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REVIEW ARTICLE

Targeting the Needs of Self-Determination Theory: An Overview of Mental Health Care Apps

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Introduction: Smartphone apps are a highly accessible tool to supplement self-treatment for mental health challenges, such as depression, and are underrepresented in research. While many studies have performed content analyses of health apps, few studies have reviewed their adherence to behavior theory.
Aims: The objective of this study is to assess mHealth depression apps through the lens of the Self-Determination Theory and identify if app functions target the three basic needs: autonomy, competence, and relatedness.
Methods: All depression apps available from iTunes and Google Play that met inclusion criteria were analyzed (N = 194). Apps were reviewed for price options, store availability, download rates, and how functions targeted the three basic needs for intrinsic and sustained health behavior change outlined in the Self-Determination Theory.
Results: Findings showed that most of the apps targeted at least one of the basic needs (158/194, 81.4%). However, only a few of these apps targeted all three basic needs to some degree (15/194, 7.7%), and no single app targeted all three basic needs fully. Furthermore, neither store availability, price option nor download rates were accurate predictors that apps targeted the three basic needs.
Conclusions: The results suggest that some depression apps targeted autonomy, competence, and relatedness but this was limited to a small number of apps through few functions available in each app. People who want access to more functions targeting the needs would need to download a suite of apps.

Keywords: mHealth, depression, mobile applications, the Self-Determination Theory, SDT

Introduction

The number of mHealth apps continues to grow and is predicted to be over 325,000 (Larson, 2018). While there are some efforts to provide consumers with guidance on which apps have an evidence base (e.g., NHS App Library; McCartney, 2013), overall, governmental regulators do not recognize mHealth apps as medical devices and impose no authority over dissemination. This means that developers can develop and distribute apps through apps stores as treatment tools for depression without regulation. This leaves consumers vulnerable to poor quality health apps. However, due to the benefits of mobile apps as a platform to supplement self-treatment of depression, many apps have been developed and are competing to capture the market transitioning to the mHealth platform. The affordability of mHealth apps, coupled with the accessibility, practicality, and expectations of privacy, provides a viable healthcare option for private and stigmatized health concerns (Deng et al., 2014). As a result, this makes mHealth apps a viable option for people with depression. However, most of these apps are not developed by health professionals (Powell et al., 2016), and there are cases of apps misreporting organizational affiliations and content (Shen

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et al., 2015). These apps need to demonstrate some level of clinical foundation to be safe and effective (Powell et al., 2016), yet wide-spread dissemination means there are unfounded apps in circulation and non-specialist apps masking themselves as depression apps (Shen et al., 2015). Additionally, these apps could have adverse effects and worsen depression (Leigh & Flatt, 2015). Newspaper reports have claimed that most mHealth depression apps are unproven (Knapton, 2015) and many apps foster depression and depressive symptoms and do not offer any effective treatment (Ryu, 2012). Without guidance, finding a research-based mHealth depression app would be challenging (Shen et al., 2015), particularly as few mHealth depression apps incorporate health behavior theory into their designs (Sama et al., 2014). This study hopes to offer suggestions for suitable apps with a human behavior theory basis. mHealth has strong potential for mental health intervention yet more formal assessments around mHealth are needed (Grossman et al., 2020). This study exists to review mHealth depression apps for in-app functions that operate to target basic needs for health behavior change outlined by the Self-Determination Theory (SDT) (Ryan et al., 2008). An SDT-based approach to treatment of depression is empirically supported (Britton et al., 2008) and is well-suited to the app platform (Umaefulam & Premkumar, 2020). Furthermore, it is important for us to conduct this type of research around enabling change in a context of depression due to the barriers to health behavior change that depression enacts (Williams, 2014). Despite this, there is minimal research around SDT treatment approaches to mental health issues through apps (Fish & Saul, 2019).

The Self-Determination Theory

This study assesses mHealth depression apps using SDT as a theoretical basis. SDT acknowledges the fulfillment of three basic needs: autonomy, competence, and relatedness. These needs are crucial to create and support intrinsic, long-term motivation for behavioral change, and a lack of needs satisfaction can result in depression (Bartholomew et al., 2011) and depressive symptoms (Ryan et al., 2008) Furthermore, controlled motivation, as opposed to intrinsic motivation, can be associated with depression (Levesque et al., 2007). In light of this, the sample of apps in this study are reviewed for functions that target the three basic needs configured by SDT. Other popular health behavior theories, including the Health Belief Model and the Theory of Reasoned Action, are limited in their ability to explain health behavior change (Rothman, 2000). Conversely, SDT offers keen insight into understanding health behavior through apps (Monney et al., 2015). and depression treatment (Ryan & Deci, 2008).

Autonomy

The need for autonomy is the need for self-direction of behavior that is motivated by value, satisfaction, and interest in the behavior to the exclusion of external stimuli (Ryan et al., 2008). It is self-management of health with limited to no support from others (Ryan et al., 2008). In SDT, the motivation to change behavior is dependent on autonomy; when motivation is autonomous, people are more willing to sustain health behavior change than when motivation is forced (Ryan et al., 2008). Furthermore, a lack of autonomy in the face of difficult situations can be an indicator of depressive onset (Mazure et al., 2000), and low autonomy levels are associated with depressive symptoms (Schiffrin et al., 2019). This suggests that autonomy absence is a trigger for issues concerning mental health. Fostering health behavior change through supported autonomy can be identified as follows. Firstly, providing meaningful reasons for behavior change. Secondly, providing alternative behaviors or activities to enact that require active participation. Thirdly, supporting individual initiatives through personalization. Fourthly, recognizing alternative opinions or approaches to content. In light of this, it is assumed that mHealth depression apps with these qualities would support depression self-treatment.

Competence

The need for competence is the need to feel adept or skillful towards a behavior or the feeling that a skill or behavior change is improving (Ryan et al., 2008). It is different to autonomy, as it reflects personal ability rather than personal control. Experiencing the feeling that you are capable of changing a behavior is a component of motivation and maintenance of long-term behavior change. Furthermore, lower levels of competence are associated with depressive symptoms (Schiffrin et al., 2019). This supports findings that self-efficacy and competence foster effective depression treatment (Ryan & Deci, 2008). Feelings of competence come from tools, advice, and feedback that encourage behavioral changes and overcome barriers (Ryan et al., 2008). In light of this, apps that foster competence for depression self-treatment would provide sources of information that support depression treatment. Additionally, apps would include supportive tools that enable change and feedback mechanisms.

Relatedness

The need for relatedness is the need to feel connected to others (Ryan et al., 2008). In SDT, feelings of relatedness are important for establishing motivation as it allows people to adopt social influences from meaningful relationships. Social influence is an important component to health behavior change (Fogel et al., 2002), including treating depression (Logsdon et al., 2009). Furthermore, relatedness and social influence are increasingly important aspects of our digital lives and online presence. This is also true for our digitization of health behavior and management. For instance, online communities, forums, and chat rooms enable social engagement with likeminded people with relatable health issues (Fogel et al., 2002). mHealth apps that enable social connection with peers and feelings of relatedness would likely contribute to positive health behavior change around depression.

To sum up, in accordance with SDT, the needs for autonomy, competence, and relatedness are central to innate and sustained motivation to make behavioral changes. mHealth depression apps that recognize these needs are likely to make greater positive changes for people with depression than those apps which overlook these needs and other aspects of behavior and treatment theories. In light of this, this study investigates the following question: Do mHealth depression apps host functions to target user needs for autonomy, competence, and relatedness in line with SDT? From this investigation, the study makes suggestions of mHealth depression apps.

Methods

Sample Selection

For this app review study, mHealth depression apps are recognized as apps that claim to treat, manage, educate, or help with depression and depressive symptoms. Generic mental health treatment apps were included only if they met this criterion. Apps focusing on symptom assessment and mood monitoring were excluded. With granted ethics clearance, two popular app stores (Google Play and Apple iTunes) were checked for any apps using the words "depression" and "depressive" in either the titles, keywords or descriptions of their app store webpages during March 2020. All search results from both stores were reviewed to assess if the apps qualified for study inclusion. A range of specialist apps were reviewed, including, but not limited to, chat apps, workbook apps, mindfulness-based apps and faith-based apps. Several apps, for instance hypnosis and acupuncture apps, were excluded because they cannot be appropriately analyzed within the context of this research. Social chat and communication apps were also excluded as they are generic communication apps without a focus on depression. Apps that were not in English were also excluded. From this sampling approach, 221 apps were reviewed: 144 from Google Play and 77 from iTunes. After correcting for twenty-seven duplicates, the sample was reduced to 194. As developers will occasionally give an app different names across app stores, both app names and developer names were recorded during data collection. By sorting the original 221 apps by app names, then developer names, all duplicates were identified by comparing descriptions, imagery and content. Any apparent duplicate apps were compared between the two app stores concurrently for confirmation.

Coding of Apps

App and Download Details

Apps were coded for market type (Google Play, iTunes, or both stores) and price type (free or paid). Download rates were included for apps available from Google Play only as iTunes does not report download information. Apps were reviewed according to titles, descriptions, and imagery; a supported method of data collection in mHealth research (Pinheiro et al., 2019; Wali et al., 2019). The coding scheme was developed by using the conceptualization of the SDT variables outlined earlier. As a quality check, 20% of included apps were randomly selected and recoded by the author to confirm consistency in the coding. Functions that targeted the three basic needs were observed and coded appropriately. Some apps gave instructions that align with SDT; however, they did not provide functions to support it and were coded appropriately. For example, some apps advised users to make to-do lists while others hosted to-do list functions which enable the behavior and target the need for competence. Additionally, to target the need for autonomy, an app must provide in-depth, objective information about depression (e.g., psychoeducation approach, Harrer et al., 2021) as opposed to a brief, undiscerning description.

Autonomy

Autonomy was assessed through functions in apps that supported autonomous behavior of users through: 1) providing meaningful reasons for change, 2) providing alternative behaviors, and 3) supporting individual initiatives through personalization. Coding was based on the presence or absence of these functions in the apps. First, apps were assessed for relevant, sound information that supports reasons for behavior change, such as objective and clinical information on depression and depressive symptoms and valid reasons for treatment. Valid reasons are justifications that treating depression improves health and life quality. The second aspect of autonomy considers choices and behavior alternatives. Apps were reviewed for activities and exercises with active participation that redirect concentration towards treatment, such as workbooks, guided meditation, writing, learning games, and mindfulness practices. Apps with a dedicated treatment approach, such as mindfulness and CBT exercises, likely have a strong overlap with elements of SDT. The third aspect of autonomy is to support individual initiatives. Here, apps were reviewed for functions that enable change through behavior plans or schedules, such as a personalized depression management plan outlining how to act and react for future situations and how to achieve behavior goals. The last aspect of autonomy considers individual perspectives. This can only be assessed in interpersonal communication. Therefore, this aspect of autonomy was not coded for this study.

Competence

Competence is enabled by skill development, supportive tools for development and feedback on behavior change (Ryan et al., 2008). Coding was dependent on whether apps hosted functions that target the need for competence through: 1) resources, 2) supporting change, and 3) providing feedback. Firstly, apps were reviewed for informational resources on skills for change, such as treatment guidelines and insights and stories from lived experience. Practical resources to educate app users, such as FAQs, hotlines, educational quizzes, and games were also identified. The second aspect of competence can be seen in app functions that actively support change, such as reminders and push notifications, goal settings and to-do list functions, and mood assessments and journaling. Finally, apps were reviewed for evidence of providing feedback, such as personalized reviews of progress based on mood and behavior tracking and journaling.

Relatedness

Relatedness is determined by feelings of connectedness to peers (Ryan et al., 2008). Therefore, apps were reviewed for relatedness by observing functions that connect users with peers and chatbots to enable social support and with clinicians to enable more formal correspondence. Functions such as chat rooms, forums, bulletin boards, messaging functions, and connection to social media were identified as evidence of mHealth depression apps supporting relatedness and coded appropriately.

Results

App and Download Details

Out of 194 apps, the majority were uniquely available to Google Play (118/194, 60.8%) while around one-quarter (50/194, 25.8%) were exclusive to iTunes. As a result, a minority of apps were available from both app stores (26/194, 13.4%). In terms of price type, 135 of the 194 apps reviewed (69.6%) were free, and the remaining apps (59/194, 30.4%) required some form of payment. Price type did not predict download rates in Google Play as the highly downloaded apps were a combination of free and paid. iTunes does not disclose download rates for apps meaning download rate could not be used either. Google Play download rates are provided as approximations, so no exact numbers can be given in this study. However, based on these approximations, it is clear that all 144 mHealth depression apps from Google Play have been downloaded at least once. One million downloads was the highest rate which was represented by eight apps. Approximately 80,000 was the average rate despite the majority of apps having low rates and the popular minority, less than twenty percent, having more downloads than the average. However, download rates were not a reliable indicator that apps targeted the basic needs of SDT as highly downloaded apps did not appear to consistently meet the basic needs.

Table 1. Apps Functions Corresponding to the Needs of the Self-Determination Theory (*N*=194)

The Self-Determination Theory Needs through Functions	Distribution, *n* (%)
Autonomy	73 (37.6)
Meaningful Reasons for Behavior Change	36 (18.6)
Function - Information on Depression	36 (18.6)
Function - Reasons for Treating Depression	0 (0)
Providing Choices and Behavior Alternatives	42 (21.6)
Function - Activities that Involve Active Participation	42 (21.6)
Supporting Individual Initiatives	6 (3.1)
Function - Personalized Depression Management Plan	6 (3.1)
Competence	95 (49)
Information Resources on Skills for Change	17 (8.8)
Function - Treatment Guidelines or Tips	5 (2.6)
Function - Practical Resources for Education	12 (6.2)
Supportive Tools for Behavior Change	88 (45.4)
Function - Reminders or Notifications	9 (4.6)
Function - Goal Setting or To-Do List	9 (4.6)
Function - Mood Tracker or Journaling	84 (43.3)
Feedback	31 (16)
Function - Personalized Review of Progress or Change	31 (16)
Relatedness	49 (25.3)
Interaction with Others	49 (25.3)
Function - Connection with Peers, Chatbots or Clinicians	47 (24.2)
Function - Connection with Social Media	5 (2.6)

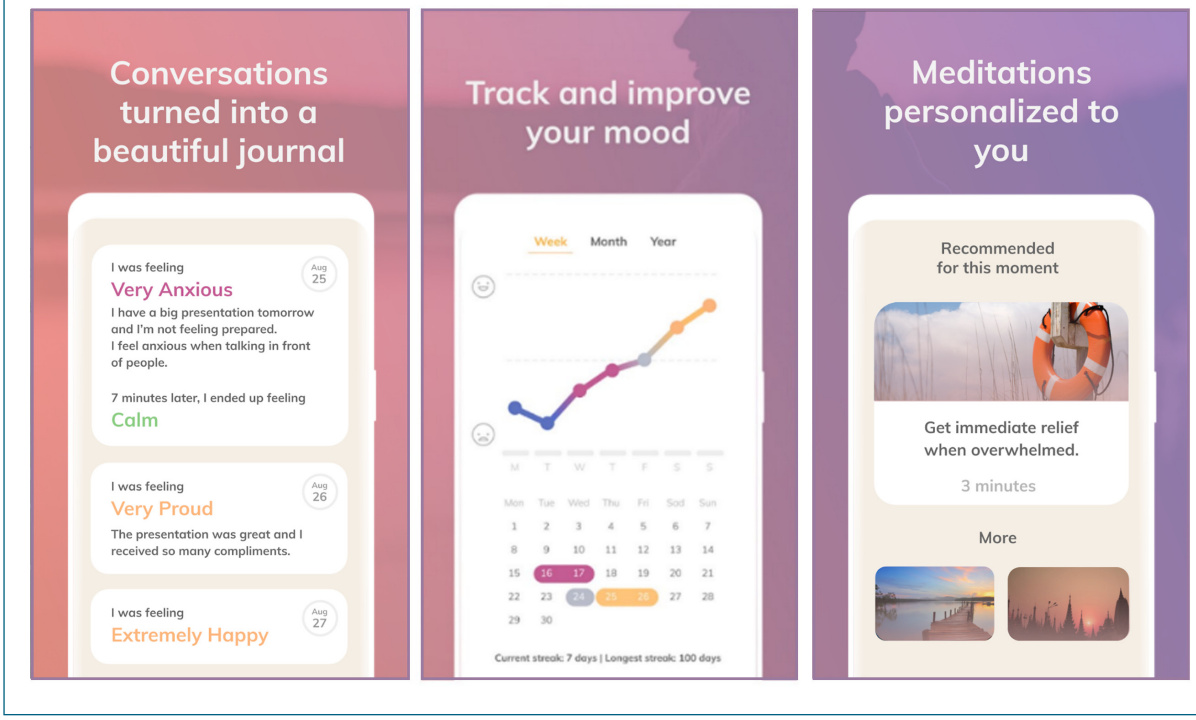
Note. The distribution does not add up in cases where apps have multiple functions within a single need.

Functions Satisfying the Basic Needs

This study aims to investigate whether mHealth depression apps, through their functions, satisfied needs for autonomy, relatedness, and competence as characterized by SDT. Analysis showed that while no apps hosted all functions identified in the coding criteria, most apps (158/194, 81.4%) hosted a function that satisfied at least one need, and only fifteen apps (15/194, 7.7%) hosted functions that targeted all three basic needs. However, thirty-six apps (19%) did not host any functions outlined, meaning that they did not target any of the basic needs.

Just over one-third of the apps satisfied the need for autonomy (73/194, 37.6%). Four app functions were observed in this study to target the need for autonomy. First, providing information on depression (36/194, 18.6%). Second, activities that involve active participation (42/194, 21.6%). Third, assisting with creating a personalized depression management plan (6/194, 3.1%). Lastly, no apps provided reasons for treating depression. Almost half of the apps targeted the need for competence (95/194, 49%). Few apps provided information resources on skills for change towards competence; five apps (2.6%) offered treatment guidelines or tips, and twelve apps (6.2%) provided practical resources for education on depression and treatment. The other functions that target the need for competence are as follows. The two functions, 1) reminders or notifications and 2) goal setting or to-do lists, were each seen in nine apps (4.6%) while mood tracking or journaling functions were found in close to half (84/194, 43.3%). Functions that gave feedback, including personalized reviews of progress and behavior change, were observed in thirty-one apps (16%). The need for relatedness was addressed by one-quarter of the apps (49/194, 25.3%) making it the least-targeted need outlined by SDT. The most common function that targeted this need allowed users to communicate with peers, clinicians, and even chatbots. Five apps (2.6%) hosted a function for social media connection that allowed users to link their app behavior to social media.

Figure 1. Youper



Suggested Apps Based on Popularity and Basic Needs

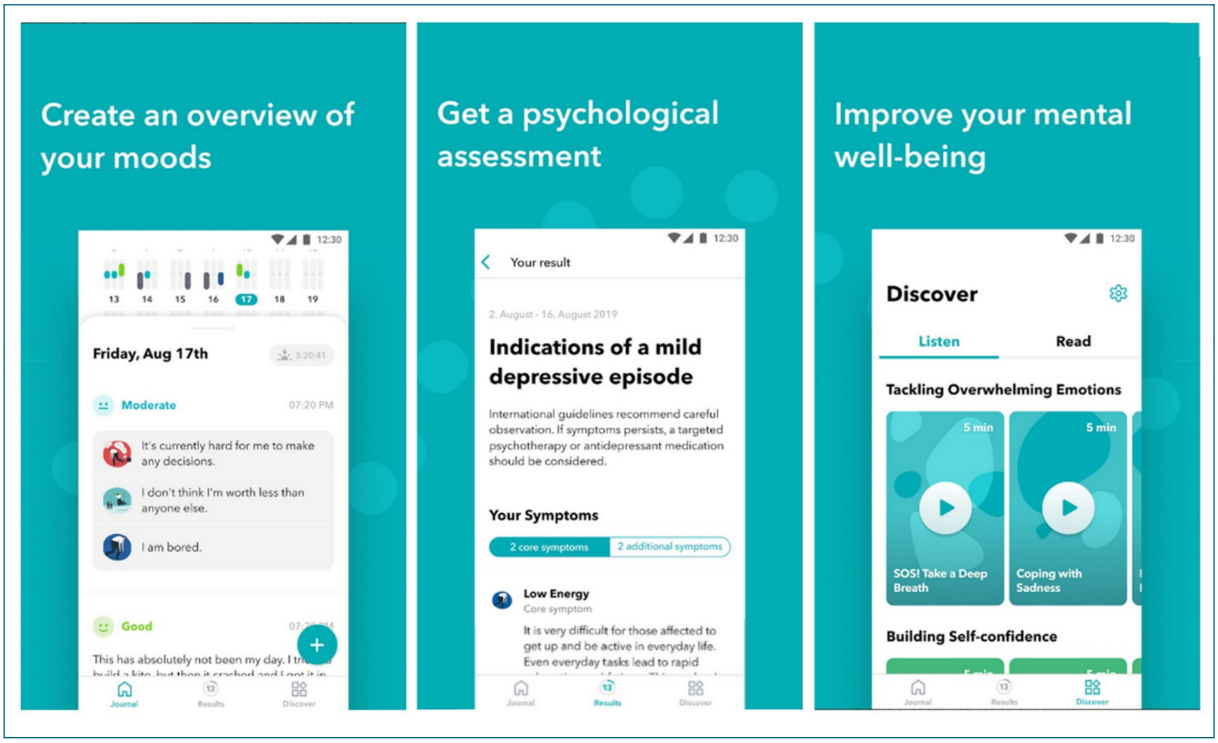
Of the three most downloaded mHealth depression apps, two apps, Youper (Youper, 2020) (Figure 1) and Moodpath (ReachOut Australia, 2020) (Figure 2), targeted the needs for autonomy, competence, and relatedness through five functions, the highest number of observed functions in any app in this study. Furthermore, both of these apps were free and available in both app stores making them an attractive starting point for anyone seeking apps for depression self-treatment. Youper is an artificial intelligence app where users can connect with a chatbot designed to use empathetic language while they complete therapy exercises on their device. Moodpath describes itself as a clinical app. It provides a mood journal for users and analyzes their health assessments to develop individualized progress reports and suggestions for self-reflections and activities. Based on how these apps targeted the needs for autonomy, competence, and relatedness, their stand-out concepts and aesthetics, and their popularity based on download rates, this study suggests two particular apps, Youper and Moodpath, as a starting point for anyone seeking an mHealth depression app. Both apps scored highly in a study conducting quality evaluation of mHealth depression apps and each have produced positive results in clinical trials (Burchert et al., 2021; Mehta et al., 2021).

Discussion

Main Findings

Using SDT as a theoretical basis, this study reviewed mHealth depression apps (N = 194) available from the Google Play and iTunes app stores. Research into applications of SDT to mHealth apps appears to be minimal (see Eysenbach et al., 2020). Hence, the objective in this study was to identify functions in apps that target the needs for autonomy, competence, and relatedness to identify apps with a SDT basis. These needs are outlined by SDT as crucial for creating and supporting intrinsic, long-term motivation for health behavior change (Ryan et al., 2008). The analysis proposes that the minority of the apps hosted features to target the basic needs outlined by SDT. In particular, one-quarter (49/194, 25.3%) of the apps satisfied the need for relatedness, and less than half targeted autonomy (73/194, 37.6%) and competence (95/194, 49%). This suggests that finding an app for self-treatment of depression that targets the needs would not be immediate for people using Google Play or iTunes. Furthermore, neither the price type nor download rates are reliable indicators; apps that targeted the three basic

Figure 2. Moodpath



needs were reflected similarly in both paid (91/194, 46.9%) and free apps (103/194, 53.1%) and had varying download rates.

The study found that while a small portion of the apps (36/194, 19%) did not target any of the basic needs, a smaller portion (15/194, 7.7%) hosted functions that targeted all three basic needs. Research demonstrates that addressing the three basic needs of SDT is a prerequisite to building and maintaining intrinsic motivation for behavioral change (Ryan et al., 2008). In light of this, it can be argued that mHealth depression apps that do not target the three basic needs would produce limited results. In contrast, the few apps that target all three needs might foster motivation and positive, long-term health behavior change. Although few of the apps targeted all three needs, people are able to build intrinsic motivation for behavior change by targeting the three basic needs by using a single mHealth depression app. Therefore, individuals would not need to access a suite of apps which would be a more costly and less practical approach. Despite this, the effectiveness of mHealth depression apps that target all three basic needs would depend correspondingly on other factors not covered here, including but not limited to, users' subjective evaluation of app engagement techniques (i.e., gamification and aesthetics) and technology acceptance and usage drivers (i.e., perceived ease of use and usefulness).

Strengths and Limitations

The strength of this study is that it presents a theory-driven overview of mHealth depression apps that are available and highly accessible in the market and is bolstered with empirical analysis. This study also has limitations. Firstly, the apps reviewed were limited to Google Play and iTunes. Consequently, other relevant apps available only in other competing app stores, e.g., Amazon Appstore and Windows Appstore, may likely have been excluded. Furthermore, apps reviewed in this study were limited to apps with content delivered in English further truncating the selection of mHealth depression apps. Secondly, as iTunes does not disclose download rates, all analyses and discussion around download rates are based solely on the information provided by Google Play. Thirdly, by focusing solely on SDT, this study has overlooked many other behavior change theories and therapies, such as operant conditioning theory and cognitive behavior therapy, that may have more relevance to mHealth and mental health management spaces.

Conclusion, Implications and Future Directions

To summarize, this study reviewed mHealth depression apps to identify functions that target the basic needs for autonomy, competence, and relatedness which foster intrinsic motivation for behavioral change as outlined in SDT. To some extent, the apps that were reviewed targeted these needs and may be useful. Nonetheless, most of the apps offered limited functions to satisfy these needs and few apps targeted all three needs. This corresponds with other findings that mental health support apps are not at an acceptable standard (Larsen et al., 2016). The study reviewed all mHealth depression apps available from the Google Play and Apple iTunes app stores that claimed to treat, support, manage, or help people with depression and depressive symptoms. With this in mind, it is suggested that significant potential remains for improvement to these apps by refining and introducing functions guided by health behavior theory. However, the findings from the study coupled with the accessibility of apps makes mHealth depression apps, at the very least, an ideal platform to begin treatment. Of course, experimental research is needed to measure the efficacy of mHealth depression apps.

While this research is not assessing the effectiveness of mHealth depression apps based on user outcomes, it offers a review. There are some implications to this. Firstly, although some apps may target the three basic needs, it is possible that these apps are limited in their ability to engender sustained behavioral change as this rudimentary research overlooks many other relevant factors. Secondly, health professionals should consider a suite of studies on the topic and make their own assessment before prescribing mHealth depression apps to patients. Thirdly, users of these apps may not have the capacity to access or use academic literature on the topic, so future research should investigate how to best give people the skills and materials to make their own assessment of mHealth depression apps. Furthermore, future research that clinically assesses whether these apps and functions target needs of depressive individuals would be a contribution to the field. Lastly, it is unknown how many healthcare-developed apps are offered or in use today, and there is limited research on treatment of depression through apps and how apps can be used safely without the support of a clinician. Also, why people turn to apps and whether the healthcare system encourages this movement is underrepresented in research.

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Author contribution

Luke Brownlow: conceptualization, design, methodology, investigation, project administration, data management, formal analysis, interpretation, writing original draft, writing review and editing.
The author gave final approval of the version to be published and agreed to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

Declaration of interest statement

The author has no conflicts of interest to disclose.

Ethical statement

This manuscript is the author's original work.
Human participants have been not involved in this study.
No ethical approvement, informed consent or data handling policy was needed.

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