
Smartwatch Applications for Mental Health: An Exploratory Analysis on Users' Perspectives

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Abstract

Smartwatches have a large potential to address mental health issues, thanks to their small dimensions, conventional form, and unobtrusive interaction. Due to their capabilities to collect data and monitor users' activities and behaviors continuously, smartwatch applications are also able to provide prompt interventions, timely notifications, discreet alerts, and emergency responses for end users. These features make smartwatch solutions versatile, enabling them to accommodate requirements for diverse problems. In mental health, smartwatch applications provide numerous affordances. To understand how smartwatch applications have been appropriated to address mental health concerns, we performed an exploratory analysis of users' reviews about ten smartwatch applications. All applications analyzed focus on interventions delivered through multimodal contents – with audio, images and vibration. Users tend to consider these applications as effective means for intervention, comparing it to a 'medicine cabinet' and incorporating them to their daily routines. As main benefits, users highlight the customizable options for audio features, and as main drawbacks of existing applications, users remark their costs, unstable implementations (incompatibility and issues with updates) and limited features.

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Wearables for Mental Health

Anxiety and Stress: Dibia (2016) studied smartwatch applications to reduce anxiety and stress. Kelling et al. (2016) studied how wearables (a sleeve, a heart rate monitor and a smartwatch) reduce stress.

ADHD: CASTT is an assistive prototype that captures activities and assists children with ADHD to maintain attention (Sonne et al., 2015). Takt employs touch and vision to inform the time through users' senses (Eriksson et al., 2017).

Depression: the asymmetry in electro-dermal activity in patients with depressive episodes can be used as biomarkers to diagnose and treat depression (Fedor et al. 2016).

Schizophrenia: Cella et al., (2017) studied wearables to characterize schizophrenia. Wang et al. (2016) developed CrossCheck, an application to monitor mental health indicators in patients with schizophrenia for early prediction and intervention.

Author Keywords

Smartwatch; wearable applications; mental health care.

ACM Classification Keywords

H.1.2 [Information Systems]: User/Machine Systems—human factors, Human information processing. H.5.2 Information Interfaces and Presentation (e.g. HCI): User Interfaces—User-centered design.

Introduction

Lifestyle diseases continuously rise, with aging, epidemics, and life stressors altogether contributing to a growing need for novel solutions in mental health. Despite the inherent challenges to bring computing and mental health communities together (Wadley et al., 2018), digital technologies, including web, mobile and wearable solutions have a large potential to promote mental health, and help to address problems related to anxiety, stress, and insomnia. Mobile solutions can aid stakeholders to better understand behavioral patterns, their trends and potential correlations (Calvo, 2010), besides having potential to inform and improve standard care practices. Wearable technologies are available in multiple form factors; among those, wrist-worn devices stand out by their conventional look and easy access for users' interaction and interfaces. Besides being in close contact with the human body, wrist-worn wearables are continuously used, which extends their potential to serve as versatile tools for a large range of psychopathologies and mental health conditions.

This study characterizes Apple Watch solutions for mental health, based on their features and contents. We analyze the users' views about the applications, identifying their benefits, drawbacks and users' profiles.

Related Work

For mental health, wearable computing has been investigated to address depression (Fedor, 2016), stress (Sano & Picard, 2013), (Picard, 2016), anxiety, borderline and bipolar disorder, and schizophrenia (Wang et al., 2016), (Cella et al., 2017), (Torous and Keshavan, 2018).

Searching in iTunes and Android Market (renamed to Google Play), Larsen et al. (2016) identified applications for depression, bipolar disorder, and suicide. They noted that 35.3% (347 out of 982) were actually clinically relevant, only 2.6% (nine) had clinical effectiveness and only three referred to a published study. Grist et al. (2017) analyzed existing apps for mental health care for preadolescents and adolescents. With a systematic review they concluded that the effectiveness of such applications is still unclear, and despite a high acceptability of the solutions there is not sufficient research evidence to ensure their efficacy and safety.

Larsen's study focused on the longevity and stability of mental health applications for smartphones (Larsen et al., 2016), unlike his work, in this paper we focus on analyzing the users' perceptions about smartwatch applications. We analyze the comments posted as users' reviews on iTunes for mental health applications available for Apple watch.

Methods

To extract the reviews of the applications selected and parse their contents, we developed a web crawler in Python using the packages Regex and BeautifulSoup (Richardson, 2013). Once the contents were extracted, we performed an exploratory and qualitative analysis of

textual contents of the app descriptions. From iTunes, 240 applications were initially selected, as the most popular resulting apps (highly rated and downloaded) in January 2018 under the category 'health and fitness'. From those 240 applications, we selected 35 related to mental health. After refining our search for applications that offered a watch version, only 10 apps remained for the analysis: Calm, Digipill, Headspace, iMessage, Omvana, Relax Meditation, Relax Melodies, Relax Yoga Music, White Noise, and White Noise Ambience Lite.

To complement the analysis of the applications selected we used SensorTower (<https://sensortower.com/>), an online service that provides information about mobile applications, including: their descriptions, screenshots, number of downloads, most recent reviews, and geographic location of the users. The inclusion criteria to select users' comments were English texts including the users' perceptions and experience with the application. For data analysis we read the users' comments, and annotated them according to their nature with emerging codes in a bottom-up approach. The codes that emerged were mindfulness, meditation, massage, relaxation, and sleep. We analyzed the sentiment associated to the reviews (as positive or negative), identified the features discussed, the users' profiles, the problems they faced and the benefits of the application. Using a word tree we explored key words that reflected the users' views (love, hate, like, wish) based on previous work (Motti and Caine, 2014).

Results

We selected ten Apple Watch applications whose focus is mental health. We analyzed 78 reviews posted online by diverse users. All ten applications selected for

analysis were related to interventions, e.g. meditation, mindfulness, relaxation, white noise, and massage.

Benefits and Key Features

Among the benefits discussed by users in their reviews, we highlight the variety of sounds available in the applications, the ability to customize the app features, and to access the application whenever necessary. Using a word cloud (Figure 1) and content analysis of the reviews, we noted that the preferred characteristics of the applications were: ease of use, free of cost, variety of sounds, and prompt access.

The sound options stood out among users' comments, as a user mentioned '*This app is far better because of the quality of the sound options and the ability to really personalize the saved sounds*', which suggests that audio features are useful in mental health interventions, besides also providing accessibility for users with hearing impairments ('*I'm hard of hearing so this is actually a big deal to me otherwise I struggle to hear the meditations because the background noise is too loud*'). Users complimented the variety of choices, ability to adjust the volume, to record and add personalized sounds, and soft voice tones. Users mentioned to incorporate the app in to their morning routine, and compared it to a '*medicine cabinet with all your pills*'.

Concerning the features, users remarked the ability to concentrate, relax, meditate or sleep using the apps. As a user mentioned '*Oh, and we love how Headspace's Apple Watch app lets you hit a literal panic button when extra-stressful situations arise*'.

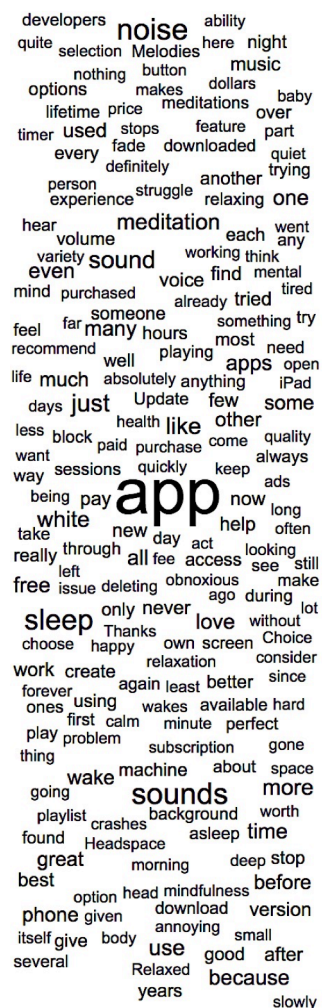


Figure 1. Word Cloud generated from all users' reviews.

Drawbacks

Among the problems users face, they reported issues with upgrades, incompatibility, crashes and bugs in the navigation and login system. As a user mentioned '*I love this app more than anything but it keeps freezing and when I use it nothing else will work.*'. The most common complaint was related to the cost of the application, as a user remarked '*I love it but I can't afford it*', followed by issues with the battery, upgrades, and limited language choices, as a users cited '*The app is very good but just have in English*'.

Users' Profiles and Rationale

We noticed that overall users were enthusiastic about the applications, considering them effective, as user commented '*I feel better than I have in years!*'. They purposes to use the apps regularly was '*to take better care of [their] health and train [their] mind*'. Users also reported to have tried several applications. Most users were located in the US. The mental health symptoms and conditions discussed were: anxiety, stress, insomnia, and attention deficit disorder. In addition to that, users also reported to use the applications to manage pain, tinnitus, sore muscles, and to help to recovery from surgeries, concentrate and sleep. One user reported to use the app for his/her kid: '*I used the app for my sleeping baby.*'. A user explicitly mentioned to have the app recommended by their healthcare practitioner, a psychologist.

Discussion

In general, the users reported to be willing to use the watch apps as a support for their current and traditional mental health treatments, being also positive to explore additional applications with complementary features. The easy access to the watch

and continuous usage could be the main drivers for adopting and using a wearable application. Still, despite its promising potential, the widespread adoption of wrist-worn applications for mental health does not come without drawbacks; risks involved with privacy, efficacy, and safety remain yet to be addressed, specially when users report to use their apps '*as their medicine cabinet*' (n=3), or with their kids ('*I used the app for my sleeping baby.*').

Because this study only considered self-reported comments from iTunes users of a limited number of apps (n=10), the findings are exploratory, neither conclusive nor generalizable. Also, the users access the app not only on their watch as a stand alone application, but may also consider their experiences with iPhones and iPads when reporting their feedbacks.

Conclusion

Wearable applications have a growing potential to support users in mental health, especially when allied to standard care practices to assist patients in a continuous, low-cost, accessible and personalized way. Smartwatches have potential to help in mental health, and a large number of users have already started to use them regularly as effective solutions to address mental health concerns. Still there are open questions in this domain, specially concerning how to properly ensure the efficacy of the applications, to warranty users' right to privacy and to mitigate potential risks that arise when healthcare shifts to a patient-centric solution, in which the individual becomes more active and responsible for his/her own healthcare.

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