

Self-Help Apps for Mental Health: Use, Experience and Predictors of Use

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Abstract

Background: Mental health apps are becoming more relevant in supporting mental well-being. Overall, mental health app use remains low. Research into the use and experience of different mental health apps and factors associated with use is limited.

Aim: In the current study, the aim was to investigate [1] participants' use of and experience with different types of mental health apps, [2] the relation between personality, background variables and mental health app use, and [3] the relation between mental well-being and mental health app use.

Methods: A cross-sectional online survey was conducted ($N = 111$) to measure participants' use of different types of mental health apps and the association of this use with a self-developed questionnaire. The association of this use with personality and mental well-being was assessed with the Big Five Inventory-10 (BFI-10) and the Mental Health Continuum Short-Form (MHC-SF).

Results: Most participants have tried a mental health app (62.2%) while for the majority mental health app use was limited ($M = 2.6$, $SD = 3.3$, $min = 0$, $max = 27$). Mental health app use negatively correlated with the subscale of conscientiousness ($r = -.23$, $p = .018$), positively with the subscale of openness ($r = .19$, $p = .044$), negatively with age ($r = -.21$, $p = .003$), and positively with average screen time ($r = .21$, $p = .007$). A significant difference between males ($M = 1.9$, $SD = 2.2$) and females ($M = 3.0$, $SD = 3.7$) in mental health app use was found, $z = -2.71$, $p = .007$.

Conclusion: Mental health app use was limited. Use was associated with the variables of age, gender, screen time, and the personality traits of conscientiousness and openness.

Keywords: mental health app use, personality, mental well-being

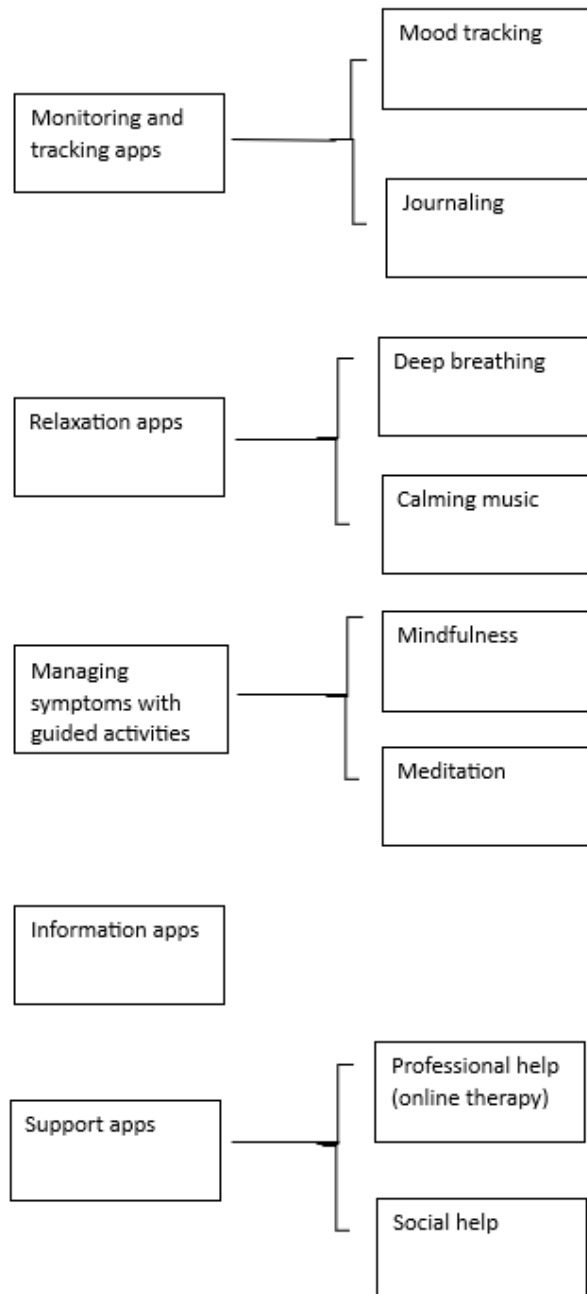
Introduction

Mental health apps- Definition and classification

The World Health Organization (WHO) defines mHealth as “mental health services (medical and public health practices) [which are] supported by mobile devices, such as mobile phones, patient monitoring devices, personal digital assistants (PDAs), and other wireless devices. They include smartphone apps, voice, video or text messaging intervention [...]” (World Health Organization, 2017, as cited in Lecomte et al., 2020, p. 2). The WHO developed a digital health strategy to improve mental health worldwide by offering suitable technological solutions (Cruz et al., 2023). A technological solution is a mental health app, a software that can be downloaded (Gama & Laher, 2023). They offer possibilities for people to monitor their mental health independently and they can be used in therapy to support traditional mental health care, which is relevant as the need for mental healthcare is rising (Neary & Schueller, 2018; Koh et al. 2022). Mental health apps are diverse, ranging from general mental health apps to apps supporting different mental health conditions such as depression, anxiety, and bipolar disorder (Schueller et al., 2018; Neary & Schueller, 2018). In 2017, no less than 325.000 mental health apps were on the market (Neary & Schueller, 2018).

There are different types of mental health apps, each using different strategies to support an individual. Both Alqahtani and Orji (2020) and Stawarz et al. (2019) claim that the following types of mental health apps are available: tracking-, mindfulness and meditation-, relaxation-, advice-, information-, social support-, and goal-setting apps. Next to that, Alqahtani and Orji (2020) also report CBT, strength-based and hypnosis apps whereas Stawarz et al. (2019) suggest games and quizzes.

Based on these classifications, a selection of the most relevant types of apps was made which will be the focus of this study. See Figure 1. The first type of mental health app is a *monitoring and tracking app* with which individuals can track their feelings, thoughts and behaviours (Alqahtani & Orji, 2020). Examples of these apps are mood tracking and journaling. The second type of app is a *relaxation app* which individuals can use to calm down. Relaxation apps can focus on deep breathing or listening to calming music. A third type is an app for *managing symptoms with guided activities* where mindfulness and meditation belong. Mindfulness is the focus on the present moment and meditation is a practice to clear the mind. The last two types of apps are *information app*, which offer information about specific mental health topics and *support app*, where individuals can receive support. On the one hand, individuals can receive support from peers and connect with others. Here, individuals can be part of a community and exchange their experiences or ask for advice in forums or discussion groups. On the other hand, apps can offer support from professionals where individuals receive online therapy through online messaging, live chat or video/phone calls with a licensed therapist.

Figure 1*Classification of Mental Health Apps***Benefits and disadvantages of mental health apps**

Mental health apps have benefits and disadvantages. A great benefit of mental health apps is that everyone owning a phone can use them without spending too much money (Neary &

Schueller, 2018). Koh et al. (2022) claim that users can find apps which suit their financial situation, making mental health apps more reachable. Another benefit is that users do not have to spend much time and effort in finding a therapist (Neary & Schueller, 2018). Mental health apps can offer timely support as users can use them directly when needed (Koh et al. 2022). Some drawbacks of traditional therapy can be overcome such as long waiting lists and limited time available of therapists. When not receiving timely support, individuals can suffer more from their mental health condition. Lastly, a benefit proposed is the reduction of stigma, meaning that people who do not want to be helped face-to-face, can be provided with help anonymously.

Mental health apps do not only provide benefits. As there is a huge number of apps, it is difficult for users to find a suitable app (Neary & Schueller, 2018). In addition, most of the available apps are not empirically tested. Therefore, users have access to many apps that might not even work. In a study about anxiety apps by Socala et al. (2017), only two out of 52 apps were considered effective. This shows that it is difficult for users and healthcare professionals to find the most effective mental health apps (Socala et al., 2017). Reduced user engagement is another disadvantage, meaning that users use it less over time (Koh et al., 2022). Furthermore, mental health apps cannot help in critical situations and for emergencies provide the necessary support. This concerns the risk of suicide or self-injury. Mental health apps cannot identify the crisis of a person. Lastly, privacy is a concern which relates to outsiders having access to private information and limited privacy policies.

Acceptance towards mental health apps

With the availability of so many mental health apps, it is important to investigate which people use these apps, how they are searching for apps, what their reasons for using them and what their experiences are. Thus far, some studies have been conducted to examine

the acceptance of mental health apps. The results of studies looking at the acceptance of mental health apps are not coherent (Cruz et al., 2023). For example, Neary and Schueller (2018) claim that users, especially patients have a positive view of mental health apps. Also, healthcare professionals would suggest these apps to their patients (Neary & Schueller, 2018). In contrast, Paslakis et al. (2019) investigated the attitude towards mental health apps in a representative German sample of 2439 adult participants which was assessed using a cross-sectional questionnaire. The results show that most people would not use a mental health app or participate in online therapy (Paslakis et al., 2019). Multiple indications of acceptance are suggested such as perceived efficiency of mental health apps and experienced symptoms related to stress (Cruz et al., 2023).

User Engagement and Experience

Studies have been conducted about the ways people find a mental health app in the first place. For example, Schueller et al. (2018) investigated the strategies people use to find a mental health app. Two common ways to find a mental health app are through social media and individual exploration in which people look through the app store and forums (Schueller et al., 2018). Next to that, some people ask for help in finding an app from close people and professionals.

Studies have been conducted about users' engagement with mental health apps. For example, Cruz et al. (2023) investigated the use of mental health apps and the factors influencing the use in a representative US sample of 1989 adults which was examined by an online questionnaire. Half of the participants used a mental health app before participating in the study (Cruz et al., 2023). In general, multiple studies report that the use of mental health apps is low to moderate (Cruz et al., 2023). What remains unclear in the study by Cruz et al. (2023) is what types of mental health apps are more used, and which are less used as mental

health apps in general were investigated. Yet it is important to have these insights as it can help to gather more insight into which apps attract people and which apps are actually used.

Next to that, other studies have been conducted about participants' experience with mental health apps. In the study by Stawarz et al. (2019), participants liked apps with guided activities the most such as tracking, relaxation, and meditation apps (Stawarz et al., 2019). Reasons for finding these apps helpful mentioned were receiving help when needed, developing new habits, and reducing stress. Apps they did not like were receiving support from peers. Still, participants had some mistrust of technology and did not think that therapy could be replaced with it. Participants claimed that mental health apps should be more personalised to their needs. To current knowledge, only the study by Stawarz et al. (2019) investigated the experience with different types of mental health apps where participants liked mental health apps and perceived them as helpful in supporting their mental health. Yet it is important to investigate what types of mental health apps are liked and perceived as helpful because there is a huge amount of mental health apps on the market, making it difficult to find the most effective ones.

Factors influencing adoption and use of mental health apps

Different studies examined the reasons for using a mental health app. Factors are related to the characteristics of the app, the context, and the potential user.

Characteristics of mental health apps are relevant. An app-related factor which influences the download of a mental health app negatively is the price (Schueller et al., 2018). Next to that, the title of the app is relevant as people are more likely to download a mental health app when the title describes exercises such as mindfulness instead of a mental illness. Certain characteristics of the app can influence long-term use. For example, easy use with

uncomplicated language, and pleasant visuals and content can increase long-term use. Next to that, the personalization of an app can increase engagement with the app.

Another relevant factor is the context. For example, Cruz et al. (2023) claim that COVID-19 greatly influenced and increased the uptake of a mental health app. The stress associated with this pandemic led to mental health problems and difficulties in visiting a therapist due to the lockdown (Cruz et al., 2023). Cruz et al. (2023) state COVID-19 “has led to a dramatic increase in the use of digital health tools, particularly for video-enabled treatment” (Cruz et al., 2023, p. 2).

User-related factors are age, gender, lack of technological knowledge, phone addiction, personality, and mental well-being. Individuals who are most likely to use a mental health app are females and young adults (Cruz et al., 2023). A possible reason for this is the usage of social media and lifestyle apps in general. A reason why men are not likely to use a mental health app is the avoidance of seeking help from professionals whereas older adults are not using mental health apps because of a lack of technological knowledge. Another factor which leads to increased mental health app use is phone addiction and high daily phone use. Cruz et al. (2023) claim that individuals with phone addiction prefer to use a mental health app over visiting a therapist. Another relevant factor Aziz et al. (2023) suggest is people having low satisfaction with life are more likely to use mental health apps. What remains unclear in the study by Cruz et al. (2023) is what types of mental health apps are associated with user-related factors. This is relevant to better understand the user archetype of different mental health apps. Lastly, two other important factors suggested are personality and mental well-being (Aziz et al., 2023; Cruz et al., 2023).

Personality and mental health apps

One factor that may influence mental health app use but has not been studied often in relation to app use, is personality. To current knowledge, only one study has examined the role of personality in mental health app use. Yet it is important to have these insights to better understand the user archetype and better tailor the needs of people using these apps. The Big Five personality traits; openness, conscientiousness, extraversion, agreeableness, and neuroticism are often used in studies as they give great insight (Aziz et al., 2023). The personality traits were studied in correlation with mental health and mental health app use specifically. In general, people who are extroverted and agreeable tend to have better mental health whereas people with neuroticism tend to have worse mental health (Aziz et al., 2023). It was shown that the traits of neuroticism and agreeableness are correlated with individuals' interest in mental health apps. Further, people with the trait of conscientiousness are more likely to use a mental health app in the long term. Individuals with the trait of extraversion prefer face-to-face help whereas people with the trait of openness prefer mindfulness and meditation apps. Next to that, Aziz et al. (2023) suggest two types of mental health app users: help-seeking and maintenance users. Help-seeking users are neurotic and extraverted, and use the app every day as they have a low quality of life (Aziz et al., 2023). The maintenance user is extraverted and has a high quality of life but does not use the app frequently. It is suggested that individuals use mental health apps more often when they feel the urge to do so.

Mental well-being and mental health apps

One factor that may influence mental health app use is mental well-being. Cruz et al. (2023) state that a predictor for using mental health apps is being diagnosed with a mental disorder. Individuals suffering from mental health issues are likely to avoid face-to-face therapy and prefer to receive help with an app to increase their well-being (Cruz et al., 2023). In contrast, mental health app use can also improve the mental well-being of people using them as they support mental health conditions such as depression or anxiety (Neary &

Schueller, 2018). Although the studies by Cruz et al. (2023) and Neary and Schueller (2018) investigated mental well-being in relation to mental health app use, these studies fall short because it remains unclear what types of mental health apps are associated with mental well-being. It is important to have these insights because the main goal of mental health apps is to improve mental well-being and it would be interesting to find out what types of mental health apps are associated with positive or negative mental well-being.

Research questions

This study aims to investigate the use and experience of different types of mental health apps. Next, the relation between mental health app use and personality as well as other background variables will be investigated. The relation between mental well-being and the use of mental health apps will be investigated as well. The following research questions are the focus of this study:

RQ1: To what extent are different types of mental health apps (monitoring, relaxation, guided activities, information, support) being used and what are people's experiences with using these apps?

RQ2: To what extent are personality traits and background variables associated with mental health app use?

RQ3: To what extent is mental health app use associated with mental well-being?

Methods

Design

A cross-sectional online survey was used to measure participants' use of and experience with different types of mental health apps and the association of this use with person-related background variables, personality, and mental well-being.

Sampling and Procedure

The study was approved by the Behavioural Management and Social Sciences Ethics Committee of the University. Inclusion criteria to make participants eligible to participate were being at least 16 years old and having sufficient English or German skills. The sample of 111 participants was acquired through two sampling methods: 1) Participants were recruited via convenience sampling where students could sign up via a participant acquisition website called SONA to receive a reward in the form of credits. Next to that, people known by the researchers were asked to participate. 2) Snowball sampling was used where participants were asked to further share the survey with friends and family. Participants were given the link to the online survey which was available in English and German where participants could choose the language they preferred. When filling out the survey, participants were first presented with an information sheet to gain more relevant information about the study such as the relevance and topic. After that, they were asked to fill out the informed consent to agree their participation is voluntary. See Appendix A. They were informed that they have the right to withdraw from the study at any time without giving any reason and without any consequences. Participants were also informed they have the possibility to contact one of the researchers when questions arise, that their responses will be anonymous, and that their responses will only be used for research purposes. Participants gave their consent when their answer to the question: “Do you agree to all the above-mentioned statements?” was yes. After giving consent, participants could complete the survey. Participation took approximately 20 minutes.

Instruments

Questionnaire

The online survey was created via Qualtrics and included questions about three groups of variables: (1) person-related background variables and personality, (2) use and experience with mental health apps, and (3) mental well-being.

Person-related background variables and personality

Person-related background questions were included to ask about participants' characteristics such as gender, age, and education level (See Table 1 for exact questions and answering options).

To measure personality, the Big Five Inventory-10 (BFI-10) by Rammstedt and John (2007) was included. It is an abbreviation of the Big Five Inventory-44 which includes 44 items and was developed in the 1980s. The BFI-10 consists of 10 items, with two items for each Big Five dimension. To investigate the reliability of the BFI-10, the internal reliability of the five subscales was measured. For all items, participants can answer on a five-point Likert Scale, with the range of “disagree strongly” (1), “disagree a little” (2), “neither agree nor disagree” (3), “agree a little” (4), and “agree strongly” (5). For each Big Five dimension, one of the two items was reversed, meaning that a higher score indicated a lower tendency of the Big Five dimension. The five subscales are the following: 1) *Extraversion* with two items namely: “I see myself as someone who is reserved”, which represents the reverse item and “I see myself as someone who is outgoing, sociable” ($\alpha = .46$ in the current study). 2) *Agreeableness* with the item “I see myself as someone who is generally trusting” and the reverse item “I see myself as someone who tends to find fault with others” ($\alpha = .49$ in the current study). 3) *Conscientiousness* with the reverse item “I see myself as someone who tends to be lazy” and the item “I see myself as someone who does a thorough job” ($\alpha = .49$ in the current study). 4) *Neuroticism* with the reverse item “I see myself as someone who is relaxed, handles stress well.” and the item “I see myself as someone who gets nervous easily”

($\alpha = .55$ in the current study). 5) *Openness* with the reverse item “I see myself as someone who has few artistic interests” and the item “I see myself as someone who has an active imagination” ($\alpha = .48$ in the current study). Even though the alphas were low in the current study, the decision was made to compute the subscales, to be able to compare with previous results and because the scale has been validated in previous research. After recoding the reverse items, a scale score was computed by averaging the scores on the two items. Scale scores could range from 0-10. Higher scale scores are indicative of a stronger personality characteristic. Rammstedt and John (2007) suggest the BFI-10 is valid and reliable.

Use of and experience with mental health apps

The use and experience with mental health apps were assessed with a self-developed questionnaire. See Table 3 for an overview of all apps and categories. A text explaining what mental health apps are was also included before the questions appeared. Moreover, examples of apps were included to give participants an idea about existing apps.

App use was measured by asking respondents for each app type to indicate if they had ever used it: “Have you ever used XX app?” Answers could be given on a four-point Likert scale ranging from “no” (0), “yes, once” (1), “yes, occasionally” (2), and “yes, regularly” (3). The apps could be divided into five categories/subscales: 1) *Monitoring and tracking apps* ($\alpha = .83$). 2) *Relaxation apps* ($\alpha = .83$). 3) *Managing symptoms with guided activities apps* ($\alpha = .83$). 4) *Information apps* ($\alpha = .86$). 5) *Social support apps* ($\alpha = .85$). The total score ($\alpha = .85$) on mental health app use was calculated by taking the mean score of all items in the scale. The higher the score, the more a participant used different mental health apps.

In case the answer to the item assessing use was “yes, once (1)”, “yes, occasionally (2)”, or “yes, regularly (3)”, two further questions assessing experience with particular mental health apps were asked, namely “To what extent did you like the XX apps you used?” (“Not

at all” (0), “Very little” (1), “Somewhat” (2), “Very much” (3)) and “To what extent was your use of this app helpful to reach your health goals?” (“Not at all” (0), “Very little” (1), “Somewhat” (2), “Very much” (3)). For each subscale, the mean was calculated to see what type of mental health apps participants liked and perceived as helpful. The higher the mean, the higher the like and perceived helpfulness of the mental health app.

Next to the self-developed questionnaire about mental health apps, three questionnaires from other researchers were included regarding health-related lifestyle apps and self-tests, but these were not used for the present thesis.

Mental health and well-being

Lastly, to measure the variable mental well-being, the Mental Health Continuum Short Form (MHC-SF) by Keyes was included (Yeo & Suárez., 2022). It is an abbreviation of the Mental Health Continuum- Long Form, consisting of 40 items. The MHC-SF consists of 14 items about how participants felt in the past month. For all items, participants can answer on a six-point Likert Scale with the range of “Never” (0), “Once or twice” (1), “about once a week” (2), “about two or three times a week” (3), “almost every day” (4), and “every day” (5). The MHC-SF consists of three subscales: 1) *emotional well-being* with three items measuring happiness, interest, and life satisfaction; for example: “In the past month, how often did you feel happy?” ($\alpha = .82$ in the current study). 2) *social well-being* with five items measuring social contribution, social integration, social actualisation, social acceptance, and social coherence; for example: “In the past month, how often did you feel that you had something important to contribute to society” ($\alpha = .81$ in the current study). 3) *psychological well-being* with six items measuring self-acceptance, environmental mastery, positive relations with others, personal growth, autonomy, and purpose in life; for example: “In the past month, how often did you feel that you liked most parts of your personality?” ($\alpha = .80$ in

the current study). The total score on the MHC-SF was calculated by taking the mean score of all items on the scale. A scale score was computed by averaging the scores on the items belonging to the scale. Higher scale scores are indicative of more positive mental health of the participant. The entire MHC-SF showed good reliability in the current study ($\alpha = .87$).

Data Analysis

The data collected from Qualtrics was translated into an Excel sheet to allow for analysis with the software program R. First, it was checked if there were any missing values. Three participants did not fill out all items on the BFI-10 and five participants did not fill out all items on the MHC-SF; therefore, the participants were removed for the corresponding analysis. Descriptive statistics were performed in which means, standard deviations, ranges, and frequencies of the demographical data were investigated. To examine mental health app use and experience with mental health apps, descriptive statistics were computed. To examine the relation between personality and mental health app use, Pearson correlation analyses were performed on the subscales of the BFI-10 and the total score of the self-developed questionnaire about mental health app use. To examine the relation between background variables and mental health app use, different correlation analyses were used because the background variables had different measurement levels. To examine the relation between age, education, employment, average screen time per day, and health with mental health app use, Kendall Tau correlations were computed. Wilcoxon Rank sum test was used to examine the relation between gender and app use whereas the Kruskal-Wallis test was used to examine the relation between nationality and app use. In addition, to examine the relation between mental well-being and the use of specific mental health apps, Pearson correlation analyses were performed on the subscales and total score of the MHC-SF and the self-developed questionnaire about mental health app use.

Results

Demographics of participants

The number of participants was 111 and the mean age was 33.4, with a large spread seen by the standard deviation of 16 years (Table 1). The age range was 16 to 72 years. Over two-thirds of the participants identified as female, and one-third identified as male. Most participants were German or Dutch. The education levels ranged from less than a high school diploma to a master's degree with the majority having a high school degree or less.

Participants had different employment statuses with nearly half having a full-time job. Half of the participants described their physical health as good. Other background variables were also measured, but not used for this study.

Table 1*Demographic Characteristics of the Participants. (N = 111)*

Sample characteristic	Categories	N	%	M (SD)
Age		111		33.4 (16.1)
Gender	Female	74	66.7%	
	Male	37	33.3%	
	Non-binary	0	0.0%	
	Prefer not to say	0	0.0%	
Nationality	Dutch	22	19.8%	
	German	77	69.4%	
	Other	12	10.8%	
Highest education completed	Less than a high school diploma	34	30.6%	
	High school degree or equivalent	47	42.4%	
	Bachelor's degree	10	9.0%	
	Master's degree	14	12.6%	
	Doctorate	0	0.0%	
	Other	6	5.4%	
Current employment status	Pupil	17	15.3%	
	Full-time student	27	24.3%	
	Not employed (including retired, looking for employment, house mother/father)	5	4.5%	
	Part-time employed or part-time own business (>8 hours < 32 hours)	15	13.5%	
	Full-time employed or occupied with own business (>32 hours a week)	47	42.4%	
Average screen time per day	0-2 hours	12	10.9%	
	3-4 hours	35	31.5%	
	5-7 hours	40	36.0%	
	8-10 hours	14	12.6%	
	More than 10 hours	10	9.0%	
Physical Health	Poor	2	1.8%	
	Fair	33	29.7%	
	Good	51	46.0%	
	Very good	22	19.8%	
	Excellent	3	2.7%	

Note. N = number of participants, % = percentage of sample, M = mean, SD = standard deviation.

On the BFI-10, participants scored highest on the subscale of Conscientiousness and lowest on the neuroticism subscale (Table 2). On the MHC-SF, participants scored highest on the subscale of psychological well-being and lowest on the emotional well-being subscale. A reference mean from other studies was taken to compare the mean of the BFI-10 and MHC-SF from the current study with the mean of other studies. A one-sample t-test was computed. The results from the BFI-10 in the current study ($p > .05$) are significantly different from the

results of Balgiu (2018). The sample in the current study scored higher on conscientiousness and neuroticism and lower on agreeableness than the sample of Balgiu (2018). Only the mean of the subscale of extraversion is not significantly different ($p = .19$). The results from the MHC-SF in the current study ($p < .05$) are not significantly different from the results of Bassi et al. (2021). Only the mean of the subscale of emotional well-being is significantly different ($p = .01$). The sample in the current study scored higher on emotional well-being than the sample of Balgiu (2018).

Table 2

Descriptive Statistics (means, SD), on Personality Traits (BFI-10) and Mental Well-being (MHC-SF). (N = 111)

Variable	Number of items	Range	M (SD)	Reference mean ¹
BFI-10 Extraversion	2	2-10	6.4 (2.1)	6.7 (1.7)
BFI-10 Agreeableness	2	2-10	6.8 (1.6)	8.4 (1.4)
BFI-10 Conscientiousness	2	2-10	7.2 (1.8)	6.6 (1.8)
BFI-10 Neuroticism	2	2-10	6.2 (2.1)	5.5 (2.1)
BFI-10 Openness	2	2-10	6.6 (2.1)	-
MHC-SF total score	14	0-70	40.1 (13.5)	40 (13.6)
MHC-SF emotional well-being	3	0-15	10.2 (3.4)	9.3 (3.6)
MHC-SF social well-being	5	0-25	11.1 (5.7)	11.2 (5.5)
MHC-SF psychological well-being	6	0-30	18.8 (6.4)	19.5 (6.7)

Note. M = Mean, SD = standard deviation, BFI-10 = Big-Five Inventory-10, MHC-SF = Mental Health Continuum- Short Form.

¹ Reference means for the BFI-10 were taken from Balgiu (2018), who used the BFI-10 on a sample of 496 participants with a mean age of 19.2; reference means for the MHC-SF were taken from Bassi et al. (2021), who used the MHC-SF on a sample of 653 participants with a mean age of 42.9.

To what extent are different types of mental health apps (monitoring, relaxation, guided activities, information, support) being used and what are people's experiences with using these apps?

On the self-developed questionnaire measuring mental health app use, participants indicated that their use of mental health apps was low (Table 3). Yet, the majority (69, 62.2%) had at least some experience with some kind of mental health app. Relaxation apps were most often used (with 25-39% of the participants responding to having some experience with such an app) whereas support apps were least used (with 1-7%). In general, participants used mental health apps only occasionally: less than 5% reported frequent use of (any) mental health apps.

Table 3

Descriptive Statistics (means, SD) of Mental Health App Use. (N = 111)

Mental health app	No (0)	Yes once (1)	Yes occasionally (2)	Yes regularly (3)	M (SD)
Monitoring and tracking apps					0.5 (1.2)
Mood tracking	94 (84.7%)	9 (8.1%)	6 (5.4%)	2 (1.8%)	
Journaling	94 (84.7%)	5 (4.5%)	11 (10.0%)	1 (1.0%)	
Relaxation apps					1.1 (1.4)
Deep breathing	83 (74.8%)	12 (10.8%)	15 (13.5%)	1 (1.0%)	
Calming music	68 (61.2%)	16 (14.4%)	22 (19.8%)	5 (4.5%)	
Managing symptoms with guided activities apps					0.6 (1.2)
Mindfulness	92 (82.9%)	8 (7.2%)	10 (9.0%)	1 (1.0%)	
Meditation	87 (78.4%)	10 (9.0%)	13 (11.7%)	1 (1.0%)	
Information apps	92 (82.9%)	9 (8.1%)	8 (7.2%)	2 (1.8%)	0.3 (0.7)
Support apps					0.1 (0.4)
Professional help	104 (93.7%)	5 (4.5%)	2 (1.8%)	0 (0.0%)	
Social help	110 (99.1%)	0 (0.0%)	1 (0.9%)	0 (0.0%)	
Total score mental health app use [0-27]					2.6 (3.3)

Note. M = Mean, SD = Standard deviation.

Of those participants who used mental health apps, most of them liked the mental health apps somewhat whereas they liked mindfulness and calming music the most and journaling the least (Table 5). Participants liked mental health apps more than they perceived them as helpful. Most participants perceived mindfulness, meditation, and professional help apps as being somewhat helpful whereas mood tracking was perceived as least helpful. All participants, if they ever used mental health apps or not, could indicate if they would consider using a mental health app in the following six months. Two-thirds indicated they would not use a mental health app and one-third would maybe or probably use a mental health app in the following six months.

Table 5

Descriptive Statistics (means, SD) of Experience With Mental Health Apps.

Mental health apps	N participants with experience	<i>M</i> (<i>SD</i>) Like ¹	<i>M</i> (<i>SD</i>) Perceived helpfulness ¹
Mood tracking	17	1.7 (0.7)	0.8 (0.9)
Journaling	17	1.6 (0.6)	1.1 (0.6)
Deep breathing	28	1.7 (0.9)	1.4 (1.0)
Calming music	43	2.0 (0.6)	1.5 (0.8)
Mindfulness	19	2.0 (0.7)	1.7 (1.0)
Meditation	24	1.9 (0.9)	1.7 (0.6)
Information	19	1.7 (1.0)	1.6 (0.7)
Professional help	7	1.7 (1.0)	1.7 (1.0)
Social help	1	2.0 (0.0)	2.0 (0.0)

Note. *N* = number of participants with experience, *M* = Mean, *SD* = standard deviation.

¹ = Answering options varied from 0= 'not at all' -- to 3= 'very much'

To what extent are personality traits and background variables associated with mental health app use?

Relation between personality and mental health app use

When looking at the total mental health app use, more mental health app use was significantly (but weakly) associated with lower scores on conscientiousness and higher scores on openness (Table 6). When looking at the relation between personality traits and the different types of app use, separately, the results revealed that only for Monitor and tracking apps and support apps, significant correlations with personality traits were found: more conscientiousness was associated with less use of monitoring and less use of support apps. Whereas neuroticism was associated with more use of monitoring and tracking apps.

Table 6

Correlation (Pearsons r) Between Personality (BFI-10) and Mental Health App Use. (N = 108)

Apps	BFI-10 Extraversion	BFI-10 Agreeableness	BFI-10 Conscientiousness	BFI-10 Neuroticism	BFI-10 Openness
Monitoring and tracking apps	-.11 (.246)	.06 (.542)	-.32 (.001***)	.25 (.009**)	.14 (.138)
Relaxation apps	-.01 (.919)	.03 (.753)	-.15 (.124)	.04 (.684)	.17 (.070)
Managing symptoms with guided activities apps	.06 (.565)	.03 (.731)	-.05 (.640)	.01 (.897)	.10 (.299)
Information apps	.02 (.810)	.09 (.341)	-.04 (.697)	-.01 (.945)	.08 (.383)
Support apps	-.06 (.557)	-.06 (.549)	-.20 (.038*)	.12 (.207)	.11 (.258)
Total score mental health app use	-.03 (.788)	.06 (.546)	-.23 (.018*)	.12 (.198)	.19 (.044*)

Note. BFI-10 = Big Five Inventory-10, the values in brackets show the p-value for each correlation, p-value is significant if $p < 0.05$ * $p < 0.05$. ** $p < 0.01$. *** $p < 0.001$.

Relation between background variables and mental health app use

Kendall Tau correlations were performed between different types of mental health apps and different background variables (Table 7). When looking at the total mental health app use, more mental health use was significantly (but weakly) associated with lower age,

lower current employment, and higher average screen time per day. When looking at the relation between background variables and the different types of mental health apps used, separately, the results revealed that only for Monitor and tracking apps and Managing symptoms with guided activities apps, significant (but weak) correlations with background variables were found: higher age was associated with less use of monitoring and tracking apps and less use of Managing symptoms apps. Whereas higher average screen time per day was associated with more use of monitoring and tracking apps and more use of Managing symptoms apps. Higher education completed and higher current employment was associated with less use of Monitoring and tracking apps.

Table 7

*Kendall Tau Correlation Between Background Variables and Mental Health App Use.
(N=111)*

Apps	Age	Highest education completed	Current Employment	Average screen time per day	Physical Health
Monitoring and tracking apps	-.31 (.001***)	-.18 (.035*)	-.33 (.001*)	.11 (.174)	-.04 (.607)
Relaxation apps	-.10 (.277)	.11 (.180)	-.03 (.743)	.13 (.098)	-.09 (.257)
Managing symptoms with guided activities apps	-.17 (.025*)	-.03 (.748)	-.14 (.107)	.23 (.005**)	.03 (.705)
Information apps	.001 (.994)	-.01 (.908)	-.01 (.909)	.13 (.132)	-.13 (.136)
Support apps	-.14 (.071)	-.11 (.208)	-.17 (.050)	-.02 (.854)	-.05 (.621)
Total score mental health app use	-.21 (.003**)	-.01 (.920)	-.17 (.032*)	.21 (.007*)	-.05 (.521)

Note. The values in brackets show the p-value for each correlation, p-value is significant if $p < 0.05$
* $p < 0.05$. ** $p < 0.01$. *** $p < 0.001$.

The Wilcoxon Rank Sum test indicated that there was a significant difference between males ($M = 1.9$, $SD = 2.2$) and females ($M = 3.0$, $SD = 3.7$) in mental health app use, $z = -2.71$, $p = .007$. The Kruskal-Wallis test indicated there was no significant difference in mental health app use between Dutch, German and other nationalities, $X^2 ([2], N = [111]) = 0.07$, $p = .97$.

To what extent is mental health app use associated with mental well-being?

The total score on mental health app use did not correlate to any of the MHC-SF subscales (Table 8). A significant but weak negative correlation ($r = -.20$) was found between monitoring and tracking apps and the MHC-SF subscale of psychological well-being, indicating that more use of these apps was associated with lower psychological well-being. More use of Managing symptoms with guided activities apps was significantly positively (though weak) correlated to the MHC-SF subscale of social well-being.

Table 8

Pearsons r Correlation Between Mental Health (MHC-SF) and Mental Health App Use. (N = 106)

Apps	MHC-SF Emotional well-being	MHC-SF Social well-being	MHC-SF Psychological well-being	MHC-SF Total score well-being
Monitoring and tracking apps	-.14 (.167)	-.01 (.884)	-.20 (.041*)	-.14 (.167)
Relaxation apps	-.06 (.531)	.12 (.226)	-.06 (.531)	.02 (.876)
Managing symptoms with guided activities	.11 (.282)	.23 (.019*)	.07 (.487)	.16 (.094)
Information apps	.10 (.304)	.06 (.528)	.16 (.103)	.13 (.184)
Support apps	-.08 (.418)	-.04 (.697)	-.09 (.351)	-.08 (.407)
Total score mental health app use	-.02 (.878)	.13 (.169)	-.05 (.600)	.03 (.735)

Note. MHC-SF= Mental Health Continuum- Short Form; the values in brackets show the p-value for each correlation, the p-value is significant if $p < 0.05$, * $p < 0.05$. ** $p < 0.01$. *** $p < 0.001$.

Discussion

In the current study, mental health app use was limited, and the reported experience was moderately positive. Participants being female, young, having a high average screen time, or scoring low on conscientiousness or high on openness were more likely to use mental health apps. No correlations were found between mental well-being and total mental health app use.

The first research question was ‘*To what extent are different types of mental health apps (monitoring, relaxation, guided activities, information, support) being used and what*

are people's experiences with using these apps? The current study revealed that although most participants (62.2%) have at least tried a mental health app once in their lives, for the majority use of mental health apps was rather limited. These findings are in line with the study by Cruz et al. (2023) where half of the participants used mental health apps before participating in the study. Next to that, our study revealed that participants' experience with mental health apps was moderately positive. They liked mental health apps somewhat and perceived mental health apps as not at all to somewhat helpful. Moreover, participants could indicate if they would consider using a mental health app in the next six months, where two-thirds of participants said no. This is consistent with the findings by Paslakis et al. (2019), who found that most people in a German sample would not use a mental health app. In the current study, participants had the possibility to share their opinions on mental health apps, and some participants gave reasons for not using mental health apps. Some participants claimed that they would prefer to see a professional, mental health apps are not enough tailored to their needs, and that mental disorders are too complex and individual to be treated with an app. Similarly, in the study by Stawarz et al. (2019), participants criticised mental health apps for not being enough tailored to their needs and not being able to replace therapy. Our study was the first to specify different types of mental health apps when studying mental health app use and experience and revealed some interesting differences between the types of mental health apps. The results revealed that relaxation apps were used most often whereas support apps were used least. Further, participants liked calming music and mindfulness apps the most and journaling the least. Meditation and mindfulness apps were perceived as the most helpful and mood-tracking apps as the least helpful. A recommendation for future research is to classify mental health apps when studying use and experience with them. Having insight into these different apps is important since many mental health apps exist

which makes it difficult to make claims about the use and experience with specific types of mental health apps. Future research is needed to replicate the findings.

The second research question was *'To what extent are personality traits and background variables associated with mental health app use?'* More mental health app use was negatively correlated with the personality traits of conscientiousness and positively correlated with the trait of openness. Participants who were not conscientious were more likely to use mental health apps. A possible reason for this could be that people who are not conscientious tend to have worse mental well-being (Kummer et al., 2021). Aziz et al. (2023) suggest that people use mental health apps more when they feel the urge to do so. Further, participants in this study who were more open were more likely to use mental health apps. A possible reason for this could be that people who are open are more likely to try new things out, explaining why people being more open would try out a mental health app (Aziz et al., 2023). Still, these findings seem to contradict previous findings of Aziz et al. (2023) who examined the relation between interest in mental health apps and the Big Five personality traits and found that people with the traits of neuroticism and agreeableness are more interested in mental health apps. In the current study, no correlation was found with the personality traits of neuroticism and agreeableness. The incongruence between the findings of Aziz et al. (2023) and this study could be due to that in the study by Aziz et al. (2023), the relation between interest in mental health apps and personality traits was measured whereas the current study focused on the relation between the actual use of mental health apps and personality traits. Interest in mental health apps is no direct indication of actual use of it. Therefore, the results can be incoherent. For example, in the study by Hudson et al. (2022), 43% of participants showed an interest in mental health apps while only 11% used one due to factors influencing adoption. Next to that, the alphas of the BFI-10 measuring personality traits were low which makes it difficult to make claims about the relation between personality

and mental health app use as the results may be unreliable. Future research is needed to study the relation between personality and mental health app use. To current knowledge, this study is only the second one to study this correlation which makes it difficult to compare the results with others. Having insight into the different personality traits is important to better understand the mental health app user.

Regarding the other person-related background variables, participants who are young, female or have a high average screen time were more likely to use mental health apps. The results were in line with what was expected since in the study by Cruz et al. (2023) participants being female, young, or having a high average screen time were more likely to use mental health apps.

The third research question was ‘*To what extent is mental health app use associated with mental well-being?*’ In the current study, no correlation was found between the total use of mental health apps and mental well-being. Still, a negative correlation was found between monitoring and tracking apps and psychological well-being as well as a positive correlation between managing symptoms with guided activities and social well-being. Participants who used monitoring and tracking apps more frequently were likely to have a low psychological well-being whereas participants who used managing symptoms with guided activities were likely to have a high social well-being. These findings seem to contradict previous findings of Aziz et al. (2023) who examined two types of mental health app users and found that people with a low quality of life are more likely to use mental health apps in general. A possible reason for the incongruence between the results could be the unclearness if mental well-being is a predictor or a consequence of mental health app use. People are more likely to use mental health apps when having poor mental well-being while at the same time, mental health apps can increase well-being (Cruz et al., 2023; Neary & Schueller, 2018). This could be a possible explanation for why a positive as well as negative correlation was found. A

recommendation for future research would be to use a longitudinal study to examine mental well-being before and after mental health app use to investigate if a difference can be observed. Having insight into mental well-being is important since the aim of mental health apps is to improve mental well-being. It is relevant to find out if mental well-being improves with mental health app use.

Another interesting finding in the current study is the representativeness of the sample. The physical health and personality of participants deviate from the existing literature. Participants indicated how they would rate their physical health with a range of 'poor', 'fair', 'good', 'very good', and 'excellent'. Half of the participants indicated their physical health was good, while a third that their physical health was fair and one-fifth that their physical health was very good. Compared to the study by Denton (2003) who examined the physical health of home care workers, this finding seems quite low. In the study by Denton (2003), only 5% of participants indicated their physical health was poor, while one-third indicated it to be good, 44,4% indicated it to be very good and nearly 20% indicated it to be excellent. This incongruence could be due to the highest education completed, current employment, or COVID-19. First, while in the study by Denton (2003) 80% of participants had some type of diploma, most participants in this study had a high school degree or less with only 20% having a bachelor's or master's degree. Research proved that health is correlated to the socioeconomic status of people (Wang & Geng, 2019). Secondly, the incongruence could be due to current employment. While 40% of participants in this study went to school or university, all participants in the study by Denton (2003) were home care workers. Finally, the incongruence could be due to COVID-19. While the study by Denton (2003) was conducted before the COVID-19 pandemic, the current study was conducted after the COVID-19 pandemic took place. Cruz et al. (2023) claim that this pandemic led to increased stress, possibly explaining worse physical health.

Regarding personality, participants in this study were more neurotic, conscientious, and less agreeable than in the study by Balgiu (2018). The incongruence could be due to age or sample size. While the mean age in this study was 33.4, the mean age in the study by Balgiu (2018) was 19.2. Next to that, the sample in the current study is relatively small compared to the sample of 496 participants in the study by Balgiu (2018).

Strengths and limitations

The current study has strengths as well as limitations. A strength is that the self-developed questionnaire by the researcher to measure mental health app use showed high reliability, suggesting that the questionnaire is a reliable measure to investigate the use of and experience with different types of mental health apps. Limited research exists that classifies different types of mental health apps. Therefore, this study contributes to current knowledge about mental health app use and experience.

Another strength of this study is that participants were of different ages ranging from 16 to 72 years. Approximately 60% of the participants were aged between 16 to 30, 20% between 31 to 50 and 20% between 51 to 72. The wide age range allowed to explore mental health app use and experience in more detail and make general claims about it.

The current study also has its limitations. Firstly, the reliability of the BFI-10 was low. This made it difficult to analyse the relation between personality and mental health app use as the results are likely not reliable. The findings of the second research question may be inconsistent and less useful. The recommendation for future research is to use the BFI-44 as the probability of having a reliable measurement would be higher because there are more items assessing a subscale.

Secondly, the questionnaire was cross-sectional, meaning that the results do not provide meaningful insights into the causality of the correlations studied. Future research

should conduct a longitudinal study, to analyse if mental well-being changes with mental health app use.

Lastly, the questionnaire was developed in two languages, English and German which does not ensure the validity of the questionnaire. The researchers translated the questionnaire themselves, which can lead to inconsistencies between the English and German questionnaires. For future research, it is recommended to translate it professionally to ensure validity.

Conclusion

To conclude, in this study, most participants have tried a mental health app while for the majority mental health app use was limited. Experience with mental health apps was moderately positive. Participants being female, young, having a high average screen time, or scoring low on conscientiousness or high on openness were more likely to use mental health apps. The current study contributed to current knowledge about use and experience with different types of mental health apps as well as predictors of use. This study is relevant as it gives insight into the user archetype and shows what apps attract people. A recommendation for future research is to classify mental health apps to receive more insight into which mental health apps are used and perceived as effective.

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Appendix

Appendix A

Informed Consent

Thank you for your participation in this research study. Please read the following information carefully.

The data collected during the study will be used solely for research purposes and is only available for the research team. The data will be stored anonymously to protect your privacy. It will not be possible to trace the answers back to you.

For this study, ethical approval has been gained by the Ethics Committee of the Faculty of Behavioural and Management and Social Sciences at the University of Twente.

Your participation in this study is voluntary. If you decide to participate, you have the right to withdraw from the study at any time without naming a reason and without any consequences. The responses recorded before withdrawal may still be used in this study.

If you have any questions, feel free to contact one of the researchers for this study:

- *(email of researchers)*

- I have read and understood the information provided

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

- I am aware I can contact the researchers in case I have any questions

- I understand that my answers will be saved and used for the research

- I understand that my responses will be anonymous

- I give my consent to participate in this study

Do you agree to all the above-mentioned statements? (yes/no)