Designing a Mobile App to Help Young Adults Develop and Maintain Mental Well-Being

Completed Research

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Abstract

A person who is not mentally sound typically has a difficult time integrating with the community and society around and this is especially true for young adults as they are going through changes both socially and physically. The current study is focused on developing the design and message framing of a mobile application that aims to promote mental well-being among young adults between 18 and 24 years old. Our application is intended to create awareness within oneself that there might be some mental health issues and to suggest possible steps to alleviate the problem. The goal of the application is to give holistic remedies in order to restore mental well-being among young adults and encourage them to reach out to providers if they feel their issues are more serious.

Keywords

Mental health, young adults, mHealth, mobile application, design, interface.

Introduction

Mental health is an important concept as it is relevant in every stage of life, particularly in that of a young adult’s life. As defined by the World Health Organization (WHO), mental health is “a state of well-being in which every individual realizes his or her own potential, can cope with the normal stresses of life, can work productively and fruitfully, and is able to make a contribution to her or his community” (WHO 2014). This in turn affects how a person thinks, feels, and acts. It determines how others are treated, whether it be with respect or violence, and it can have a heavy impact on personal and private interactions. Overall, a person that is not mentally sound will have a difficult time integrating in the community. This is especially true for young adults as they are going through changes both socially and physically. Mental well-being is crucial, especially for young adults, which is why it is important to address it and create consciousness.

Mobile application platforms are an increasingly widespread technology (Rakestraw et al. 2013) and smartphones are becoming more integrated into most people’s lives, whether it be shopping, finance, or healthcare. This accessibility makes providing information, help, and recommendations very easy and convenient. Smart wearable devices are starting to have an increase in the market as well, making more information available at one’s fingertips. Healthcare specifically is promoted by giving laypersons accurate and reliable medical data whenever they want it through devices and platforms such as Fitbit or Apple Health. However, little work has been done to assess a person’s mental health on a mobile application, partly because of the challenges in diagnosing a case.

The current study is focused on developing the design and message framing of a mobile application that aims to promote mental well-being among young adults between 18 and 24 years old. Our application is not
designed to give medical diagnosis of any sorts. Rather, it is intended to create awareness within oneself that there might be some mental health issues and to suggest possible steps to alleviate the problem. The goal of the application is to give holistic remedies in order to restore mental well-being amongst young adults and encourage them to reach out to providers if they feel their issues are more serious.

We consider developing the design and building the application as an iterative process, so we followed best practices in Design Science Research (Gregor and Hevner 2013; Hevner and Chatterjee 2010; Hevner et al. 2004) when creating our artifact. Our design interface and message framing was grounded in theoretical research. We conducted an online survey amongst young adults, more specifically university students to gather information that would help us later on build the application. We had a total of 169 usable responses and the results indicate that a staggering percent (67%) of the student body or someone they know was experiencing mental disabilities. We were able to obtain information on moods and colors associated with them, the shapes and design of the mobile interface, and last but not least how to best frame the messages so they can appeal to the targeted population. The goal of the application is to make alternative mental health solutions easily accessible on a mobile device. Our results and the overwhelming support we received from the community during the initial stage of this project demonstrate the pressing need for such a tool that can be utilized by young adults for promoting mental well-being and offering relevant resources and support for those in need.

**Background**

**Mental Health**

While mental health is an individual and personal matter involving the condition of an individual human mind (Jahoda 1958), considered in a more global perspective, the collective mental health of individuals can have a serious impact on society. The issue of mental health is very important and there have been many initiatives to promote mental well-being among the population, including the National Institute for Mental Health and National Alliance on Mental Illness. These efforts are extremely necessary due to the growing impact of mental health issues.

The economic costs of mental illness are very difficult to quantify (Insel 2008). The Agency for Healthcare Research and Quality, cites a cost of $57.5B in 2006 for mental health care in the U.S. (Soni 2009). But much of the economic burden of mental illness is not the cost of care, but the loss of income due to unemployment, expenses for social supports, and a range of indirect costs due to a chronic disability that begins early in life. The WHO has already reported that mental illnesses are the leading causes of disability worldwide ((WHO) 2011) and depression alone accounts for one third of this disability ((WHO) 2004). The new report estimates the global cost of mental illness at nearly $2.5T (two-thirds in indirect costs) in 2010, with a projected increase to over $6T by 2030.

It is even more concerning that new evidence points to a substantial rise in psychosocial disorders affecting young people over the past 50 years (Collishaw et al. 2004). Some of the leading causes of these issues include drug use (Newcomb and Bentler 1988), parental divorce (Chase-Lansdale et al. 1995), adverse childhood experiences (Schilling et al. 2007) and perceived stress (Bovier et al. 2004). Given the substantial prevalence of mental illness at such a critical time in the life course, attention is now focusing on providing more support and resources to these young populations who are entering the workforce. By addressing the issues early on, we can potentially make a much larger impact on one’s life later on.

**Mobile Health (mHealth)**

Mobile health, or mHealth, is a rapidly growing field demonstrating the intersection of mobile devices and healthcare. Smartphones are increasingly viewed as handheld computers due to their improved computing capabilities (Boulos et al. 2011). The acceptance and adoption of these devices is growing due to their improved ease of use (Park and Chen 2007). They are utilized by physicians to access patient records, to view test results, and to prescribe medications (Burdette et al. 2008; Luxton et al. 2011; Ozdalga et al. 2012). Patients also use smartphones to access and update their medical records, to monitor their health statistics, and to view their prescriptions (Brennan et al. 2010). The impact of mobile applications on reducing healthcare costs has also been established (MobileSmith 2014). There are over 165,000 apps on the two most popular app stores – iTunes and Google Play (Terry 2015), and according to the Food and Drug
Administration (FDA) mobile health (mHealth) apps were downloaded by 660 million people as of June 2013 (Conn 2013). There are thousands of mobile healthcare apps and about 40% of them are directly related to patient health and treatment (Constantino 2013).

**Gamification and Patient Empowerment**

Certain applications facilitate empowerment, as they encourage gestures and physical movement (Zamfirou et al. 2012). Other applications induce a point system, giving merits and awards to those that use the app with greater frequency (Lister et al. 2014). Some of the most popular applications regarding well-being combine the best of both of these elements, giving way to an interesting and fun way for patients to enjoy the journey to reaching their goal in mind. Nike+ is an example of a social, gamified mobile app that assesses physical fitness (Zichermann and Cunningham 2011). Within the application, challenges can be created between friends and other random users, creating a safe, yet competitive environment for users. Less research has been conducted with regards to mental health apps and gamification; however, it is clear that patient empowerment on physical well-being apps have provided to be very successful. Some possible features we can include in the app are daily/weekly challenges for the users, a reward system to monitor their progress, etc. Those will be added to the tool at a later stage as we plan to gradually roll out our app and make necessary changes after each stage. Thus, we are not including any screenshots to illustrate the concepts in the current study.

**Human Computer Interaction**

Application design is a very complex and challenging subject to study. There are several identified ways in which the design of an app can influence human interaction, some of them being ergonomics, user and system language, and intent (Dix et al. 2004). Ergonomics is defined as “the study of the physical characteristics of the interaction” (p. 16). It includes arrangement of controls and displays, the physical environment of the interaction, and the use of color. Other aspects that influence the human-computer interaction (HCI) include elements of the interface such as windows, icons, menus, and pointers; interaction styles like command line interface, menus, natural language, and form-fills. We reviewed the recommendations on HCI and used them to develop various designs of our mobile application. Our goal is to investigate which elements and color schemes are more appealing to the target audience – young adults. Our study is taking a step further by exploring how the users’ mood and mental condition can influence their preference. We investigate the development of successful mobile application design by adding another dimension, the user’s emotional state, and whether that has any influence on their interface preferences.

Another aspect of the app we need to take into consideration is its cultural appropriateness. Since there are differences in the perception of colors across different cultures (Roberson et al. 2000; Uchikawa and Boynton 1987), we need to be mindful of those expected differences. The university where we are piloting our app has only about 11% non-resident aliens according to https://www.collegefactual.com. Due to the predominantly American student body, our initial design will be more US-centered but in the future we will also consider other alternatives so our work can be replicated in various cultures.

**Message Framing**

There has been extensive research conducted on message framing of health-related communication. Studies conducted by (Rothman and Salovey 1997) on shaping perceptions, Keller et al. (2003) on framing and persuasion and Wansink and Pope (2014) on gain-framed health messages suggest that there is a relationship between message framing and health. Framing of messages stems from a cognitive bias known as the framing effect. Behavioral psychologists Tversky and Kahneman (1981) were the first to publish research related to how changing the presentation of a situation can affect the outcome. Tversky and Kahneman (1981) explain that situations, or messages in this case, can be framed as either gains (benefits) or losses (costs). This idea of framing messages as gains or losses was used to frame persuasive messages to impact healthy decision making (Rothman and Salovey 1997). O’Keefe and Jensen (2009) build upon that concept and perform a meta-analytic review of over 9,000 studies demonstrating how loss- and gain-framed messages are perceived. Keller et al. (2003) consider the initial mood of the participants and the resulting response to gain- and loss-framed messages. After conducting two experiments, their findings indicate that participants with a positive mood were more persuaded by loss-framed messages, and those
with a negative mood were more persuaded by gain-framed messages. Even though there has been more than two decades worth of research, there are still inconsistencies and inconclusiveness regarding message framing. Wansink and Pope (2014) attempt to provide specific questions to answer in order to determine which type of message (gain or loss) would be best suited for individuals. We build upon prior work in the field of message framing to make our proposed mobile application more appealing to young adults.

**Research Question**

The purpose of this study is to investigate the impact mobile application design can have on maintaining mental well-being. The intent is to see whether particular colors/color schemes, shapes, and framing of statements have any effect on mood and well-being of young adults. More specifically, our study aims to answer the research question: "How can a mobile app design help young adults develop and maintain mental well-being?" We answer the question by developing the mental well-being app design and framing of the messages. This is our first step of the project. Once we establish what interface and messages appeal the most to young adults. Our future goal is to develop the mobile app and make it available to the broader audience and ultimately make a positive impact on mental well-being as a whole.

**Application Design**

Based on the extensive literature review we conducted, we developed several different interfaces that we asked the users to evaluate. Figures 1a-d present the four different concepts we displayed to the users. In these screens, we ask them specifically to evaluate the spatial look of the app. We would like to know whether certain shapes or patterns are perceived more favorably by the users than others.

In addition, our survey investigates the way subjects feel about different colors. For instance, whether they feel depressed, anxious, scared, nervous, happy, optimistic or relaxed when they see a particular color. We will use this information when developing the mobile application in the future. We plan to first ask the users how they feel and then, based on their response, the app will display a different interface design.

**Figures 1a-d. Application Interface Examples**

In addition to the colors and shapes, we also asked the users to evaluate the impact of various messages on them. Some examples of these messages include:

- Without the adequate nutrition, you may feel more tired throughout the day.
- By doing more exercise, you can increase your energy levels.
- Using sunscreen may reduce the risk of skin cancer.
- If you decide not to take the vaccine, you may contract the virus with greater side effects.
- Just smile :)
Based on the review of prior work that we conducted, we framed these statements in either a positive or a
negative way. The collected data can help us improve our knowledge of HCI in the context of the mental
well-being app we will develop in the future.

Research Method

The main method for evaluating the effectiveness of our app interface was utilizing Design Science Research
(DSR). We followed best practices suggested by Gregor and Hevner (2013), Hevner and Chatterjee (2010),
and Hevner et al. (2004). We grounded our artifact in theory to make sure the mobile app interface is
appealing to end-users and that the messages displayed to the subjects are going to achieve maximum effect.
Once we developed the mobile app interface, we pilot tested it with a small number of subjects to ensure
that the survey and the design was adequate and that we were did not make any critical errors. Then, we
tested the artifact with a larger population and investigated whether our interfaces and message framing
techniques were successful. Following DSR best practices, we intend to make future iterations to the artifact
and develop the complete mobile app.

For the data collection, we recruited 215 young males and females (ages 18-24) at a private university in the
Southeast in the period January-February 2018. Our subjects were predominantly freshmen taking a First
Year Seminar course. We used the snowball technique and reached out to the faculty members teaching the
course. We also reached out to faculty members on campus and asked them to give the survey to their
students. Unfortunately, we are unaware of how many students actually got access to the survey so we
cannot estimate the response rate of the survey. However, we were looking for a minimum of 200 subjects
in order to get a diverse and representative sample of the population and we were able to achieve that
number in about 2 weeks of launching the survey. The survey instrument was developed and distributed
using anonymous links in Qualtrics. The project was approved by the Institutional Review Board (IRB) at
the university.

Results and Discussion

Demographics

Of the 215 students who started the survey, 14 did not complete it. From the remaining 201 complete
surveys, 32 were done by students who were outside of our age inclusion criteria (18-24 years old). This left
us with a total of 169 usable responses. Out of those, 110 were females (65%), 58 were males (34%), and 1
identified themselves as “other” (1%). About 75% of the respondents were white, 12.5% - Hispanic/Latino,
6% - Asian, 4% - Black or African American, and the remaining 2.5% were Native American and Other.
Overall, the ethnicity of the subjects is representative of the demographics at the university.

Mental Well-Being

From the 169 participants we surveyed, we noticed that 114, or over 67%, said they or someone they know
have experienced mental health issues (Figure 2a). This is a very concerning trend and it is consistent with
the previous studies we examined when we researched the trends in mental well-being among young adults
(Glowinski and D’Amelio 2016; Mojtabai et al. 2016). If a mental well-being app, such as the one we are
proposing, exists, over 67% of the respondents indicated they would use it (Figure 2b).

Mobile App Attitudes

In order for us to determine whether a mobile app would be a good solution to the issue at hand, we surveyed
our participants about their mobile device habits. The median response was that they spend about 5 hours
a day interacting with their mobile devices and about 25% indicated they spend more than 8 hours a day.
Over 51% indicated they currently use some type of health apps (i.e. Fitbit, Myfitness Pal, Google Fit, Apple
Health, etc.). Thus, we believe that providing students with such an app would be beneficial for offering
support tools, resources, and mechanisms for them to cope with their mental health issues.
Mobile App Design Evaluation

To get a better understanding of the participants’ attitudes towards the application interface design, we asked them how they feel about certain colors. Their responses will guide us in developing the app during the next stage of our project. We wanted to see if there is any association between different colors and feelings. The seven moods we asked for were: depressed, anxious, scared, nervous, happy, optimistic, and relaxed; and the colors we evaluated were: red, white, blue, green, yellow, purple, orange, brown, and black. Figure 3 presents the results of that survey question. We intend to customize the app interface experience for each user based on their mood when interacting with the tool. For instance, if the user indicates they are happy, the app will have predominantly yellow colors or white/blue when they feel relaxed. During the development phase, we will consult with psychology experts to guide us in what is the best approach to present the app to a student who indicates they are depressed, sad, or anxious for example. Since this is a preliminary study, we want to build a solid foundation and make sure the app will be able to have a positive impact on the community.
Of the four shapes and designs the subjects were presented with (Figures 1a-d), 39% liked a lot or somewhat liked the first one, 19.5% - the second one, 28.4% - the third one, 16.5% - the fourth one. This provides us with valuable inputs on how to further improve our work and what specific shapes work or do not work with the targeted population.

**Message Framing Evaluation**

And finally, we asked the students to evaluate the five messages we provided them with. Each message was framed differently so we can understand whether the loss or gain type would have more effect. In order to appeal to our target population, we also used emojis. As presented in Figure 5, the subjects perceived better gain-framed messages and indicated they have a more positive effect on them. Thus, when developing the app in the future, we will take that consideration in mind.

![Message Framing Evaluation](image)

**Figure 4. Message Framing Evaluation**

Based on the results from this preliminary survey, we were able to test our initial design and message ideas and get information from the subjects on how to better address their mental health needs in the future. We received valuable feedback on the app interface and were able to determine what colors to use and what types of messages to send to the users in order to best appeal to them.

**Implications for Practice**

It is interesting to point out that during the data collection for this study, the researchers were approached by a number of individuals on campus who expressed their interest in further developing the project – from the Director of the Wellness Center, to faculty, staff, and student members who were very supportive of the idea and demonstrated the need to provide more resources for students on campus. Many said they found out about our project based on word of mouth or the survey we sent out. Some of them even provided us with qualitative feedback on future features of the app such as a forum and/or chat option so that students can help each other and even start some support groups on campus. While this was a first step, we were able to not only test our app design, but also to raise awareness about such an important issue as mental disability. This is a very serious concern at our institution where the suicide rate during the 2017/2018 academic year was more than twice the national average\(^1\) and there is a pressing need to address the problem.

\(^1\) [https://www.neumann.edu/life/counseling/mental_health/suicide/national_data.htm](https://www.neumann.edu/life/counseling/mental_health/suicide/national_data.htm)
Future Research

In the future, we would like to develop and pilot test this app at the university. Once we obtain good feedback and improve the app enough, we plan on providing it to other institutions to use. This will be a valuable tool not only for young adults but also for counselors as it can provide them with a better insight onto the students they are advising. In addition, raising awareness about mental health can help overcome the stigma around it (Bharadwaj et al. 2017; Clark et al. 2013; Corrigan 2004; Corrigan 2000) and allow young adults to seek help early on.

The topic we are investigating is very broad and multifaceted. Our work is just scratching the surface and we encourage our colleagues to continue exploring this domain and also take different perspectives to it. We believe that working closely with psychologists or other health experts can increase the quality of the app and thus make it more attractive and useful to students. We would like to see more collaborative work done in this domain and we hope our study inspires others to pursue this topic.

We acknowledge that our sample size is obtained at a single location and this may present some bias in the results. Perhaps if tested at another institution in a different city, the results would be different. We do not see this necessarily as a shortcoming but as an invitation to our colleagues to replicate our work and start similar projects at their institutions. Since this is a preliminary study, we do not strive for absolute generalizability of the results but rather to gain a better understanding of our community and raise awareness of mental health issues.

Conclusion

Overall, our findings suggest that undergraduate students in the young adults range (18–24 years of age), are open to the idea of using a mobile app for mental well-being. This application has the potential to help over 67% of students, surveyed by the research team who say they would use a mental well-being app to help their day to day lives. The community has widespread resources that could be used to partner up with the developers of this app, including campus Wellness Center/Clinic, faculty members, and other students in established support groups. Additionally, the app has the potential to connect students at other universities across the nation, if adopted widely.

With these findings, the researchers hope to raise awareness of mental health, especially at the critical young adult stage. The awareness does not necessarily have to be a clinical diagnosis; in fact, the app is meant to be a springboard for users to assess their own mental health in a holistic fashion. Simple aesthetic features within the app, such as layout and framing of messages, can go a long way in promoting this first step for users.

REFERENCES


