Mindfulness-based Cognitive Behavioral Therapy during Pandemic: mHealth Application

Bavly Hanna[1], Andrew Hanna[2]
Faculty of Engineering, Canadian Higher Institute of Engineering[1]
Faculty of Medicine, Ain Shams University[2]
Egypt

Abstract

Humans are sociable creatures by nature. Our ability to survive and grow is dependent on our ability to connect with others. Consequently, loneliness and social isolation has been linked to health issues including cognitive decline, lower educational performance, poorer health outcomes, vulnerability, depression, heart disease and it has been highlighted as a public health issue. This paper is based on the VicHealth Mental Wellbeing Strategy 2019-2023 on promoting social connections among the young people. The major aim of the app is to help the youngsters in improving their mental wellness and general quality of life through cognitive therapy, behavioral therapy, and mindfulness-based therapy.

1. Introduction

Mental illness is becoming a worldwide problem especially after the outbreak of the novel COVID-19. Physical isolation, lockdown, school, and university closure affected the mental wellbeing of youngsters [1]. Furthermore, people who are worried about their future and their families, particularly those for whom the pandemic resulted in the loss of a job or, in the worst-case scenario, a loss of a close relationship, that most likely to develop mental health issues such as anxiety, depression, or stress-related conditions. Even people who do not become ill during a pandemic can be subjected to a variety of psychological stresses, which can last even after the outbreak has ended [2].

During these uncertain times, the popular media recognizes the importance of "self-care", small gestures designed to preserve one's mental health or reduce stress for otherwise healthy individuals. Using state-of-the-art depression prediction algorithms and data from prominent social media sites, the influence of COVID-19 on depression and anxiety rates is significant. Mental illness has been dubbed one of the world's most significant health issues, with an increasing number of people suffering from depression, anxiety, and other mental disorders [3].

Loneliness is a subjective sense of social isolation that has less to do with the number of relationships and more to do with the perceived quality of those interactions. Loneliness has been associated with lower educational performance, poorer health outcomes, and has been identified as an emerging public health problem.

The World Health Organization (WHO) defines mental health as "a state of wellbeing in which every individual realizes his or her potential, can cope with the normal stresses of life, can work productively and fruitfully, and can contribute to her or his community" [4]. There are more than 500 million individuals worldwide who suffer from mental health issues, with depression, schizophrenia, and dementia is the most common according to the WHO [5]. Mental illnesses like depression have become a significant cause of disability, as anticipated and worsened by the COVID-19 pandemic [6].

One in six teenagers and one in three young adults reported feeling lonely. Almost one-third of young Victorians said they were at high risk of social isolation, as assessed by their frequency of interaction with family and friends [7]. Those who feel lonely are more likely to have bad mental health results. Loneliness has been linked to an increased risk of developing depression and social anxiety. Adolescents also reported a lower likelihood of social isolation than the youngsters.

This paper is based on the VicHealth Mental Wellbeing Strategy 2019–2023 [7], which focuses on encouraging young people to form social relationships and promote social connections. This paper focuses on the design and development of a smartphone application in an attempt to address this issue. Currently, the app is a high-fidelity prototype created with proto.io software. The app ultimately aims to help the youngsters improve their mental health and quality of life by asking them to answer a structured questionnaire at first then the app uses artificial intelligence and machine learning techniques to analyze big data to provide users with tailored personalized treatment. An assessment algorithm would be able to determine the best type of treatment as well as the appropriate degree of care. An optimal therapy would include in-app modules, communication with peers, specialists, or chatbots.

The rest of the paper is designed as follows: section 2 is related literature about mental health apps and theories of social wellbeing. Section 3 covers the importance of smartphone applications. Section 4 is the design of this mental health application. This is followed by a discussion in section 5 and a conclusion

in section 6 which evaluates the application for future improvements and general biases.

2. Related Literature

Cognitive-behavioral therapy (CBT) is a very successful treatment that focuses on how our ideas, beliefs, and attitudes impact our feelings and behavior. Collaboration and active involvement are key components of CBT as CBT is problem-focused and goal-oriented. CBT stresses the present at first. CBT is instructional, with the goal of teaching the user to be their own therapist and a focus on preventing recurrence. CBT has three major components: cognitive therapy, behavioral therapy, and mindfulness-based therapies as shown in Figure 1.
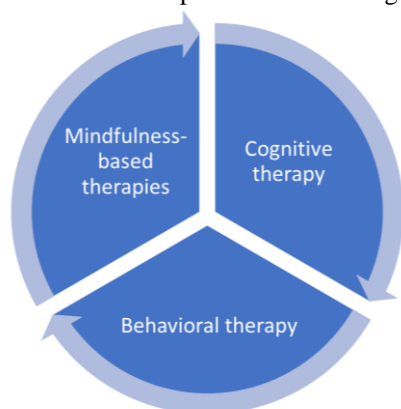

Figure 1. Three Components of CBT

Because of young people's overall excitement for new technology, with more than 97 percent of them using the Internet daily [8]. Young people with mental health disorders may find internet-based therapies particularly helpful and appealing [9]. Internet-based interventions may lead to the development of supportive relationships [10], decreased isolation [11], increased self-disclosure [12], and may reduce stigma [13].

Social networking interventions are employed in a unique way to help young people suffering from mental illness [14]. Young people suffer from significant social isolation and have difficulty establishing connections as a result of the stigma associated with mental illness [15]. The use of online social networking sites is linked to positive socialization, the promotion of supportive relationships, increased self-esteem, communication facilitation, and feelings of group membership among young people, highlighting the importance of these sites for the youngsters at risk of social isolation [16]. These advantages may provide young people a sense of belonging, resulting in increased usage and engagement with social networking sites on the Internet.

Social support and social belongingness could be established and shared which may increase the psychological well-being of online community users based on three theories. These theories are social support theory, belongingness theory, and nudge theory as highlighted in figure 2.
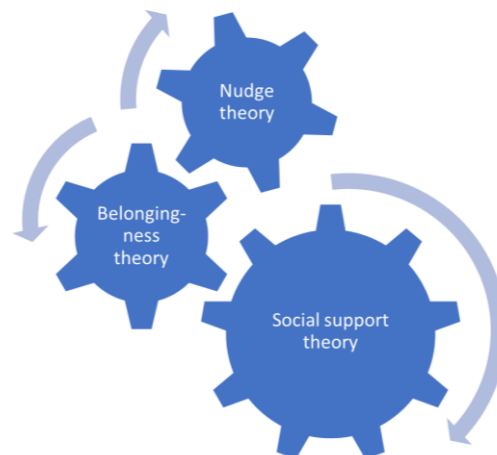

Figure 2. CBT Theoretical Framework

Designing, developing, and testing online social therapy systems for youth mental health is the goal of the moderated online social therapy (MOST) project [17]. The MOST approach combines online peer support and evidence-based treatments with a clinician- and consumer-centered care delivery method in a unique way. It was also created using participatory design principles and persuasive design features to encourage participants to interact with the intervention and alter their behavior [18]. Young people in a transitional social network may learn and practice therapeutic approaches, acquire perspective and validation, and learn how to address difficulties in a therapeutic setting.

Geyer et al. also created an app for college students to look at how emotional evaluations during social encounters predicted how such interactions were seen from the perspective of social anxiety [19]. This was, however, observational research. Huberty et al. used commercially accessible applications to test the effectiveness of the mindfulness meditation app "Calm" on mental health among college students [20]. The usage of the app resulted in substantial improvements in all outcomes in this randomized controlled trial (RCT), including perceived stress levels, mindfulness scores, and self-compassion scores. Arena et al. found that a group using a cognitive training app and a problem-solving therapy app improved their mood more than a control group [21].

Ivanova et al. evaluated the efficacy of an Internet-delivered acceptance and commitment therapy-based treatment program utilizing a smartphone on anxiety disorders; the treatment group reported lower general and social anxiety disorder symptoms but no lower

panic symptoms than the waiting-list group [22]. Several interventional studies have assessed the effectiveness of CBT utilizing smartphone applications and found it to be effective [23]. Reid et al. undertook a randomized controlled trial (RCT) to investigate the mental health advantages of self-monitoring with a mobile phone. Although the usage of the mobile phone program was substantially related to an increase in the emotional self-awareness (ESA) score, the authors observed no significant differences in depression, anxiety, or stress ratings between the intervention and control groups [24].

Randomized controlled studies, meta-analyses, and the recommendations of most professional guidelines all support CBT as a first-line treatment for major depressive disorder (MDD) and generalized anxiety disorder (GAD) [25]. To evaluate the usability of CBT applications for depression, Huguet et al. used Nielsen's expert-led heuristic evaluation technique [26]. The degree to which consumers can readily use and understand the app, or with minimum training, is referred to as usability.

Interactive elements, professional assistance, peer support, and personalization are all mentioned by Doherty et al. as significant techniques for facilitating therapeutic participation [27]. In CBT applications for depression, contact with peers or professionals was practically non-existent [28].

Interactive elements, peer or professional assistance, and personalization can all help to increase engagement with treatment or therapeutic material [28]. Interactive elements such as video material, graphs, and charts; a bot interface that allows users to communicate with a "virtual" therapist; and the option to upload personal photos were increasingly common in mental health applications. More customization options for CBT applications for depression should be available, allowing users to tailor the functionality to their own requirements.

3. Smartphone Application

Smartphone applications are becoming more popular as a way of delivering psychological treatments to people with mental illnesses. Over the last decade, the popularity of cell phones has exploded. According to various statistics, about 35% of people globally own a smartphone; in developed nations, penetration rates are considerably higher, ranging from 76 percent in the United Kingdom to 95 percent in South Korea. Even in emerging nations, smartphones are quickly becoming the most popular mobile phone [29].

Mindfulness-based cognitive therapy (MBCT) is a style of psychotherapy that combines "cognitive therapy", "behavioral therapy", "meditation", the "cultivation of mindfulness," and a present-oriented, nonjudgmental "attitude" [30]. Mindfulness-based cognitive therapy is based on the principles of

cognitive therapy by teaching people to consciously pay attention to their thoughts and feelings without passing judgement on them, using techniques such as mindfulness meditation [31]. As part of the MBCT programme, a variety of mindfulness methods and exercises are used as illustrated in Figure 3 [32].

Figure 3. MBCT techniques and exercises

The goal of cognitive therapy is to identify and change dysfunctional ideas and negative thinking patterns concerning sleep, such as worrying. Then, to overcome unwanted sleep-related thoughts and false fears, a series of techniques are used [33]. Figure 4 shows the fifteen types of cognitive distortions.

Figure 4. Types of cognitive distortions

CBT has been shown to be successful in treating depressive and anxiety symptoms, increasing general functioning in individuals with these symptoms, and avoiding relapses [34], with long-term benefits [35].

Effectively providing CBT via face-to-face or virtual/ live (ie, synchronous) techniques takes a lot of time and money, and many patients don't have access to these methods. Electronically delivered CBT (i.e., nonlive, asynchronous treatment; e-CBT) may be a feasible mental health care delivery option. E-CBT has been shown to be effective in treating anxiety and depression disorders, with outcomes that are equivalent to in-person treatment [36].

E-CBT content may be accessible at any time and from any location, allowing for flexible access to care, especially for those who reside in rural regions. One of the biggest advantages of e-CBT is that it allows therapists to forgo repeating identical general concepts to many patients and cut their time commitment in half compared to in-person therapy [37]. This not only lowers the cost of treatment, but it also allows more individuals to use current clinical services and reduces wait times.

There are a variety of ways to offer e-CBT, ranging from unguided self-help [38] to guided programs that combine a standardized material delivery mode with professional assistance [39]. Figure 5 displays the major advantages of digital CBT.
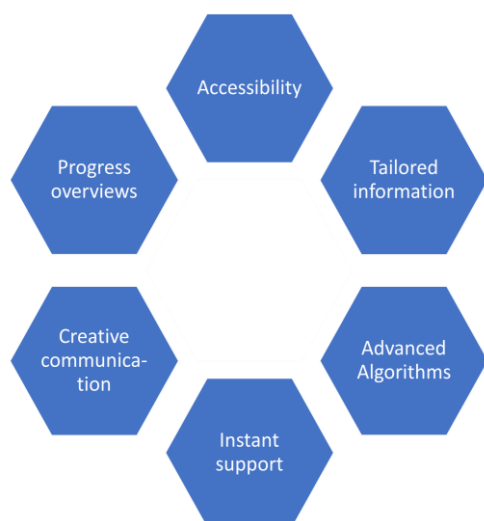

Figure 5. Advantages of digital CBT

Persuasive technologies are technologies that are used to encourage people to change their behavior [40]. The nudge theory, which was initially developed from behavioral economics and social psychology [41], is at the foundation of persuasive technology. To influence people's views and/or actions, such technologies have been widely employed in different fields such as marketing, game design, and healthcare [42].

4. Design of Application

A high-fidelity prototype of the proposed app was created using Proto.io's prototype software and design tools. Figure 6 is a flowchart that depicts the app's high-level storyboard of events. There is a link to return to the homepage at the bottom of each page. Figure 7 shows a thorough flowchart of the processes involved in the application's initial setup.
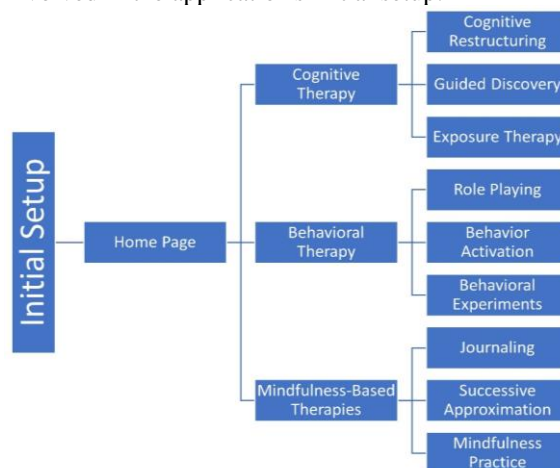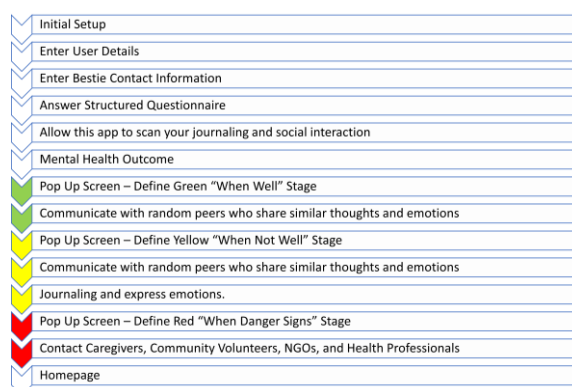

Figure 6. The high-level flowchart of the app

Figure 7. Detailed flowchart of app initial setup

A baseline survey of 20 users was done to determine how the smartphone app will be used in the future. The end-user rating of app features, cross-referenced with clinical design criteria, plus the addition of a chatbot function, is based on the user's need and desire for a loneliness and social isolation smartphone application.

This feedback indicated that characteristics such as connecting with people who share similar thoughts and emotions are a good form of peer support, also, the degree of loneliness and the proposed therapeutic intervention method at each degree is a major feature for connection. In addition, identifying when to seek immediate medical assistance, as well as information on call-to-action responses and management of rising severity, were also among the most important to users. All features, on the other hand, were judged to be at

least somewhat significant, with the majority of users rating them as "important" or "extremely important."

The major aim of the app is to help young people in improving their mental health and general quality of life through cognitive therapy, behavioral therapy, and mindfulness-based therapy.

Cognitive therapy includes (1) Cognitive restructuring: the app develops more reasonable, grounded methods of comprehending difficult situations and learning to detect unhealthy thought patterns. It entails keeping track of thoughts in stressful situations, recognizing cognitive distortions, and participating in behavioral tests to see if our beliefs are correct. (2) Guided discovery: the app discovers the user's point of view. The system will next ask questions to test the user's ideas and extend their thinking. The user will have the ability to perceive things from other angles, particularly those that they may not have considered previously. This allows the user to select a more beneficial path. (3) Exposure therapy: the app gradually introduces the user to the things that cause stress or anxiety, while also offering tips on how to deal with them in the time. This will be accomplished in modest steps. Exposure can eventually help the users feel less vulnerable and more secure in their coping skills.

Behavioral therapy includes (1) Roleplaying: the app allows the user to practice various behaviors in potentially challenging circumstances. Playing out various scenarios can help to reduce fear and can be used to improve problem-solving abilities, familiarity and confidence in certain circumstances, social skills practice, assertiveness training, and communication skills. (2) Behavior activation: Activity scheduling may assist in the formation of healthy habits and give sufficient opportunities for the user to put what they have learned into practice. If the user is putting off or avoiding an activity due to fear or anxiety, putting it on their calendar might assist. Users may be more inclined to follow through once the decision-making load has been lifted and the app will send periodic reminders. (3) Behavioral experiments: the user will be asked to guess what would happen before beginning an activity that typically causes anxiety. The user will next record whether or not the prediction was correct. Over time, the software will aid the user in recognizing that the projected disaster is unlikely to occur. The user will most likely begin with lower anxiety tasks and work their way up.

Mindfulness-based therapy (1) Journaling: users will be asked to post their negative ideas as well as positive thoughts. The app will display visuals of the mood and thoughts that the user has adopted over time. This approach can assist the user in recognizing and describing their thinking patterns and emotional inclinations, as well as changing, adapting, or coping with them. (2) Successive approximation: the aim of overcoming depression or anxiety and achieving mental wellbeing may appear to be challenging. The

app allows the user to plan out the road to achievement and make the journey seem a bit less intimidating by dividing the huge objective into tiny, easy-to-achieve milestones. (3) Mindfulness practice: the objective of mindfulness is to help users stop ruminating or worrying about unpleasant thoughts and instead focus on what is actually going on in the present moment. Mindfulness has been found to be beneficial in enhancing attention, pain management, and emotion control in studies.

5. Analysis

In this paper, we develop a user-centered self-monitoring app to assist youth who struggle with anxiety, depression, and loneliness through cognitive therapy, behavioral therapy, and mindfulness-based therapy. Although several observational studies have used a smartphone app to assess the mental health of young people, this is the first interventional study to build an app for youngsters and allow real-time interaction between users as well as chatbots to evaluate its impact on their mental health. Our app has three main functions: self-monitoring, self-training, and engaging with peers.

The app assists the users to identify their thoughts and emotions through cognitive therapy. The app makes suggestions and recommendations to improve the user's mood through behavioral therapy including training modules, pop-up motivational quotes, and playing their favorite songs.

The app monitors the user's actions in real-time and makes timely recommendations for better results. When users check into an isolated place, which is identified via Bluetooth beacons and location services, the app records their location and pops up messages to the user. Reminder, alert systems, as well as paths/challenges, are included in the app, which is crucial for self-help transformation in users with depression and anxiety issues.

We use artificial intelligence techniques to analyze big data to provide users with tailored personalized treatment packages. An evaluation algorithm would be able to determine the best type of treatment as well as the appropriate degree of care. Optimal therapy may then be provided to the individual instantly via the app, such as smartphone-based treatment modules that include a degree of support that is specifically suited to the individual or support via peer network or an in-app expert as shown in Figure 8.

Assessment module: the primary goal of this module is to determine the intensity of the users' depression and anxiety symptoms. The user is guided through a series of questions that classify the user's symptoms as mild, moderate, or severe. The assessment module is the first one that the user should complete in order to produce an assessment and a progress route for the user.
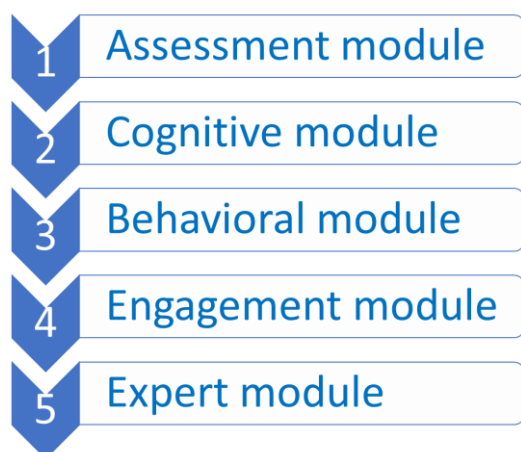
Figure 8. Modules of the iMate App

Cognitive module: the user goes through a number of exercises to help them recognize their negative ideas, and then they are given methods to help them replace those negative thoughts with good ones. This module also guides the user through a series of exercises that assist them in identifying their feelings and creating a good attitude towards themselves. This module has the capability of associating different music with certain emotions. The related music will be played based on the replies in other modules and the application's evaluation of the mood.

Behavioral module: the primary goal of this module is to detect the user's distorted ideas and assist them in overcoming them. This module also provides users with stress-relieving methods to assist them in putting these strategies into practice in real-life situations. This module encourages relationship development and supports the user to look at the positive side of a relationship. This module examines the user's relationship with others (peers, parents, friends, partners) and offers advice on how to improve it.

Engagement module: users can connect and communicate with other users who share the same thoughts and emotions. They receive peer support from users who share the same attitude and went through a similar experience, so they understand the language and emotions of each other which helps them to recover. Also, there is a chatbot that is used when there is no one online or no other user is sharing the same mood. A chatbot imitates the real conversation and reduces the user's loneliness as the chatbot has a conversation based on the sentiment analysis of the user and uses the appropriate words and shows compassion. Users could share data (audio, video, files) with their peers.

Expert module: psychologists and healthcare professionals will share regular content on the app and users could contact therapists when they need further assistance with their mental health. The app uses AI techniques to match the content of experts with the mental status of the use.

6. Conclusion

Mobile health technologies are cost-effective and scalable apps for self-monitoring and therapeutic intervention. Smartphone app includes mobile-specific therapies and CBT modules that seek to provide the user with dynamic supportive psychotherapy. The app's mobile-specific interventions ensure that the user is always engaged with the program and focused on changing their negative thought and emotional process. This proposed app is a virtual CBT and self-efficacy app that is intended to assist users in self-monitoring and connect with peers who share the same emotions and thoughts through cognitive therapy, behavioral therapy, and mindfulness-based therapy.

7. References

[1] B. Pfefferbaum, and C. S. North, "Mental health and the covid-19 pandemic," N. Engl. J. Med. 2020, 383.

[2] M. Grigg, and S. Saxena, "Promoting mental health nursing research in low and middle-income countries," *International Nursing Review*, Geneva, Switzerland, 2004.

[3] WHO, "Depression and other common mental disorders," Global Health Estimates: Geneva, Switzerland, 2017.

[4] M.Hadzic, M. Chen, and T. S. Dillon, "Towards the mental health ontology," In Proceedings of the IEEE International Conference on Bioinformatics and Biomedicine (BIBM 2008), Philadelphia, PA, USA, 3-5 November 2008.

[5] J. B. Walther, and J. K. Burgoon, "Relational communication in computer-mediated interaction," Human Communication Research. 1992, 19 (1), 50-88.

[6] B. Abedin, F.Daneshgar, and J. D'Ambra, "Students' communicative behavior adaptability in CSCL environments," Education and Information Technologies, 2011, 16(3), 227-244.

[7] Victorian Health Government, "VicHealth mental wellbeing strategy," 2019-2023, 2019.

[8] Pew Research Center, "Pew internet and american life project," Washington, DC, 2014. Available online at: http://assets.pewresearch.org/wp-content/uploads/sites/14/2014/02/12-internet-users-in-2014.jpg (Accessed Date: 12 April 2021)

[9] J. Burns, and C. Morey, "Technology and young people's mental health and wellbeing," in Challenges in Adolescent Health: An Australian Perspective, eds D. L. Bennet, S. J. Towns, E. J. Elliot, J.Merrick (Melbourne, VIC: International Academic Press), 2008, 61–71.

[10] G. S. O'Keeffe, and K. Clarke-Pearson, "The impact of social media on children, adolescents, and families,". Am. Acad. Pediatr. 2011, 127, 800–804. Doi: 10.1542/peds.2011-0054

[11] C. L. Dennis, "Peer support within a health care context: a concept analysis," Int. J. Nurs. Stud. 2003, 40, 321–332. Doi: 10.1016/S0020-7489(02)00092-5

[12] S. Weisband, and S. Kiesler, "Self-disclosure on computer forms: meta analysis and implications," in CHI 96 - Electronic Proceedings, 1996.

[13] T. K. Houston, T. K., Houston, L. A., Cooper, and D. E. Ford, "Internet support groups for depression: a 1-year prospective cohort study," Am. J. Psychiatry 2002, 159, 2062–2068. Doi: 10.1176/appi.ajp.159.12.2062

[14] S. M. Rice, J. Goodall, S. E. Hetrick, A. G. Parker, T. Gilbertson, G. P. Amminger, et al., "Online and social networking interventions for the treatment of depression in young people: a systematic review," J. Med. Internet Res. 2014, 16, 1–16. Doi: 10.2196/jmir.3304

[15] V. Morgan, A. Waterreus, A. Jablensky, A. MacKinnon, J. McGrath, V. Carr, et al., "People living with psychotic illness in 2010: the second Australian national survey of psychosis," Aust. N.Z. J. Psychiatry 2011, 46, 735–752. Doi: 10.1177/0004867412449877

[16] P. Collin, K. Rahilly, I. Richardson, and A. Third, "Literature review: the benefits of social networking services," Melbourne, VIC, 2011. Available online at: http://www.fya.org.au/app/theme/default/design/assets/publications/ (Accessed Date: 25 May 2021)

[17] R. Lederman, G. Wadley, J. F. Gleeson, S. Bendall, and M. Alvarez-Jimenez, "Moderated online social therapy: designing and evaluating," ACM Trans. Comput. Interact. 2014, 2, 1–27. Doi: 10.1145/2513179

[18] P. Hagen, P. Collin, and A. Metcalf, "Participatory design of evidence-based online youth mental health promotion, intervention and treatment," Melbourne, VIC: Young and Well Cooperative Research Centre, 2012.

[19] E. C. Geyer, K.C. Fua, K.E. Daniel, P.I. Chow, W. Bonelli, Y. Huang, et al., "I did OK, but did i like it? using ecological momentary assessment to examine perceptions of social interactions associated with severity of social anxiety and depression," Behav Ther. 2018;49(6): 866–80. pmid:30316486

[20] J. Huberty, J. Green, C. Glissmann, L. Larkey, M. Puzia, and C. Lee, "Efficacy of the mindfulness meditation mobile app "Calm" to reduce stress among college students: randomized controlled trial," JMIR Mhealth Uhealth. 2019;7(6): e14273. pmid:31237569

[21] P. A. Arean, K. A. Hallgren, J. T. Jordan, A. Gazzaley, D. C. Atkins, P. J. Heagerty, et al., "The use and effectiveness of mobile apps for depression: results from a fully remote clinical trial," J Med Internet Res. 2016;18(12): e330. pmid:27998876

[22] E. Ivanova, P. Lindner, K. H. Ly, M. Dahlin, K. Vernmark, G. Andersson, et al., "Guided and unguided Acceptance and Commitment Therapy for social anxiety disorder and/or panic disorder provided via the Internet and a smartphone application: A randomized controlled trial," J Anxiety Disord. 2016;44: 27–35. pmid:27721123

[23] J. Firth, J. Torous, J. Nicholas, R. Carney, A. Pratap, S. Rosenbaum, et al., "The efficacy of smartphone-based mental health interventions for depressive symptoms: a meta-analysis of randomized controlled trials," World Psychiatry. 2017;16(3): 287–98. pmid:28941113

[24] S. C. Reid, S. D. Kauer, S. J. Hearps, A. H. Crooke, A. S. Khor, L. A. Sanci, et al., "A mobile phone application for the assessment and management of youth mental health problems in primary care: a randomized controlled trial," BMC Fam Pract. 2011;12: 131. pmid:22123031

[25] E. Carl, S. M. Witcraft, B. Y. Kauffman, E. M. Gillespie, E. S. Becker, P. Cuijpers, M. Van Ameringen, and J.A.J. Smits, "Powers MB. – psychological and pharmacological treatments for generalized anxiety disorder (GAD): a meta-analysis of randomized controlled trials," Cogn Behav Ther. 2020 Jan; 49(1):1–21. Doi: 10.1080/16506073.2018.1560358.

[26] A. Huguet, S. Rao, P. J. McGrath, L. Wozney, M. Wheaton, J. Conrod, et al., "A systematic review of cognitive behavioral therapy and behavioral activation apps for depression," PLoS One 2016 May 02;11(5):e0154248. Doi:10.1371/journal.pone.0154248.

[27] G. Doherty, D. Coyle, and J. Sharry, "Engagement with online mental health interventions: an exploratory clinical study of a treatment for depression," In: Proc SIGCHI Conf Hum Factor Comput Syst. New York, NY, USA: ACM Press; 2012 Presented at: The 30th SIGCHI Conference on Human Factors in Computing Systems; May 05-10, 2012; Austin, TX, USA p. 1421-1430. Doi: 10.1145/2207676.2208602.

[28] K. Stawarz, C. Preist, D. Tallon, N. Wiles, and D. Coyle, "User experience of cognitive behavioral therapy apps for depression: an analysis of app functionality and user reviews," J Med Internet Res 2018, vol. 20, iss. 6, e10120, p. 1

[29] Statista, "Number of smartphone users worldwide from 2016 to 2021 (in billions)", Statista, 2019 URL: https://www.statista.com/statistics/330695/number-of-smartphone-users-worldwide/ (Accessed Date: 1 June 2021).

[30] M.B. Mackenzie, and N.L. Kocovski, "Mindfulness-based cognitive therapy for depression: Trends and developments," Psychol Res Behav Manag. 2016;9:125-32. Doi:10.2147/PRBM.S63949

[31] W.E., Sipe, and S.J. Eisendrath, "Mindfulness-based cognitive therapy: Theory and practice," Can J Psychiatry. 2012;57(2):63-9. Doi:10.1177/070674371205700202

[32] R. Crane, "Mindfulness-Based Cognitive Therapy," New York: Routledge; 2017. Doi:10.4324/9781315627229

[33] C. M. Morin, C. L. Drake, A. G. Harvey, A. D. Krystal, R. Manber, D. Riemann, and K. Spiegelhalder, "Insomnia disorder," Nat. Rev. Dis. Prim. 2015, 1, 15026.

[34] J. Hall, S. Kellett, R. Berrios, M. K. Bains, and S. Scott, "Efficacy of cognitive behavioral therapy for generalized anxiety disorder in older adults: systematic review, meta-analysis, and meta-regression," Am J Geriatr Psychiatry. 2016 Nov; 24(11):1063–1073. Doi: 10.1016/j.jagp.2016.06.006.

[35] A. Kodal, K. Fjermestad, I. Bjelland, R. Gjestad, L. G. Öst, J. F. Bjaastad, B. S. Haugland, O. E. Havik, E. Heiervang, and G. J. Wergeland, "Long-term effectiveness of cognitive behavioral therapy for youth with anxiety disorders," J Anxiety Disord. 2018 Jan;53:58–67. Doi: 10.1016/j.janxdis.2017.11.003.

[36] D. M. Sztein, C. E. Koransky, L. Fegan, and S. Himelhoch, "Efficacy of cognitive behavioural therapy delivered over the Internet for depressive symptoms: A systematic review and meta-analysis," J Telemed

Telecare. 2018 Sep;24(8):527–539. Doi: 10.1177/1357633X17717402.

[37] N. Alavi, and A. Hirji, "The efficacy of PowerPoint-based CBT delivered through email: breaking the barriers to treatment for generalized anxiety disorder," J Psychiatr Pract. 2020 Mar; 26(2):89–100. Doi:10.1097/PRA.0000000000000455.

[38] S. Sethi, A. J. Campbell, L. and A. Ellis, "The use of computerized self-help packages to treat adolescent depression and anxiety," J Technol Hum Serv. 2010 Aug 31; 28(3):144–160. Doi:10.1080/15228835.2010.508317.

[39] N. Titov, B. F. Dear, G. Schwencke, G. Andrews, L. Johnston, M. G. Craske, and P. McEvoy, "Transdiagnostic internet treatment for anxiety and depression: a randomised controlled trial," Behav Res Ther. 2011 Aug;49(8):441–452. Doi: 10.1016/j.brat.2011.03.007.

[40] B. J. Fogg, "Persuasive technology: using computers to change what we think and do," Morgan Kaufmann, 2003, San Francisco.

[41] R. H. Thaler, and C. R. Sunstein, "Nudge: Improving decisions about health, wealth, and happiness," Penguin, 2009.

[42] P. Karppinen, H. Oinas-Kukkonen, T. Alahäivälä, T. Jokelainen, A.-M. Keränen, T. Salonurmi, and M. Savolainen, "Persuasive user experiences of a health behavior change support system: a 12-month study for prevention of metabolic syndrome," International Journal of Medical Informatics, 2016, 96, 51-61.