Reviewing and evaluating mobile apps for memory impairments in depression

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Abstract. Depression is a major affective disorder which influences autobiographical memory processing abilities. Mobile phones hold great potential for delivering effective self-help treatments that target depression and for assisting users' memory processing. This work explores commercial apps that support users' everyday challenges associated with depression and in particular memory processing. Our results highlight the current functionalities of top-rated apps on major marketplaces, which could be used to inform novel functionalities, better tailored to address depression-related memory issues and consequently reduce users' depressive symptoms.

Keywords. depression, mHealth, mobile apps, review

1. Introduction

With significant socioeconomic costs [6], depression is a major affective disorder impacting over 300 million people worldwide [11]. Addressing this raises significant challenges, both for providing clinical interventions and everyday self-care strategies. Mobile phones hold much potential to scale up the provision of interventions that target depression [7, 8] most often structured psychological interventions [5]. Researchers however, have called for importance of exploring also additional interventions such as those building on users' life-narratives [1]. The latter are promising because they particularly target memory processing issues associated with depression [10].

Recent studies have shown depression's impacts on autobiographical memory processing abilities [2, 4]. Neuropsychological studies have suggested an opportunity to reduce depressive symptoms by helping users improve their self-memory processing abilities [2]. These findings call for futher work on memory technologies for assisting people's memory processing and their specific impairments in depression [9, 10].

This work aims to identify key funtionalities of currently available, top-rated mobile apps, with the potential to address autobiographical memory impairments in depression. Future work will focus on evaluating their effectiveness in addressing autobiographical memory impairments in depression, and on the provision of guidelines for advancing current apps.

2. Method

We used a systematic review approach to guide the collection and analysis of depression and diary apps. The review was carried out on two major mobile app marketplaces: Apple (iTunes), Android (Google Play) in Spring 2019. For retrieving the apps for depression, we used the keyword "depression", and for apps for memory processing, we used the following keywords: "diary", "mood tracker", "mood memory", "journal", and "daily event". We entered each of the keywords into the search field of App crawler and google Play search engines. We used a script [3] to extract all apps shown in the search results, with their name, category, price, review score, number of reviewers, and their description on the marketplace. Originally, we retrieved 482 depression apps and 3119 memory apps.

We then filtered these two sets of apps separately, by excluding apps that : (1) have less than 100 reviews, (2) are in irrelevant categories, (3) do not mention keywords such as "depression", "diary" in either title or description, (4) are not accessible at the time of selection. This resulted in 34 memory apps and 35 depression apps that meet the inclusion critera. After removing duplication, 20 apps were finally selected for further evaluation, which includes 7 apps yielded from searching memory related keywords, 9 apps from depression keywords, and 4 apps from both.

We extracted descriptive characteristics of the apps from the information provided on the marketplace, including categories, price, review score, and description. To extract the functionalities, the first author used all apps on an iPhone device, completed and shared the initial coding result with the other authors during weekly meetings over two months. The results were iteratively revised until a final agreement was reached.

3. Preliminary results:

The 20 reviewed apps belong to 3 categories: Health& Fitness (55%, 11/20), Medical (25%, 5/20), Lifestyle (20%, 4/20). Most apps (70%, 14/20) are free to download, with the price of the paid apps (30%, 6/20) ranging from $1.99 to $9.99. A third of the apps (35%, 7/20) can only run on Android devices, less than a third (6/20) can only run on iOS devices, while 35% (7/20) can run on both platforms.

Our results indicate that *trackers* are the most popular type of functionality for addressing both depression and memory processing: 75% (15/20) of selected apps provide *thought tracking,* wheras *55%* allow users to track *mood (11/20),* 20% track *activities* (4/20)*,* 20% track *progress* (4/20), or everyday gratitude (10%, 2/20).

For targeting depression, we found popular functionalities such as *psychological exercises* (30%, 6/20) including *CBT* (15%, 3/20) and *mindfulness* (158%, 3/20). One app provides a hybrid functionality, including positive tracking, meditation and behaviour activation.

4. Conclusion and future perspectives.

This work explores the potential of mobile apps to support users' memory processing issues in depression. Our study is the first to explore the shared functionalities of the two types of selected apps: those for depression and for supporting memory processing. Future work will focus on the evaluation of these apps, and recommendations for guiding the design of memory technologies for depression. .

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