between the ages 18 and 29 years ($M = 23.23$ $SD = 2.68$). 42.6 %

were German, 14.9% were Dutch and 42.5% Other. Educational level showed 48.9% High Schoolers, 40.4% Bachelor graduates, 8.5% Master graduates and 2.2% Doctoral graduates. The current employment status showed that 19.1% were Employed Full-Time, 12.8% were Employed Part-Time, 42.6% just Student, 21.3% Student + Employed Part-Time, 2.1% Unemployed, and 2.1% Other.

Table 3

Overview of the demographic data of Respondents for the quantitative part of the study

Variables	Sub-variables	N	%
Gender	Male	25	53.2%
	Female	22	46.8%
Nationality	German	20	42.6%
	Dutch	7	4.9%
	Other	20	42.6%
Educational Status	High School	23	48.9%
	Bachelor's degree	19	40.4%
	Master's degree	4	8.5%
	Doctoral degree	1	2.1%
Employment	Employed full-time	9	19.1%
	Employed part-time	6	12.8%
	Students	20	42.6 %
	Part-time and student	10	21.3 %
	Unemployed	1	2.1%
	Other	1	2.1%

The variables that are relevant for the hypotheses of this paper are the four mental health scales, listed in Table 4: BDI (Beck's Depression Inventory), GAD (GAD-7 Anxiety

Scale), PSS (Perceived Stress Scale). Further, W/E (Willingness/Engagement) is the dependent variable of interest and PEU (Perceived ease of use), being related to Willingness and Engagement. The *Mean* indicates the average levels of symptoms the participants reported on, *Standard Deviation* shows the amount of variability in each of the scores among the participants. The *Median* reports on the distributions of the scores and the *Standard Error* reflects on the variability around the mean estimate for the variable scores.

According to their scoring scale, Beck's Depression Inventory ($M = 12.11$) indicates that on average participants reported a 'Mild mood disturbance', The GAD-7 Anxiety Scale ($M = 9.04$) shows that on average participants reported 'mild anxiety', and the PSS ($M = 9.98$) indicates that on average participants reported 'low stress' levels. The Warwick-Edinburgh was excluded for the exploration of the hypotheses, as it measures well-being and not mental health.

To obtain an overall "Mental Health" variable, the average of the means across the 3 scales were added up and divided by 3 ($12.11 + 9.04 + 9.98$) / 3 = 10.71). In sum, 10.71 represents the mean score of the "Mental health" variable.

Table 4

Descriptive statistics of the relevant coded variables

Variable	Mean	Standard Deviation	Median	Standard Error
Beck's Depression Inventory	12.11	7.95	11	1.09
GAD-7 Anxiety Scale	9.04	4.69	11	0.64
Perceived Stress Scale	9.98	4.79	10	0.66
Willingness/Engagement	17.02	8.77	16	1.20
Perceived ease of use	6.04	1.65	6	0.23

Inferential statistics

The first analysis conducted was a correlation analysis to examine Hypothesis H1: “There will be a significant relationship between the mental health status of young adults and their willingness to use and engage in digital tools aiming at increasing well-being”.

Table 5

Correlation analysis of the relationship between the mental health variables and willingness/engagement

	1	2	3	4
1 Beck’s Depression Invent.	1.000	.724	.588	.027
2 GAD-7 Anxiety	.724	1.000	.674	.104
3 Perceived Stress Scale	.588	.674	1.000	.050
4 Willingness/Engagement	.027	.104	.050	1.000

What can be seen in Table 5 are the correlation coefficients between variable 1 = Beck’s Depression Inventory, 2 = GAD-7 Anxiety, 3 = Perceived Stress Scale as the independent variables and 4 = Willingness/Engagement as the dependent variable. To gain a more detailed overview, Table 5 shows the relevant correlation coefficients, suggesting there is a positive correlation between the GAD-7 Anxiety scores Willingness/Engagement, yet is likely to be statistically non-significant. In addition, the rest of the mental health test scores paired with Willingness/Engagement show a correlation coefficient very close to 0, indicating that there is little to no relationship between the two variables.

In addition, the Warwick-Edinburgh and Willingness/Engagement correlation coefficients also showed a positive correlation, however, was not included in Table 5, as the Warwick-Edinburgh assesses general well-being and not mental health.

The Pearson Correlation Test was included, indicating whether there is a significant correlation between each of the variables. In this case, the p-values for Willingness/Engagement and the 3 mental health variables show no significant correlation, with all p-values being higher than $p = .49$. To conclude, the overall mental health status is not significantly correlated with the dependent variable Willingness/Engagement. As a result, Hypothesis 1 can be rejected.

Focusing on Hypothesis 2 in the next section of this paper, three separate regression analyses were conducted to test H2: *Young adults who report high levels of anxiety, depression, and/or stress will be less willing and engaged to use DMHIs compared to those who report low levels of anxiety, depression, and/or stress.* The analysis was done to obtain the correlation between all 3 predictor variables Anxiety, Depression, and Stress, and the dependent variable Willingness/Engagement.

Anxiety and Willingness/Engagement

There is a significant positive relationship between Anxiety and Willingness/Engagement ($B = 19.88$, $SE = 8.21$, $t(2.42)$, $p = 0.02$), and suggests that as levels of anxiety increase (coded low anxiety to high anxiety, 1-4), levels of Willingness/Engagement (coded low Willingness/Engagement to high Willingness/Engagement, 1-4), increases. This indicates that Hypothesis 2, that high levels of anxiety will show less engagement, can be rejected.

Depression and Willingness/Engagement

The results of the regression analysis suggest that there is no significant relationship between Depression and Willingness/Engagement ($B = 9.76$, $SE = 14.17$, $t(0.99)$, $p = 0.33$). Thus, the reported results do not provide evidence to support or reject hypothesis 2, as a p-value of 0.33 suggests that there is not enough statistical evidence.

Stress and Willingness/Engagement

Looking at the results of the regression analysis ($B = -5.00$, $SE = 12.89$, $t (-0.274)$, $p = 0.79$), it can be concluded that there is no significant evidence that suggest that higher stress levels are associated with lower Willingness/Engagement since the high p-value suggests that there is no statistical significance.

Discussion

The aim of this research study was to examine the research question “Is there a relationship between the mental health status of young adults and their willingness to use and engage in DMHIs?” The findings suggest that there is a relationship.

It was found that the Warwick-Edinburgh mental well-being scores are weakly positively correlated with Willingness/Engagement. The weak positive correlation indicates that as mental well-being increases, young adults are more willing and likely to engage in DMHIs. This is consistent with other research studies. A longitudinal study by Li et al., (2023) collecting data of the German population on mental health and willingness to take risks, suggests that well-being affects willingness in terms of risk-taking behavior indicating that individuals with higher mental well-being might be more open and willing to use DMHI's. Further, results showed that individuals who reported high levels of anxiety reported higher levels of Willingness/Engagement to use digital tools to increase their well-being.

The expectation was inferred from the Technology Acceptance Model (TAM), which defines anxiety to be “an obstacle to adapt or use a system or technology”. Based on the study of Dönmez-Tura & Kir, (2019) exploring the “effect size of anxiety on perceived usefulness and perceived ease of use”, it was inferred that anxiety had little effect on perceived usefulness, yet a medium effect on perceived ease of use. This led to interpret that “any type of anxiety may lead to perceive that any technology or system is not easy to use even if it was designed user friendly”. Also, other studies such as Diwivedi et al. (2011) confirmed that anxiety has a negative influence on the technology acceptance model, suggesting that higher levels of anxiety is expected to show lower levels of engagement and willingness in digital

tools, which is contrasting to this paper's findings. Considering the findings of Study 1, there may be a connection between anxiety and motivation in the DMHI context. In Study 1 "External Motivations" and "Internal Motivation" were important subthemes. Higher levels of anxiety may lead to reduced internal motivation to engage with DMHIs, influenced by heightened fear using such tools. Anxiety is known to be a barrier hindering motivation (Majali, 2020), in this case, the motivation to engage in DMHIs. On the other hand, a further interesting finding in the study of Majali (2020) was that "A high level of anxiety contributes to a high level of academic achievement, but at the same time reduces the motivation for learning", suggesting a complex relationship between anxiety and motivation and that impact of anxiety on motivation may vary depending on the context or goal. It can be interpreted that individuals with high levels of anxiety may perceive DMHIs as beneficial, increasing their willingness/motivation and engagement in DMHIs, despite a lower mental health status.

Further, important findings derived from the qualitative data are the insights into barriers and facilitators when it comes to willingness and engagement in DMHI's. An important factor was that many users viewed DMHI's as a great source or first step to seek mental health, overcoming the privacy barrier, however trust in such tools and personalization were often-mentioned critique points. Users desire a more tailored, user-specific approach, to adjust goals and tasks and allow greater autonomy. Users evaluated that improving these elements could promote engagement and overall satisfaction of users. In a quite similar study by Gan et al., (2021), it was found that 'Personalization' or 'tailoring' of such tools, especially in terms of feedback, would ensure increased motivation in users to engage with them. This is a similar finding to this paper's insights. Also, the theme 'Cost' showed that users are reluctant to keep engaging with them when any amount of money has to be paid, which is consistent with the findings of Gega & Aboujaoude, (2021), that 'reluctance to pay' is a large issue and was mentioned in the introduction of this paper.

Implications

The results of this study have various implications for healthcare professionals, researchers, and developers in this field. To start, this study identified factors that influence engagement with DMHI's, such as general factors when using such tools and mental health of users. Having identified specific barriers users face, access, user-satisfaction, and engagement can be improved by designing interventions that meet these necessities. Developers can use these elements to improve engagement and user-satisfaction, when constructing DMHI's. It is a crucial step for developers to understand traits and desires and especially barriers of the population group of interest to make improvisations in future digital innovation designs. Example elements are personalization and tailoring features for users, reduce complexity, enhance guidance, and offer incentives for increased motivation.

Healthcare professionals can use this information on mental health and willingness and engagement in DMHI's to select appropriate interventions for their patients with enhanced insight. In sum, this paper offers highly valuable findings related to user experience, attitudes, engagement, barriers, and facilitators and the effect of mental health status on willingness and engagement in DMHI's.

Strengths

The study combined qualitative and quantitative data collection approaches and benefitted from the strengths of each method. This combination enabled a great contribution of the qualitative data to the construction of the quantitative data. Moreover, combining both types of data allowed to provide stronger evidence and confidence in the creation of the Survey and thus its findings. Study 1 gave the researchers valuable and detailed insights into the experiences of individuals that have used such tools, while Study 2 provided valuable statistical data for the analysis of the relationship between the mental health willingness and engagement. In addition, the researchers were able to utilize the valuable data from Study 1 to enhance the survey for Study 2 by incorporating interesting topics from the interviews to the

survey questions. Moreover, to ensure a good representation of the population, we made an effort to maintain an equal distribution of males and females in the interview study.

Limitations

The first limitation that contributed to a smaller sample size, is the technical issue in Qualtrics which sent an unfinished version of the survey to the first participants. This error led to a loss of 21 participants.

Another limitation was that the study was only available and conducted in the English language. This may have mediated some participants' performance on the interview or survey when the English language is not mastered well, as they may have not understood all descriptions or posed questions in the survey. Consequently, this can lead to biased and unreliable answers.

Lastly, creating subthemes during the thematic analysis involved an untypical approach, predetermining some themes prior to the analysis. This was done due to the specific research objectives and need of a more structured analysis. Thus, there may be a potential risk of researcher bias influencing the interpretation of the themes, possibly impacting the credibility of the analysis.

Recommendations

As mentioned in the limitations, this study entailed a relatively small sample size for the survey. Thus, it is important to explore these variables in a larger-scale study in future research or replication of this study. This could enhance and confirm the results of the study and enable to generate conclusions with great confidence in their reliability and validity (Hackshaw, 2008).

As this research study solely focused on a specific, younger age group, it would be recommended to also explore other age groups, such as the older populations. Many findings suggest that older adults struggle to use or reject digital technologies (Andrews, Brown, Hawley, & Astell, 2019). Especially advanced technologies such as DMHI's can be very

difficult to adopt (Schueller & Torous, 2020). Thus, it could be interesting to explore the same variables in older adults and use the findings to boost understanding and potential development of more user-specific technologies and DMHI's for the elderly.

Another possible suggestion for future research would be to expand the assessment of mental health concerns in the survey study. This study included four mental health assessments, focusing on depression, anxiety, stress, and general well-being. It would be interesting to explore further mental health concerns, such as Bipolar Disorder, PTSD, or other disorders as predictors of engagement in DMHI's.

Conclusion

In sum, the goal of the study is to gain a better understanding of how and why people use DMHI's, as well as to identify potential barriers and facilitators that come with their use. Using a mixed-method approach, this research paper gathered insight on how to contribute to the creative development of such tools to maximize effectiveness and engagement in them. This study analyzed the impact of mental health on young adults' engagement and willingness to use DMHI's. The discussion of the findings highlighted that higher mental well-being increases engagement and willingness and that anxiety symptoms are less of a barrier to engage in DMHI's. Nonetheless, such tools are still far from being a solid alternative for conventional interventions such as therapy, and emphasis on more effective elements such as Personalization features, incentives and reduced complexity were found to be vital to maximize engagement in DMHI's. Considering the study's limitations, it is important to state that a larger confirmatory study is desirable for increased reliability and validity. All in all, this research paper serves as a solid foundation for future investigations in this research area.

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Appendix A

STROBE checklist for quantitative research

STROBE Statement—checklist of items that should be included in reports of observational studies

	Item No	Recommendation
Title and abstract	1	(a) Indicate the study's design with a commonly used term in the title or the abstract (b) Provide in the abstract an informative and balanced summary of what was done and what was found
Introduction		
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported
Objectives	3	State specific objectives, including any prespecified hypotheses
Methods		
Study design	4	Present key elements of study design early in the paper
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection
Participants	6	(a) <i>Cohort study</i> —Give the eligibility criteria, and the sources and methods of selection of participants. Describe methods of follow-up <i>Case-control study</i> —Give the eligibility criteria, and the sources and methods of case ascertainment and control selection. Give the rationale for the choice of cases and controls <i>Cross-sectional study</i> —Give the eligibility criteria, and the sources and methods of selection of participants (b) <i>Cohort study</i> —For matched studies, give matching criteria and number of exposed and unexposed <i>Case-control study</i> —For matched studies, give matching criteria and the number of controls per case
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group
Bias	9	Describe any efforts to address potential sources of bias
Study size	10	Explain how the study size was arrived at
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why
Statistical methods	12	(a) Describe all statistical methods, including those used to control for confounding (b) Describe any methods used to examine subgroups and interactions (c) Explain how missing data were addressed (d) <i>Cohort study</i> —If applicable, explain how loss to follow-up was addressed <i>Case-control study</i> —If applicable, explain how matching of cases and controls was addressed <i>Cross-sectional study</i> —If applicable, describe analytical methods taking account of sampling strategy (e) Describe any sensitivity analyses

Continued on next page

Results		
Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed (b) Give reasons for non-participation at each stage (c) Consider use of a flow diagram
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders (b) Indicate number of participants with missing data for each variable of interest (c) <i>Cohort study</i> —Summarise follow-up time (eg, average and total amount)
Outcome data	15*	<i>Cohort study</i> —Report numbers of outcome events or summary measures over time <i>Case-control study</i> —Report numbers in each exposure category, or summary measures of exposure <i>Cross-sectional study</i> —Report numbers of outcome events or summary measures
Main results	16	(a) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included (b) Report category boundaries when continuous variables were categorized (c) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses
Discussion		
Key results	18	Summarise key results with reference to study objectives
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence
Generalisability	21	Discuss the generalisability (external validity) of the study results
Other information		
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based

*Give information separately for cases and controls in case-control studies and, if applicable, for exposed and unexposed groups in cohort and cross-sectional studies.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at <http://www.plosmedicine.org/>, Annals of Internal Medicine at <http://www.annals.org/>, and Epidemiology at <http://www.epidem.com/>). Information on the STROBE Initiative is available at www.strobe-statement.org.

Appendix A.1

COREQ checklist for quantitative research

Topic	Item No.	Guide Questions/Description	Reported on Page No.
Domain 1: Research team and reflexivity			
<i>Personal characteristics</i>			
Interviewer/facilitator	1	Which author/s conducted the interview or focus group?	
Credentials	2	What were the researcher's credentials? E.g. PhD, MD	
Occupation	3	What was their occupation at the time of the study?	
Gender	4	Was the researcher male or female?	
Experience and training	5	What experience or training did the researcher have?	
<i>Relationship with participants</i>			
Relationship established	6	Was a relationship established prior to study commencement?	
Participant knowledge of the interviewer	7	What did the participants know about the researcher? e.g. personal goals, reasons for doing the research	
Interviewer characteristics	8	What characteristics were reported about the interviewer/facilitator? e.g. Bias, assumptions, reasons and interests in the research topic	
Domain 2: Study design			
<i>Theoretical framework</i>			
Methodological orientation and Theory	9	What methodological orientation was stated to underpin the study? e.g. grounded theory, discourse analysis, ethnography, phenomenology, content analysis	
<i>Participant selection</i>			
Sampling	10	How were participants selected? e.g. purposive, convenience, consecutive, snowball	
Method of approach	11	How were participants approached? e.g. face-to-face, telephone, mail, email	
Sample size	12	How many participants were in the study?	
Non-participation	13	How many people refused to participate or dropped out? Reasons?	
<i>Setting</i>			
Setting of data collection	14	Where was the data collected? e.g. home, clinic, workplace	
Presence of non-participants	15	Was anyone else present besides the participants and researchers?	
Description of sample	16	What are the important characteristics of the sample? e.g. demographic data, date	
<i>Data collection</i>			
Interview guide	17	Were questions, prompts, guides provided by the authors? Was it pilot tested?	
Repeat interviews	18	Were repeat inter views carried out? If yes, how many?	
Audio/visual recording	19	Did the research use audio or visual recording to collect the data?	
Field notes	20	Were field notes made during and/or after the inter view or focus group?	
Duration	21	What was the duration of the inter views or focus group?	
Data saturation	22	Was data saturation discussed?	
Transcripts returned	23	Were transcripts returned to participants for comment and/or	

Topic	Item No.	Guide Questions/Description	Reported on Page No.
		correction?	
Domain 3: analysis and findings			
<i>Data analysis</i>			
Number of data coders	24	How many data coders coded the data?	
Description of the coding tree	25	Did authors provide a description of the coding tree?	
Derivation of themes	26	Were themes identified in advance or derived from the data?	
Software	27	What software, if applicable, was used to manage the data?	
Participant checking	28	Did participants provide feedback on the findings?	
<i>Reporting</i>			
Quotations presented	29	Were participant quotations presented to illustrate the themes/findings? Was each quotation identified? e.g. participant number	
Data and findings consistent	30	Was there consistency between the data presented and the findings?	
Clarity of major themes	31	Were major themes clearly presented in the findings?	
Clarity of minor themes	32	Is there a description of diverse cases or discussion of minor themes?	

Developed from: Tong A, Sainsbury P, Craig J. Consolidated criteria for reporting qualitative research (COREQ): a 32-item checklist for interviews and focus groups. *International Journal for Quality in Health Care*. 2007. Volume 19, Number 6: pp. 349 – 357

Once you have completed this checklist, please save a copy and upload it as part of your submission. DO NOT include this checklist as part of the main manuscript document. It must be uploaded as a separate file.

Appendix B

Interview Structure Guideline

Interview Structure and Questions

Verbal Introduction to Participant

Hello, thank you for participating in our research study. My name is ... , and I will be interviewing you today on the topic of digital mental health tools and interventions. This interview will last approximately 20-40 minutes, during which I will ask you some questions regarding your previous experience with digital tools and applications designed for improving mental well-being. With these questions, we aim to find out what the most important aspects are of using these digital tools, and what contributes to the lack of usage and engagement among the general population. This interview will be audio-recorded, no video-recording will be used and these recordings will be stored as data for two years as of today. I would like to ask you to please answer these questions as detailed as you can, as this gives us a clearer picture of the problem. You may take your time to answer a question, please do not feel rushed to give your answer, as there are no time restrictions. I would also like to remind you that you may withdraw from the study at any moment. Please do not hesitate to pause the interview and ask me anything should you have any concerns. Lastly, this study was approved by the ethics committee of the BMS of the University of Twente. Is all of this okay with you? Great! Then we can get started.

Interview Questions

1. Have you had any previous experience with a digital tool, application or intervention

- designed for mental health struggles, and could you tell me about this experience?
2. For what reason(s) did you decide to use this digital tool? (*prompt: and why did you choose this digital tool specifically?*)
 3. What did you think about the use of a digital tool to help or improve mental well-being before your experience? (*prompt: were there any moments where you considered them before your first experience with them?*)
 4. Did your initial thoughts and opinions of digital tools affect any intentions you may have had for using them? (*prompt: did it take some convincing for you to pick up the tool and use it due to any opinions you had of the tools?*)
 5. What was it that you wanted to gain from using this digital tool? (*prompt: what benefits were you expecting?*)
 6. How long were you intending on using the digital tool for? And how long did you actually end up using it?
 7. During this period, how did you feel using the tool? (*for example; frustrated, excited, happy, forced etc*)
 8. During this period, how focused and engaged were you with the contents of the tool? (*for example; determined, tired, uninspired, sluggish, slow, fast, skipping through it etc*)
 9. Did the tool have a significant effect on your mental well-being? (*prompt: was it helpful in any way, if so how?*)
 10. What were your reasons for dropping the use of the digital tool?
 11. Did your thoughts and opinions on digital mental well-being tools change after this experience? If so, how?
 12. After your experience, do you now believe that digital tools can be a viable alternative to traditional mental health care services? Please elaborate.
 13. Would you try the digital tool for a second time? What would need to change with the tool in order for you to consider re-using it again?
 14. As a user with experience, what do you now expect and demand from digital tools in order for you to continue engaging with them for a prolonged period of time?
 15. Imagine a scenario in which all of your feedback was accepted and implemented in the tool. What would your thoughts on the effectiveness and impact on digital tools for mental well-being now be?
 16. In your opinion, what things do digital tools designed for mental well-being need to prioritise in order to be effective and viable options for the general population? (*prompt: can be multiple things*) And can you rank these priorities based on importance?

That was the end of the interview. Thank you for your participation. Your SONA points will automatically be rewarded to you. Do you want to add anything, or have any questions? In any case, you have our contact information. Once again, thank you.

Appendix C

Digital Advertisement for Interview Study (Study 1)

Interview Study

Hey there!

Are you between **18 and 29 years old**?

**If you've used digital tools for mental well-being before,
we'd love to hear from you!**

We're conducting an **online Interview study**, about digital tool use for increasing mental well-being and we need your help!

The **Interview** will only take **30-40 minutes** of your time !


Please **send us an E-mail** to participate and indicate your availability.

Researchers:

Simone von Kunow, s.n.vonkunow@student.utwente.nl

Vince Lammerink, v.lammerink@student.utwente.nl

Jonathan Faria da Silva Dias, j.m.fariadasilvadias@student.utwente.nl



Appendix D

Information Sheet and Informed Consent

Qualitative Research – Interviews

Information Sheet

Informed consent form for research with human participants

Interview Study

Title of Study: Mixed Study

Acceptance and user experience of digital tools to increase well-being

The purpose of this research study is to investigate the use of digital tools for mental health and explore factors related to user acceptance, engagement, and willingness to use such tools. Through the collection and analysis of data from participants who have used digital tools for mental health, the study aims to gain insights into the perceived usefulness and ease of use of these tools and how they may influence users' motivation to engage with

them. The ultimate goal is to inform the development and implementation of more effective digital tools for mental health that can improve the well-being of individuals.

The Interviews will take place in an online setting on a smart device, using the programs 'Zoom' or 'Teams' Videoconferencing. The interviews will be one-on-one, with only the participant and the interviewer in the interview process.

The participant will be asked about 20 open questions regarding the use of digital tool for well-being and his personal opinions, attitude and perception regarding such tools.

The whole interview will take approximately 20-30 minutes to complete.

The benefits of participating in this research study include the opportunity to contribute to scientific knowledge on this important topic. Participants may also gain greater awareness and understanding of their own attitudes and behaviors towards using digital tools for mental health.

However, there may be some risks associated with participation, including emotional discomfort: Participants may experience emotional discomfort if they are asked to disclose sensitive information about their well-being or their attitude and perceptions on certain aspects due to the use of digital tool for well-being.

To ensure the participants safety, an informed consent form will be provided prior to participating, with clear and detailed information about the nature of the study, its purpose and any potential risks or benefits.

Next, Anonymity and Confidentiality of the participants will be assured, meaning that their responses will be kept confidential, and their identity protected, by pseudonyms, meaning that a code name will be used throughout the interview, instead of the participants' real name. In addition, after the interview, a follow-up with the participants will be held to make sure they have no concerns or issues with the interview process or the use of their data

Procedures for Withdrawal from the Study: Participation in this research study is entirely voluntary. If at any time during the study the participant wishes to withdraw, you may do so without any penalty or effect on your relationship with the investigator. If you decide to withdraw, please inform the investigator as soon as possible.

Personal Information Collection and Processing: During this research study, some personal information about you may be collected and processed. This information will be collected for the purpose of determining the participant eligibility for the study and if participants meet the inclusion criteria. In addition, such information is collected to gain insight into the participants use of digital tools for mental health and their perceptions on certain topics.

Lastly, you have the right to request access to and rectification or erasure of your personal data, subject to legal or ethical restrictions.

Usage of Data during Research:

The data collected during this research study will be used to investigate the use of digital tools for mental health and explore factors related to user acceptance, engagement and willingness to use such tools. Any personal information will be safeguarded, and confidentiality will be maintained through the de-identification (anonymizing) of data. Access to data will be controlled, especially in relation to data archiving and reuse. Any dissemination of research

findings will not include identifiable information. The data may be archived and possibly published, but any identifying information will be removed.

Retention Period for Research Data:

The research data will be retained for 2 years. If it is not possible to retain the research data for this length of time, criteria will be used to determine when it is appropriate to dispose of the data.

Consent Form for Qualitative Research

YOU WILL BE GIVEN A COPY OF THIS INFORMED CONSENT FORM

Please tick the appropriate boxes

Yes No

Taking part in the study

I have read and understood the study information dated [DD/MM/YYYY], or it has been read to me. I have been able to ask questions about the study and my questions have been answered to my satisfaction.

I consent voluntarily to be a participant in this study and understand that I can refuse to answer questions and I can withdraw from the study at any time, without having to give a reason.

I understand that taking part in the study involves the use of audio-recorded interviews. The information data of the interviews is recorded using digital audio recording devices such as 'Zoom' or 'Teams' and can be re-watched by the researchers. In addition, the audio recordings will be stored safely and confidentially and transcribed into text. After this process, the audio recordings will be deleted after a timeframe of 2 years.

Risks associated with participating in the study

I understand that taking part in the study involves the following risks:

Emotional distress: Asking mental health questions can evoke sensitive and personal emotions from participants, which can lead to emotional distress.

Stigmatization: Participants may fear being stigmatized due to the sensitive nature of the questions asked during the interview, which can impact their mental health and well-being.

Privacy invasion: Participants may feel that their privacy is being invaded due to the personal and sensitive nature of the questions asked. Video and audio recordings can potentially capture intimate moments, which may make participants feel exposed or vulnerable.

Breach of confidentiality: The risk of confidentiality breaches is increased when video and audio recordings are used in the research. The participant's identity may be revealed, which can lead to potential harm or negative consequences.

Use of the information in the study

I understand that information I provide will be used for:

Academic research: The data may be used to produce a research paper, thesis, or dissertation. The findings may be presented at academic conferences, published in academic journals, or used to inform further research.

Program evaluation: The data may be used to evaluate the effectiveness of a particular program, intervention, or treatment. This information can be used to make decisions about the continuation or modification of the program.

Professional development: The data may be used to inform the development of training programs or professional development opportunities for professionals working in the field.
 Advocacy and awareness: The data may be used to raise awareness of an issue or to advocate for changes in public policy or practice. This might involve sharing the findings with stakeholders, policymakers, or the public.

Personal growth: The data may be used to help participants gain a better understanding of themselves or their experiences. This can be particularly relevant in studies that focus on personal narratives or experiences.

I understand that personal information collected about me that can identify me, such as [e.g. my name or where I live], will not be shared beyond the study team.

I agree that my information can be quoted in research outputs

Consent to be Audio/video Recorded

I agree to be audio/video recorded. Yes/no

Future use and reuse of the information by others

I give permission for the audio-recorded interview that I provide to be archived in secure data servers [Qualitative Data Repository (QDR)] so it can be used for future research and learning.

Once the interview is conducted, the audio recording will be transcribed to create a written document. This will make it easier to analyze and code the data.

To protect the privacy and confidentiality of the participant, all identifying information will be removed from the data. This includes names and contact details and any other information that could be used to identify the participant.

The de-identified audio recording and transcript will be stored securely in a data server such as the Qualitative Data Repository (QDR). This will ensure that the data is easily accessible for future research and learning, while also protecting it from unauthorized access or use.

Signatures

Participant name [printed]

Signature

Date

I have accurately read out the information sheet to the potential participant and, to the best of my ability, ensured that the participant understands to what they are freely consenting.

Researcher name [printed]

Signature

Date

Study contact details for further information:

Simone von Kunow (s.n.vonkunow@student.utwente.nl)

Vince Lammerink (v.lammerink@student.utwente.nl)

Jonathan Faria da Silva Dias (j.m.fariadasilvadias@student.utwente.nl)

Contact Information for Questions about Your Rights as a Research Participant

If you have questions about your rights as a research participant, or wish to obtain information, ask questions, or discuss any concerns about this study with someone other than the researcher(s), please contact the Secretary of the Ethics Committee/domain Humanities & Social Sciences of the Faculty of Behavioural, Management and Social Sciences at the University of Twente by ethicscommittee-hss@utwente.nl

Appendix E

Digital Advertisement for Survey study (Study 2)

Online Survey Study

Hey there!

Are you between **18 and 29 years old**?


Then we are looking for you!

We aim to investigate the use of digital tools for mental health and explore factors related to user acceptance, engagement, and willingness to use digital tools for well-being.

The **online survey** will only take 20 minutes of your time and can be accessed by clicking on the link below.

Link to Study:
https://utwentebbs.eu.qualtrics.com/jfe/form/SV_d6cOCV5oTeUi7SC

Researcher: Simone von Kunow, s.n.vonkunow@student.utwente.nl
 Vince Lammerink, v.lammerink@student.utwente.nl
 Jonathan da Silva Dias, j.m.fariadasilvadias@student.utwente.nl



Appendix F

Information Sheet and Informed Consent

Quantitative Research – Online Survey

Information Sheet

Informed consent form for Online Survey

Title of Study: **Mixed Study**

Acceptance and user experience of digital tools to increase well-being

This mixed research study aims to investigate the use of digital tools for mental health and explore factors related to user acceptance, engagement, and willingness to use such tools. The study will collect and analyze data from participants regarding their current mental well-being status and their use and perceptions of digital tools for mental health to gain insights into the perceived usefulness and ease of use of these tools and how they may influence users' motivation to engage with them.

The ultimate goal is to inform the development and implementation of more effective digital tools for mental health to improve individuals' well-being.

The Online Surveys will be conducted in an online setting on Qualtrics, either through an individual Link via WhatsApp/Instagram or the survey Platform SONA for university students. For this, access to a smart device, such as a smartphone, laptop or computer and a stable internet connection is needed. The participant will be asked several multiple-choice and Likert-scale questions regarding their mental well-being and the use of digital tool for well-being and his personal opinions, attitude, and perception regarding such tools. The specific questionnaires the participant will be confronted with are the Beck's Depression Inventory, GAD-7 Anxiety, the Perceived Stress Scale (PSS), the Warwick–Edinburgh Mental Well-being Scale (WEMWBS). In addition, Likert scale questions based on the Technology Acceptance Model (TAM) and Theory of Planned Behavior regarding perceived usefulness & perceived ease of use, attitude & behavioral Intention, and lastly willingness and engagement, will be part of the survey.

The Survey will take approximately 15-25 minutes to complete.

Participants will have the opportunity to contribute to scientific knowledge on this important topic and gain greater awareness and understanding of their own attitudes and behaviors towards using digital tools for mental health.

However, participation may carry some risks, including emotional discomfort if participants disclose sensitive information about their mental health or well-being. To ensure safety, an informed consent form will be provided with clear and detailed information about the study's nature, purpose, and potential risks or benefits. Participants will remain anonymous, and their responses kept confidential through the use of an anonymous survey tool.

Participation in the study is voluntary, and participants may withdraw at any time without penalty or effect on their relationship with the investigator. Personal information, including age, gender, education, nationality, and mental health status, will be collected for participant eligibility and demographic analysis. Participants have the right to request access, rectification, or erasure of their personal data subject to legal or ethical restrictions by contacting the researchers via Email.

Data access will be controlled, and any dissemination of research findings will not include identifiable information. After collection, any identifying information will be removed, and participants can request the deletion of their data at any time.

The research data will be retained for two years, and disposal criteria will be used when it is not possible to retain the data for this length of time.

Consent Form for

YOU WILL BE GIVEN A COPY OF THIS INFORMED CONSENT FORM

Please tick the appropriate boxes

Yes No

Taking part in the study

I have read and understood the study information dated [DD/MM/YYYY], or it has been read to me. I have been able to ask questions about the study and my questions have been answered to my satisfaction.

I consent voluntarily to be a participant in this study and understand that I can refuse to answer questions and I can withdraw from the study at any time, without having to give a reason.

I understand that taking part in the study involves the use of an online survey and ask to provide responses to a set of questions or statements related to digital tools for mental health, acceptance, and engagement. The survey may be conducted through a web-based platform or a link that takes participants to the survey page.

Information is captured using various survey instruments such as multiple-choice questions, rating scales, open-ended questions, and Likert scales. Participants are asked to provide their responses to these questions based on their experiences and opinions about digital tools for mental health.

The data collected from the survey is then analysed to draw conclusions about the acceptance and engagement of digital tools for mental health.

It is important to note that participating in an online survey study involves providing personal information such as email address, age, gender, and other demographic details. Participants' privacy and confidentiality are protected through measures such as data encryption, anonymous responses, and data protection policies.

Use of the information in the study

I understand that information I provide will be used for:

Academic research: The data may be used to produce a research paper/thesis. The findings may be presented at academic conferences, published in academic journals, or used to inform further research.

Program evaluation: The data may be used to evaluate the effectiveness of a particular intervention (digital tools), or treatment. This information can be used to make decisions about the continuation or modification of it.

Professional development: The data may be used to inform the development of training programs or professional development opportunities for professionals working in the field.
Advocacy and awareness: The data may be used to raise awareness of an issue or to advocate for changes in public policy or practice. This might involve sharing the findings with stakeholders, policymakers, or the general public.

I understand that personal information collected about me that can identify me, such as [e.g. my name or where I live], will not be shared beyond the study team.

Future use and reuse of the information by others

I give permission for the Online Survey Data that I provide to be archived in secure data servers so it can be used for future research and learning.

The data from this study will be deposited in a survey database, which will include anonymized survey responses and demographic information.

Signatures

Participant name [printed]

Signature

Date

I have accurately read out the information sheet to the potential participant and, to the best of my ability, ensured that the participant understands to what they are freely consenting.

Researcher name [printed]

Signature

Date

Study contact details for further information:

Simone von Kunow (s.n.vonkunow@student.utwente.nl)

Vince Lammerink (v.lammerink@student.utwente.nl)

Jonathan Faria da Silva Dias (j.m.fariadasilvadias@student.utwente.nl)

Contact Information for Questions about Your Rights as a Research Participant

If you have questions about your rights as a research participant, or wish to obtain information, ask questions, or discuss any concerns about this study with someone other than the researcher(s), please contact the Secretary of the Ethics Committee/domain Humanities & Social Sciences of the Faculty of Behavioural, Management and Social Sciences at the University of Twente by ethicscommittee-hss@utwente.nl

Appendix G

Start of Survey – Information

Dear participant,

Thank you for your willingness to participate in this study. With this study, we aim to investigate the use of digital tools to increase mental health and explore factors related to user acceptance, engagement, and willingness to use such tools.

Through the collection and analysis of data from participants who have used digital tools for mental health, the study aspires to gain insights into the perceived usefulness and ease of use of these tools and how they may influence users' motivation to engage with them.

The ultimate goal is to inform the development and implementation of more effective digital tools to increase mental health that can improve the well-being of individuals.

The participant will be asked several multiple-choice and Likert-scale questions regarding their mental well-being and the use of digital tool to increase well-being and their personal opinions, attitude, and perception regarding such tools.

The specific questionnaires the participant will be introduced to are the Beck's Depression Inventory, GAD-7 Anxiety, the Perceived Stress Scale (PSS), the Warwick–Edinburgh Mental Well-being Scale (WEMWBS). In addition, Likert scale questions based on the Technology Acceptance Model (TAM) and Theory of Planned Behavior regarding perceived usefulness & perceived ease of use, attitude & behavioral Intention, and lastly willingness and engagement, will be part of the survey.

The survey will take approximately 15-25 minutes to complete.

Note that this survey is anonymous. The data provided by you cannot be used to identify who you are. Furthermore, you can also withdraw at any time in this study, without being forced to give an explanation. When you feel uncomfortable about your data, you can always contact us via email. Afterward, we will delete your data. Moreover, participating in this study is completely voluntary.

This Bachelor's thesis is part of our psychology program at the University of Twente. We are supervised by assigned supervisors who are Alejandro Dominguez Rodriguez and Gerko Schaap. Moreover, this study was reviewed and approved by the BMS Ethics Committee.

In case of any questions or concerns, feel free to contact us via email:

Simone von Kunow (s.n.vonkunow@student.utwente.nl)
Vince Lammerink (v.lammerink@student.utwente.nl)
Jonathan Faria da Silva Dias (j.m.fariadasilvadias@student.utwente.nl)

Supervisor:
Alejandro Dominguez Rodriguez (a.dominguezrodriguez@utwente.nl)

Appendix H

Demographical Survey questions

Demographics What is your age?

Demographics What is your gender?

- Male (1)
- Female (2)
- Non-binary / third gender (3)
- Prefer not to say (4)

Demographics What is your nationality?

- German (1)
- Dutch (2)
- Other (please specify) (3)

Demographics What is your highest level of education?

- High school (1)
 - Bachelor's degree (2)
 - Master's degree (3)
 - Doctoral degree (4)
-

Demographics What is your current employment status?

- Employed full-time (1)
- Employed part-time (2)
- Student (3)
- Unemployed (4)
- Retired (5)
- Other (6) _____

Appendix I
Beck's Depression Inventory Standardized Scale (Mental Health questions)

Q12 Please indicate how you are feeling at the present moment, and choose an answer that portrays your feelings best.

- I do not feel sad. (1)
- I feel sad (2)
- I am sad all the time and I can't snap out of it. (3)
- I am so sad and unhappy that I can't stand it. (4)

Q13 Please indicate how you are feeling at the present moment, and choose an answer that portrays your feelings best.

- I am not particularly discouraged about the future. (1)
 - I feel discouraged about the future. (2)
 - I feel I have nothing to look forward to. (3)
 - I feel the future is hopeless and that things cannot improve (4)
-

Q14 Please indicate how you are feeling at the present moment, and choose an answer that portrays your feelings best.

- I do not feel like a failure. (1)
 - I feel I have failed more than the average person. (2)
 - As I look back on my life, all I can see is a lot of failures. (3)
 - I feel I am a complete failure as a person. (4)
-

Q15 Please indicate how you are feeling at the present moment, and choose an answer that portrays your feelings best.

- I get as much satisfaction out of things as I used to (1)
 - I don't enjoy things the way I used to. (2)
 - I don't get real satisfaction out of anything anymore. (3)
 - I am dissatisfied or bored with everything. (4)
-

Q16 Please indicate how you are feeling at the present moment, and choose an answer that portrays your feelings best.

- I don't feel particularly guilty (1)
 - I feel guilty a good part of the time. (2)
 - I feel quite guilty most of the time. (3)
 - I feel guilty all of the time. (4)
-

Q17 Please indicate how you are feeling at the present moment, and choose an answer that portrays your feelings best.

- I don't feel I am being punished. (1)
 - I feel I may be punished. (2)
 - I expect to be punished. (3)
 - I feel I am being punished. (4)
-

Q18 Please indicate how you are feeling at the present moment, and choose an answer that portrays your feelings best.

- I don't feel disappointed in myself. (1)
 - I am disappointed in myself. (2)
 - I am disgusted with myself. (3)
 - I hate myself. (4)
-

Q19 Please indicate how you are feeling at the present moment, and choose an answer that portrays your feelings best.

- I don't feel I am any worse than anybody else. (1)
 - I am critical of myself for my weaknesses or mistakes. (2)
 - I blame myself all the time for my faults. (3)
 - I blame myself for everything bad that happens (4)
-

Q20 Please indicate how you are feeling at the present moment, and choose an answer that portrays your feelings best.

- I don't have any thoughts of killing myself. (1)
 - I have thoughts of killing myself, but I would not carry them out. (2)
 - I would like to kill myself. (3)
 - I would kill myself if I had the chance. (4)
-

Q21 Please indicate how you are feeling at the present moment, and choose an answer that portrays your feelings best.

- I don't cry any more than usual. (1)
 - I cry more now than I used to. (2)
 - I cry all the time now. (3)
 - I used to be able to cry, but now I can't cry even though I want to. (4)
-

Q22 Please indicate how you are feeling at the present moment, and choose an answer that portrays your feelings best.

- I am no more irritated by things than I ever was. (1)
 - I am slightly more irritated now than usual. (2)
 - I am quite annoyed or irritated a good deal of the time. (3)
 - I feel irritated all the time. (4)
-

Q23 Please indicate how you are feeling at the present moment, and choose an answer that portrays your feelings best.

- I have not lost interest in other people. (1)
 - I am less interested in other people than I used to be. (2)
 - I have lost most of my interest in other people. (3)
 - I have lost all of my interest in other people. (4)
-

Page Break

Q24 Please indicate how you are feeling at the present moment, and choose an answer that portrays your feelings best.

- I make decisions about as well as I ever could. (1)
- I put off making decisions more than I used to. (2)
- I have greater difficulty in making decisions more than I used to. (3)
- I can't make decisions at all anymore. (4)

Q25 Please indicate how you are feeling at the present moment, and choose an answer that portrays your feelings best.

- I don't feel that I look any worse than I used to. (1)
 - I am worried that I am looking old or unattractive. (2)
 - I feel there are permanent changes in my appearance that make me look unattractive (3)
 - I believe that I look ugly. (4)
-

Q26 Please indicate how you are feeling at the present moment, and choose an answer that portrays your feelings best.

- I can work about as well as before. (1)
 - It takes an extra effort to get started at doing something. (2)
 - I have to push myself very hard to do anything. (3)
 - I can't do any work at all. (4)
-

Q27 Please indicate how you are feeling at the present moment, and choose an answer that portrays your feelings best.

- I can sleep as well as usual. (1)
 - I don't sleep as well as I used to. (2)
 - I wake up 1-2 hours earlier than usual and find it hard to get back to sleep. (3)
 - I wake up several hours earlier than I used to and cannot get back to sleep. (4)
-

Q28 Please indicate how you are feeling at the present moment, and choose an answer that portrays your feelings best.

- I don't get more tired than usual. (1)
 - I get tired more easily than I used to. (2)
 - I get tired from doing almost anything. (3)
 - I am too tired to do anything. (4)
-

Q29 Please indicate how you are feeling at the present moment, and choose an answer that portrays your feelings best.

- My appetite is no worse than usual. (1)
 - My appetite is not as good as it used to be. (2)
 - My appetite is much worse now. (3)
 - I have no appetite at all anymore. (4)
-

Q30 Please indicate how you are feeling at the present moment, and choose an answer that portrays your feelings best.

- I haven't lost much weight, if any, lately. (1)
 - I have lost more than five pounds. (2)
 - I have lost more than ten pounds. (3)
 - I have lost more than fifteen pounds. (4)
-

Q31 Please indicate how you are feeling at the present moment, and choose an answer that portrays your feelings best.

- I am no more worried about my health than usual. (1)
 - I am worried about physical problems like aches, pains, upset stomach, or (2)
 - constipation. (3)
 - I am very worried about physical problems and it's hard to think of much else. (4)
 - I am so worried about my physical problems that I cannot think of anything else. (5)
-

Q32 Please indicate how you are feeling at the present moment, and choose an answer that portrays your feelings best.

- I have not noticed any recent change in my interest in sex. (1)
 - I am less interested in sex than I used to be. (2)
 - I have almost no interest in sex. (3)
 - I have lost interest in sex completely. (4)
-

Appendix J

GAD-7 Anxiety Standardized Test (Mental Health questions)

GAD-7 Anxiety Over the last two weeks, how often have you been bothered by the following problems?

	Not at all (1)	Several days (2)	More than half the days (3)	Nearly every day (4)
1. Feeling nervous, anxious, or on edge (1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
2. Not being able to stop or control worrying (2)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
3. Worrying too much about different things (3)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
4. Trouble relaxing (4)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
5. Being so restless that it is hard to sit still (5)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
6. Becoming easily annoyed or irritable (6)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
7. Feeling afraid, as if something awful might happen (7)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Appendix K

Standardized Perceived Stress Scale (Mental Health questions)

Q34 1. In the last month, how often have you been upset because of something that happened unexpectedly?

- 1. Never (1)
 - 2. Almost never (2)
 - 3. Sometimes (3)
 - 4. Fairly often (4)
 - 5. Very often (5)
-

Q35 2. In the last month, how often have you felt that you were unable to control the important things in your life?

- 1. Never (1)
 - 2. Almost never (2)
 - 3. Sometimes (3)
 - 4. Fairly often (4)
 - 5. Very often (5)
-

Q36 3. In the last month, how often have you felt nervous and stressed?

- 1. Never (1)
 - 2. Almost never (2)
 - 3. Sometimes (3)
 - 4. Fairly often (4)
 - 5. Very often (5)
-

Q37 4. In the last month, how often have you felt confident about your ability to handle your personal problems?

- 1. Never (1)
 - 2. Almost never (2)
 - 3. Sometimes (3)
 - 4. Fairly often (4)
 - 5. Very often (5)
-

Q38 5. In the last month, how often have you felt that things were going your way?

- 1. Never (1)
 - 2. Almost never (2)
 - 3. Sometimes (3)
 - 4. Fairly often (4)
 - 5. Very often (5)
-

Q39 6. In the last month, how often have you found that you could not cope with all the things that you had to do?

- 1. Never (1)
 - 2. Almost never (2)
 - 3. Sometimes (3)
 - 4. Fairly often (4)
 - 5. Very often (5)
-

Q40 7. In the last month, how often have you been able to control irritations in your life?

- 1. Never (1)
 - 2. Almost never (2)
 - 3. Sometimes (3)
 - 4. Fairly often (4)
 - 5. Very often (5)
-

Q41 8. In the last month, how often have you felt that you were on top of things?

- 1. Never (1)
 - 2. Almost never (2)
 - 3. Sometimes (3)
 - 4. Fairly often (4)
 - 5. Very often (5)
-

Q42 9. In the last month, how often have you been angered because of things that happened that were outside of your control?

- 1. Never (1)
 - 2. Almost never (2)
 - 3. Sometimes (3)
 - 4. Fairly often (4)
 - 5. Very often (5)
-

Q43 10. In the last month, how often have you felt difficulties were piling up so high that you could not overcome them?

- 1. Never (1)
- 2. Almost never (2)
- 3. Sometimes (3)
- 4. Fairly often (4)
- 5. Very often (5)

Appendix L

The Warwick–Edinburgh Mental Well-being Scale (Mental Health questions)

Q44 Below are some statements about feelings and thoughts. Please tick the box that best describes your experience of each over the last 2 weeks.

	None of the time (1)	Rarely (2)	Some of the time (3)	Often (4)	All of the time (5)
I've been feeling optimistic about the future (1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I've been feeling useful (2)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I've been feeling relaxed (3)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I've been feeling interested in other people (4)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I've had energy to spare (5)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I've been dealing with problems well (6)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I've been thinking clearly (7)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I've been feeling good about myself (8)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I've been feeling close to other people (9)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I've been feeling confident (10)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I've been able to make up my own mind about things (11)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I've been feeling loved (12)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

I've been
interested in
new things
(13)

I've been
feeling
cheerful (14)

Appendix M

Survey Information Page on Digital tools for well-being

Q80 In the following part of the survey you will be introduced to many questions regarding digital tools to increase well-being. Therefore, please read through the following information to gain a better understanding of digital tools to increase wellbeing.

Digital tools to increase wellbeing are technological applications or platforms that aim to support or improve individuals' mental health and well-being.

These tools typically provide users with resources, guidance, and activities that promote positive psychological outcomes such as stress reduction, relaxation, and improved mood. Some examples of digital tools for well-being include:

Meditation and mindfulness apps:

These apps provide users with guided meditations, breathing exercises, and other mindfulness-based practices to help reduce stress and improve focus.

Mood tracking and journaling apps:

These apps allow users to track their moods and emotions over time, as well as provide tools for journaling and reflecting on their feelings.

Online therapy platforms:

These platforms connect users with licensed therapists or counselors through virtual sessions, allowing them to receive mental health support from the comfort of their own homes.

Fitness and nutrition apps:

These apps provide users with exercise routines, healthy recipes, and other resources to support physical health, which can also have a positive impact on mental well-being.

Social connection apps:

These apps provide opportunities for users to connect with others online and build supportive social networks, which can be beneficial for mental health.

Appendix N

Survey Questions assessing perceived ease of use and perceived usefulness

Q45 Please indicate which answer you would choose for the following statements:
"Using well-being digital tools would improve my mental health."

- Strongly disagree (1)
 - Disagree (2)
 - Neutral (3)
 - Agree (4)
 - Strongly agree (5)
-

Q49 "I believe using well-being digital tools would help me manage my mental health more effectively."

- Strongly disagree (1)
 - Disagree (2)
 - Neutral (3)
 - Agree (4)
 - Strongly agree (5)
-

Q50 "Using well-being digital tools would be easy for me to learn."

- Strongly disagree (1)
 - Disagree (2)
 - Neutral (3)
 - Agree (4)
 - Strongly agree (5)
-

Q52 "The interface of digital tools to increase wellbeing is user-friendly."

- Strongly disagree (1)
 - Disagree (2)
 - Neutral (3)
 - Agree (4)
 - Strongly agree (5)
-

"I have a positive attitude towards using digital tools to increase wellbeing."

- Strongly disagree (1)
 - Disagree (2)
 - Neutral (3)
 - Agree (4)
 - Strongly agree (5)
-

Q55 "I think that using digital tools to increase wellbeing is a good idea."

- Strongly disagree (1)
 - Disagree (2)
 - Neutral (3)
 - Agree (4)
 - Strongly agree (5)
-

Q56 "I intend to use digital tools to increase wellbeing in the future."

- Strongly disagree (1)
 - Disagree (2)
 - Neutral (3)
 - Agree (4)
 - Strongly agree (5)
-

Q81 "Upon using a digital tool to increase wellbeing, I intend to use it continuously, on a daily basis."

- Strongly disagree (1)
 - Disagree (2)
 - Neutral (3)
 - Agree (4)
 - Strongly agree (5)
-

Q58 "I am likely to use digital tools to increase wellbeing."

- Strongly disagree (1)
 - Disagree (2)
 - Neutral (3)
 - Agree (4)
 - Strongly agree (5)
-

Appendix O

Survey Questions assessing attitude towards digital tools for well-being

Q59 On a scale of 1 to 5, how strongly do you agree with the following statements:

	1. strongly disagree (1)	2. disagree (2)	3. neutral (3)	4. agree (4)	5. strongly agree (5)
It is likely that I will use digital tools to increase wellbeing in the next 6 months. (1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
If I am ever dealing with mental struggles, my first solution would be to use a digital tool to increase well-being. (2)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I believe there are drawbacks using digital tools that increase wellbeing. (3)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I trust digital tools to increase wellbeing. (4)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I think the convenience of a digital tool for increasing well-being outweighs the drawbacks. (5)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Appendix P

Survey Questions assessing use, engagement and willingness in digital tools for well-being

Q60 How often do you use digital tools for well-being?

- Daily (1)
 - Weekly (2)
 - Monthly (3)
 - Rarely (4)
 - Never (5)
-

Q61 How often do you search for information about digital tools to increase well-being?

- Daily (1)
 - Weekly (2)
 - Monthly (3)
 - Rarely (4)
 - Never (5)
-

Q62 How often do you talk with others about digital tools to increase well-being?

- Daily (1)
 - Weekly (2)
 - Monthly (3)
 - Rarely (4)
 - Never (5)
-

How often do you think about using digital tools to increase well-being?

- Daily (1)
 - Weekly (2)
 - Monthly (3)
 - Rarely (4)
 - Never (5)
-

How much do you feel influenced by other people's opinions about using digital tools to increase well-being?

- Extremely influenced (1)
 - Somewhat influenced (2)
 - Neutral (3)
 - Not very influenced (4)
 - Not at all influenced (5)
-

Q65 How much do you feel influenced by social media posts or advertisements about using digital tools to increase well-being?

- Extremely influenced (1)
 - Somewhat influenced (2)
 - Neutral (3)
 - Not very influenced (4)
 - Not at all influenced (5)
-

Q66 How much do you feel influenced by your own past experiences using digital tools to increase well-being?

- Extremely influenced (1)
- Somewhat influenced (2)
- I don't have experiences using digital tools for well-being (3)
- Not very influenced (4)
- Not at all influenced (5)

Q67 How willing are you to use digital tools to increase well-being?

- Very willing (1)
 - Somewhat willing (2)
 - Neutral (3)
 - Not very willing (4)
 - Not willing at all (5)
-

Q68 How confident are you that you can use digital tools for well-being effectively?

- Very confident (1)
 - Somewhat confident (2)
 - Neutral (3)
 - Not very confident (4)
 - Not confident at all (5)
-

Q69 How likely are you to use digital tools to increase well-being in the next month?

- Extremely unlikely (1)
 - Somewhat unlikely (2)
 - Neither likely nor unlikely (3)
 - Somewhat likely (4)
 - Extremely likely (5)
-

Q73 How much control do you feel you have over your ability to use digital tools to increase well-being?

- None at all (1)
 - A little (2)
 - A moderate amount (3)
 - A lot (4)
 - A great deal (5)
-

Q74 How important is it to you to use digital tools for well-being?

- Not at all important (1)
 - Slightly important (2)
 - Moderately important (3)
 - Very important (4)
 - Extremely important (5)
-

Q75 How likely do you think it is that using digital tools to increase well-being will have a positive impact on your mental health?

- Extremely unlikely (1)
 - Somewhat unlikely (2)
 - Neither likely nor unlikely (3)
 - Somewhat likely (4)
 - Extremely likely (5)
-

Q86 How much impact do you think the presence of advertisements in a mobile application impacts your likelihood to continue using it?

- Very high impact (1)
 - High impact (2)
 - Moderate impact (3)
 - Slight impact (4)
 - No impact at all (5)
-

To what extent do you believe that people in your social circle support using digital tools to increase well-being?

- Strongly support (1)
 - Somewhat support (2)
 - Unsure (3)
 - Somewhat do not support (4)
 - Strongly do not support (5)
-

Q88 In order to use a digital tool for a long period of time, I need to be motivated enough

- Strongly Agree (1)
 - Somewhat Agree (2)
 - Neutral (3)
 - Somewhat Disagree (4)
 - Strongly Disagree (5)
-

Q87 How effective do you think mobile applications that use 'streaks' (or other similar methods) would be for encouraging you to consistently use an app that helps you achieve a specific goal or task?

- Extremely effective (1)
 - Very effective (2)
 - Moderately effective (3)
 - Slightly effective (4)
 - Not effective at all (5)
-

Q88 How important is it to you that the account creation process for a digital tool for mental health is quick and easy?

- Extremely important (1)
 - Very important (2)
 - Moderately important (3)
 - Slightly important (4)
 - Not at all important (5)
-

Q89 How important is it to you that a digital tool for mental health is engaging enough to hook you and keep you using it consistently?

- Extremely important (1)
 - Very important (2)
 - Moderately important (3)
 - Slightly important (4)
 - Not at all important (5)
-

Q90 In order to use a digital tool for a long period of time, the tool needs to keep me motivated

- Strongly Agree (1)
 - Somewhat Agree (2)
 - Neutral (3)
 - Somewhat Disagree (4)
 - Strongly Disagree (5)
-

Q91 A payment requirement would make me drop the use of the digital tool completely

- Strongly Agree (1)
- Somewhat Agree (2)
- Neutral (3)
- Somewhat Disagree (4)
- Strongly Disagree (5)

Survey Questions assessing perceived obstacles in digital tools for well-being (derived from qualitative data)

Q92 Please rate how significant of an obstacle each of the following factors is to you when using a digital tool for mental health. Please use the scale below to rate each factor from 1 to 5

	Not significant at all (1)	Slightly significant (2)	Moderately significant (3)	Very significant (4)	Extremely significant (5)
Payments/Subscriptions attached to a digital tool (1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Minimal personalisation (2)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Too many applications to choose from (3)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Little variety in tasks and/or questions (4)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
No long-lasting results (5)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Q90 I will eventually lose interest in using a digital tool, even if I have no complaints about the tool

- Strongly Agree (1)
 - Somewhat Agree (2)
 - Neutral (3)
 - Somewhat Disagree (4)
 - Strongly Disagree (5)
-

Q96 I prefer not to rely on a digital tool for my mental well-being

- Strongly agree (1)
 - Somewhat agree (2)
 - Neutral (3)
 - Somewhat disagree (4)
 - Strongly disagree (5)
-

Q97 I expect digital tools for mental well-being to be a viable replacement for face-to-face therapy in the next five years

- Strongly agree (1)
 - Somewhat agree (2)
 - Neutral (3)
 - Somewhat disagree (4)
 - Strongly disagree (5)
-

Q96 How important is it to you to have access to all available content of a digital tool for mental health during a trial period before committing to a payment?

- Extremely important (1)
 - Very important (2)
 - Moderately important (3)
 - Slightly important (4)
 - Not important at all (5)
-

Q97 How strongly do you agree or disagree with the following statement: “The time pressure of having to complete daily questions and/or tasks in a digital tool within a limited time frame causes me stress”

- Strongly agree (1)
 - Somewhat agree (2)
 - Neither agree nor disagree (3)
 - Somewhat disagree (4)
 - Strongly disagree (5)
-

Q99 How important is it for you to have direct contact with licensed medical health professionals within the digital tool?

- Extremely important (1)
 - Very important (2)
 - Moderately important (3)
 - Slightly important (4)
 - Not important at all (5)
-

Q101 How strongly do you agree or disagree with the following statement: “A poorly designed user interface would discourage me from using the digital tool for mental health”

- Strongly agree (1)
 - Somewhat agree (2)
 - Neither agree nor disagree (3)
 - Somewhat disagree (4)
 - Strongly disagree (5)
-

Q100 How important is it to you that a digital tool for mental health provides a variety of different daily questions and/or tasks to keep you engaged with the tool over time?

- Extremely important (1)
- Very important (2)
- Moderately important (3)
- Slightly important (4)
- Not important at all (5)
-

Q98 In my opinion, the content of digital tools is too difficult for the general population to understand

- Strongly agree (1)
- Somewhat agree (2)
- Neither agree nor disagree (3)
- Somewhat disagree (4)
- Strongly disagree (5)

End of Block: Questionnaire

Appendix R

Overview of all new Survey Questions derived from findings of Thematic Analysis.

Additional Survey Questions
How much impact do you think the presence of advertisements in a mobile application impacts your likelihood to continue using it?
To what extent do you believe that people in your social circle support using digital tools to increase well-being?
In order to use a digital tool for a long period of time, I need to be motivated enough.

How effective do you think mobile applications that use 'streaks' (or other similar methods) would be for encouraging you to consistently use an app that helps you achieve a specific goal or task?
How important is it to you that the account creation process for a digital tool for mental health is quick and easy?
How important is it to you that a digital tool for mental health is engaging enough to hook you and keep you using it consistently?
In order to use a digital tool for a long period of time, the tool needs to keep me motivated.
A payment requirement would make me drop the use of the digital tool completely.
Please rate how significant of an obstacle each of the following factors is to you when using a digital tool for mental health. Please use the scale below to rate each factor from 1 to 5 (1. Payment/Subscriptions attached to a digital tool, 2. Minimal personalization, 3. Too many applications to choose from, 4. Little variety in tasks and/or questions, 5. No long-lasting results.)
I will eventually lose interest in using a digital tool, even if I have no complaints about the tool.
I prefer not to rely on a digital tool for my mental well-being.
I expect digital tools for mental well-being to be a viable replacement for face-to-face therapy in the next five years.
How important is it to you to have access to all available content of a digital tool for mental health during a trial period before committing to a payment?
How strongly do you agree or disagree with the following statement: “The time pressure of having to complete daily questions and/or tasks in a digital tool within a limited time frame causes me stress”?
How important is it for you to have direct contact with licensed medical health professionals within the digital tool?
How strongly do you agree or disagree with the following statement: “A poorly designed user interface would discourage me from using the digital tool for mental health”

How important is it to you that a digital tool for mental health provides a variety of different daily questions and/or tasks to keep you engaged with the tool over time?

In my opinion, the content of digital tools is too difficult for the general population to understand.