

On the Involvement of Mental Healthcare Professionals in the Co-design of Highly-rated Anxiety Apps

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Abstract: Mobile applications (apps) have the potential to assist people with their mental health issues. They have shown promising results in mitigating many mental health disorders and symptoms, including issues related to anxiety. Mental health apps are based on different approaches, one of which is cognitive behavioral therapy (CBT). However, these solutions still face many concerns and challenges, such as the lack of involvement and inputs of mental healthcare professionals (MHP) in their design and evaluation. This paper focuses on highly-rated CBT-based apps for anxiety and investigates the involvement of MHP in their co-design. Based on the obvious importance of inclusion of mental health professionals in the creation of mental care apps, the following hypothesis was formed: MHP are involved in the design and creation of CBT-based apps for anxiety. To investigate this hypothesis, 23 apps were selected and analysed. Results showed that contrarily to the initial hypothesis, about half of the selected CBT-based apps for anxiety did not involve MHP in their design. Results also showed that the number of installs of the selected apps might be impacted by the involvement of MHP. The average of installs of apps which involved MHP was significantly higher than the average of installs of apps that did not. This might indicate that users tend to trust apps that involve MHP more, which might have impacted their decision to install them. Findings of this study might be of interest to people suffering from anxiety, to help them find apps for anxiety that are based on MHP input, as well as to developers and researchers targeting similar apps.

1 INTRODUCTION

Requirements engineering (RE) is critical for the success of software projects (Pohl, 2010). There are four main phases in the requirements development process: (1) requirements elicitation, (2) requirements analysis, (3) requirements specification, and (4) requirements validation (Bourque et al., 2014). The requirements elicitation phase can be viewed as the most important step in any software project, including the development of mobile applications (apps). It is the base for all the steps that follow in the creation process (Stephens, 2015). In this phase, the requirements engineer or the software engineer works to collect the needs of different stakeholders that have interest in the software product. The stakeholders that can be involved include, among others, the customer, the user, and the developers. It should be noted that the customers are not always the users. The customers are the ones paying for the creation of the software prod-

uct, while the users are the ones that will be using the product. End-users are very important stakeholders that are very often overlooked and not included in the design process (Costabile et al., 2009). Many design approaches such as user-centred design stress on the importance to understand the expectations of end-users and to capture their needs (Van Leersum et al., 2020). Several studies have also shown the importance of including end users in the co-design and co-creation of the software product, particularly in connected health solutions (Ouhbi et al., 2019; Dey et al., 2019).

In the case of connected mental health solutions (Drissi et al., 2020a), RE process is crucial and critical as it will produce functionalities that are supposed to help end-users with their mental health issues. Mental health in general and anxiety in particular should be approached and treated carefully. Which is why it is not enough to opt for including only end-users in the co-design of related apps, as in many cases the end-users do not know what treatment approaches are suitable to assist them with their anxiety. Therefore men-

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tal health professionals (MHP) should be involved in the co-design of these apps, especially that the end-users with anxiety are vulnerable users. Anxiety is a “psychological and physiological state (mind and body) associated with feelings of fear, worry, uneasiness, dread, or nervousness” (Cortman et al., 2015). It can be managed with several treatment approaches such as cognitive behavioral therapy (CBT) (Loerinc et al., 2015). CBT is a common type of psychotherapy, based on helping patients becoming aware of inaccurate or negative thinking, in order to be able to deal with challenging situations in a more effective way (Mayo Clinic Staff, 2020). CBT has been proven to be effective for anxiety (Norton and Barrera, 2012; Lyneham and Rapee, 2006), and can help with other issues like depression and sleep disorders (Mayo Clinic Staff, 2020).

Mobile mental health is one of the most adopted forms of use of technology for mental care (Drissi et al., 2020a). The number of mobile mental health apps is increasingly growing in app repositories (Hollis et al., 2015; Olff, 2015), especially due to the current COVID-19 pandemic, which has increased the interest in digital mental health (Torous and Keshavan, 2020). In fact, COVID-19 has resulted in the surge of several psychological issues, including anxiety, in the general population (Salari et al., 2020). There is a wide range of apps that offer different functionalities targeting anxiety self-treatment and management, such as breathing exercises, meditation, yoga, games, and online therapy (Drissi et al., 2020b; Drissi et al., 2019). The use of apps for mental health has been reported to be effective for many psychological issues, including stress, anxiety, and depression (Harrison et al., 2011; Loo Gee et al., 2016). But the majority of the available apps lack evidence on their efficiency and only few have been thoroughly tested (Larsen et al., 2019; Anthes, 2016). Involvement of MHP in the co-design, testing and evaluation of such apps, might help overcome those problems, as well as help insuring users’ trust, and improving clinical outcomes (Hollis et al., 2015).

This paper investigates the involvement of MHP in the co-design of anxiety apps. To do so, 23 highly-rated CBT-based apps for anxiety were selected and analyzed. Highly-rated apps are considered to provide a certain level of satisfaction to end users. Users’ satisfaction is related to the quality of the app, particularly to its usability. For this reason, we included only highly-rated apps. To the best of our knowledge, there are no similar studies that address the involvement of MHP in the co-design of mental care apps. Since the involvement of MHP in mobile mental care apps is important on many levels, our hypothesis is as

follows: *CBT-based mental care apps for anxiety do include MHP in their co-design.*

2 METHODOLOGY

This study mainly focuses on answering this research question (RQ): Do CBT-based apps for anxiety involve MHP in their design?

This section presents the methodology followed to answer the RQ and select the apps to be analysed in this paper. The search conducted in this study followed the guidelines of the Preferred Reporting Items for Systematic reviews and Meta-Analysis (PRISMA) group (Liberati et al., 2009).

2.1 Sources and Eligibility Criteria

A general search string composed with only the term “Anxiety” was used, and it was automatically applied to the names and descriptions of the apps. Each app identified from the search result was analyzed to determine whether to be included or excluded from the selection.

The following Inclusion criteria (IC) were used:

- IC1: anxiety-related apps in Google Play Store
- IC2: apps that have a free version
- IC3: apps rated 4+ stars

IC1 focuses on apps available in Google Play Store as, in contrast with Apple App Store, it provides the number of installs of each app. Google Play is a very popular app repository, with a wide range of health apps, it includes over 41,377 app (Statista, 2019).

IC2 focuses the selection on free apps, as many people can use them without payment. Moreover, recent statistics in March 2020 showed that 96.3% of Android apps were freely available worldwide (Clement, 2020).

IC3 includes only apps that provide high user satisfaction as the app’s user ratings reflect a certain level of the app’s user satisfaction.

The apps identified from the search results that met at least one of the following exclusion criteria (EC) were excluded:

- EC1: apps that do not include the CBT approach
- EC2: apps that could not be installed

EC1 includes only anxiety app based on the CBT approach, which are the focus of this study. EC2 excludes apps that could not be installed, therefore could not be examined.

2.2 Apps Analysis

The description of each app selected available in the Google Play was examined. Each selected app was installed in OPPO A9 (Android 9) and analyzed. Extracted data included:

- Name of the app
- Rating
- Number of raters
- MHP involved (e.g. therapists, counselors, researchers, advisors, and others with a mental health background), this information was retrieved from the app's description
- Number of downloads
- Release date, which was retrieved from the App Annie platform (<https://www.appannie.com/en/>)

3 RESULTS AND DISCUSSION

A total of 23 apps were included in the final selection as shown in Fig. 1. Table 1 presents information on the included apps, and Table 2 presents apps that involve MHP and information on the latest. It must be noted that for some apps, the stated involvement of MHP in the app was general, and did not provide specific names. Twelve selected apps included MHP in their design, while the rest did not.

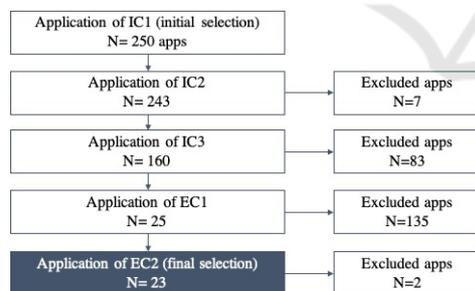


Figure 1: Selection process.

One way to conduct requirements gathering is by looking for answers to these questions: Who, What, When, Where, Why and How (Stephens, 2015). In the case of CBT-based apps for anxiety, the answer to the “who” question is *users suffering from anxiety*; the answer to the “what” is *functionalities that will help with anxiety*; the answer to the “why” is *to help people suffering from anxiety to deal with it*; and the answer to the “how” can be *any method able to deliver the functionalities identified in the “what” question*. Looking for answers of these questions from end-users is not enough to create an app able to help

users deal with anxiety, even if they suffer from it. They should not be considered as experienced in the field of anxiety as they cannot provide a clear insight on how to deal with it. Therefore, incorporating MHP in mental health apps is necessary as they can provide science- and evidence-based answers to the aforementioned questions. However, only half of the selected apps involved MHP in their design. Inclusion of MHP in the creation and design of apps for mental health, is crucial to insure the safety of the end-user.

Many mental treatment approaches can be used in a wrong way if not under supervision of a professional. This is also the case of CBT, as it has many disadvantages that should be acknowledged (The Healthy CBT-Clinic, 2020), and in many cases it works only under certain circumstances (Institute, 2020). MHP are knowledgeable of approaches used for anxiety, like the CBT approach, and can present methods to manage and treat anxiety, that can be transformed to app functionalities, and can also provide directions on how to best implement those functionalities in apps.

According to the U.S. Food and Drug Administration (FDA), an app is considered of a “*minimal risk*” to the user, if it helps users self-manage their condition, provides tools to help users organize or track their health information, or provide easy access to information about a health condition or a treatments, among others (FTC, 2016). Apps selected in this study provide functionalities that fall under the aforementioned characteristics, such as self-assessment tests, guided relaxation audios, breathing exercises, providing educational content, journaling and mood tracking. This “*minimal risk*” can be mitigated by the involvement of MHP.

For an app to keep its health claims healthy according to the Federal Trade Commission (FTC) (Lesley Fair, 2015), it should first respect this principle: “Claims about serious medical conditions call for serious science”. The perfect way to ensure that a mental care app respects this principle is by involving MHP in the co-design of m-health apps in general and mental health apps in particular. This would insure that all implemented treatment-related functionalities are based on well comprehended and previously practiced science, that have proof of being effective on previous patients.

There is also a lack of research evidence on the efficacy and effectiveness of health apps (Giota and Kleftras, 2014), including mental health apps, which despite their potential effectiveness and ability to improve treatment access, and improve the monitoring and management of many mental health symptoms and disorders, the majority of available ones still lack

Table 1: Results.

ID	App name	Link	Rating	#Raters	Latest Update	Initial release date	#Installs
A1	Youper - Emotional Health	https://bit.ly/32AAnKq	4.7	46,031	22-May-20	27-Aug-15	1,000,000
A2	Wysa: stress, depression & anxiety therapy chatbot	https://bit.ly/2Q3NAss	4.7	36,225	21-May-20	6-Oct-16	1,000,000
A3	Moodpath - Depression & Anxiety Test	https://bit.ly/2X6FelC	4.6	23,980	15-Apr-20	1-Jun-17	1,000,000
A4	Sanvello (ex Pacifica)	https://bit.ly/2rmJGAG	4.6	14,106	5-May-20	25-Jan-15	1,000,000
A5	InnerHour: Calm, Sleep, Depression & Anxiety Therapy	https://bit.ly/2pNLOBn	4.5	4,109	9-May-20	22-Aug-17	500,000
A6	What's Up? - A Mental Health App	https://bit.ly/2Q2Hzwj	4.4	3,126	20-Apr-20	10-Mar-15	500,000
A7	BetterHelp: Online Counseling & Therapy	https://bit.ly/32sv12A	4.3	7,392	15-Apr-20	17-Nov-14	500,000
A8	Stop Panic & Anxiety Self-Help	https://bit.ly/2K5YaeS	4.7	2,353	15-Apr-20	21-Jan-12	100,000
A9	CBT Thought Record Diary	https://bit.ly/2NyGHxH	4.7	671	22-May-20	28-Jun-14	100,000
A10	Woebot: Your Self-Care Expert	https://bit.ly/33yS11g	4.5	6,223	15-Apr-20	6-Mar-18	100,000
A11	Clear Fear	shorturl.at/lsOUX	4.4	173	15-Apr-20	15-Apr-20	100,000
A12	Depression CBT Self-Help Guide	https://bit.ly/36OIfvh	4.2	1,446	15-Apr-20	26-Feb-12	100,000
A13	feel better - Mood & CBT therapy to manifest goals	shorturl.at/eowKP	4.6	539	15-Apr-20	24-Jul-17	50,000
A14	FearTools - Anxiety Aid	shorturl.at/mnwY9	4.4	96	20-Apr-20	6-Dec-16	50,000
A15	UP! - Mood Tracker for Burnout and Bipolar	shorturl.at/IFOQ6	4.3	1,859	30-Jul-19	-	50,000
A16	Moodfit - Tools & Insight to Shape Up Your Mood	shorturl.at/rvHQR	4.6	280	2-May-20	19-Jan-17	10,000
A17	GG Relationship Doubt & Obsessions (ROCD)	shorturl.at/cyF16	4.5	163	15-Apr-20	4-Jun-16	10,000
A18	OCD Daily Exercise by GG (GGOC)	shorturl.at/joFIV	4.5	153	15-Apr-20	7-Sep-16	10,000
A19	Psychiatry Pro-Diagnosis, Info, Treatment, CBT & DBT	shorturl.at/vwIV2	4.4	185	10-May-20	19-Mar-19	10,000
A20	Stress & Anxiety Companion	https://bit.ly/2Vs9OXp	4.1	14	2-May-20	15-Oct-18	10,000
A21	Pocketcoach - Anxiety Helper	https://bit.ly/2XmrLql	4.6	63	20-May-20	8-Aug-19	5,000
A22	De-StressMe: CBT Tools to Manage Stress	shorturl.at/lsuPY	4.3	42	15-Apr-20	21-Jun-18	5,000
A23	Self-manage Depression: Daily exercise (GGDE)	shorturl.at/czWZ2	4.3	33	11-May-20	24-Jul-18	1,000

Table 2: Mental health professionals involved.

ID	Mental health professional involved
A1	Team of doctors and scientists led by Dr. Jose Hamilton (a psychiatrist)
A2	Advisors with a mental health background
A3	Experienced therapists and doctors.
A4	Psychologists
A5	Psychiatrists and therapists
A7	Counselors and therapists
A9	Licensed mental health professionals at Duke university
A10	Dr. Alison Darcy (a clinical research psychologist) and Dr. Athena Robinson (a psychologist and expert clinician).
A11	Developed by a clinician
A17, A18, A23	Dr. Guy Doron (IDC) (a clinical psychologist and researcher)

scientific evidence about their efficacy (Donker et al., 2013; Wang et al., 2018). The majority of studies investigating health apps were found to test basic mobile features like text messaging, and only few assessed the impact of the apps based on their outcome (Fiordelli et al., 2013).

CBT-based mental care apps are an example of that, as even though CBT is an effective approach when used face to face (Hofmann et al., 2012), the evidence on its impact when implemented in an app

environment is limited (Giota and Kleftras, 2014), especially over a long time periods of use (Rathbone et al., 2017). Inclusion of MHP in the design as well as in the evaluation can help solve this issue. When this is the case, apps will be based on scientific, proven mental care approaches since the first stages of their design, and their outcome regarding treatment results can be properly investigated and tested based on scientific evidence. An example of that, is the selected app A3, which in its description, the devel-

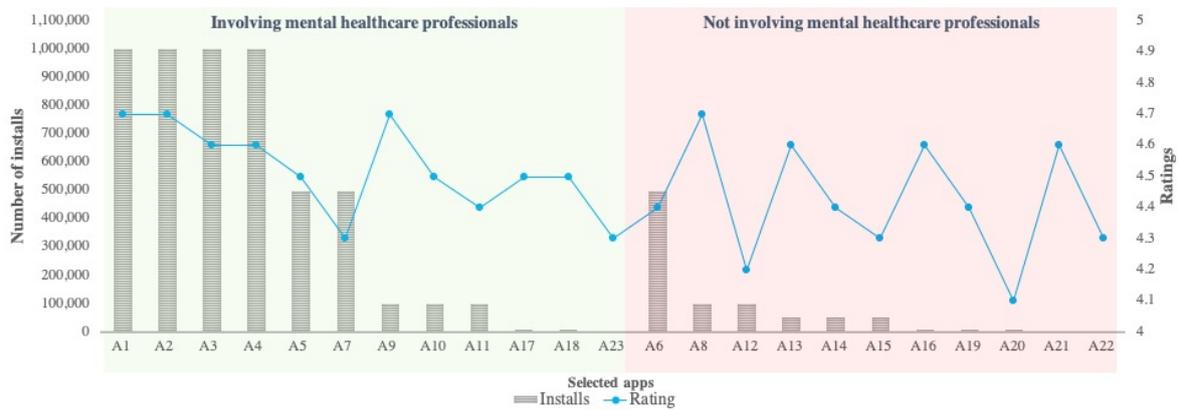


Figure 2: Number of installs and ratings of the selected apps.

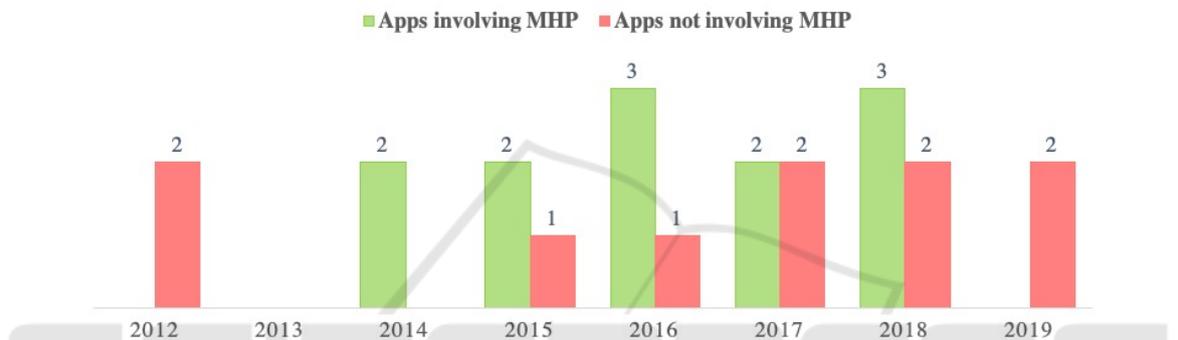


Figure 3: Initial release years of selected apps. Acronym: Mental Healthcare Professionals (MHP).

opers specified the inclusion of researchers from the fields of psychology and psychotherapy to conduct clinical studies on the app. A recent study (Burchert et al., 2019), compared the results of A3’s assessment of mood dynamics with results from the Patient Health Questionnaire (PHQ-9) depression screening. Another recent study (Mulansky, 2020) analysed the geodata of the A3’s users to determine its connection to their state of mind.

After a careful analysis of the selected apps, we found that 48% did not include MHP in their creation process. If we project the aforementioned insights, we can assume that many existing mental care apps were not co-created with MHP. Such apps might jeopardize the safety of end-users, and provide misguided information or harmful practices. Results presented in Fig 2 also show that the involvement of MHP might influence the number of installs of a CBT-based anxiety app. The average of installs of apps that mention in their description the involvement of MHP is 443,417 installs, while the average of installs of the apps that do not is 80,909 installs. Having MHP involved in the design of an app might increase its chance of installation by five times. This big difference shows that involvement of MHP might increase the trust of the

users in the app, and encourages them to install the app and use it. It should be noted that on average both categories of apps were released 4 years ago as shown in Fig. 3. Note that the A15’ initial release date was not available.

This study might have some limitations such as: (i) including paid apps in the selection might have allowed us to identify additional findings. However, the majority of Android apps (96.3% of Android apps), according to recent statistics, are available freely in app repositories (Clement, 2020); and (ii) analyzing low-rated apps might have allowed us to identify additional findings as well. However, we investigated highly-rated apps to remove concerns about the usability of the studied apps.

4 CONCLUSIONS

This study investigated the involvement of MHP in the co-design of CBT-based apps for anxiety. A total of 23 Android highly-rated apps were selected and analyzed. Contrarily to our hypothesis, not all investigated apps included input from MHP, as nearly half of the selected apps did not report any involve-

ment of MHP in their design or evaluation. A significant difference in numbers of installs in the selected apps was identified. Results suggested that the fact of mentioning the involvement of MPH in the description of a CBT-based anxiety app, might impact potential users trust, and increase its installation chances by five times. This study further confirms the existing concerns of existence of non-evidence-based apps, that are neither co-designed, nor evaluated in collaboration with MHP, which might influence the apps' safety and effectiveness.

For future work, we intend to work with psychiatrists and other MHP to co-create a connected health application for anxiety treatment in UAE.

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