Progressing Social Good by Reducing Mental Health Care Inequality with Persuasive Technology

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Abstract

The alarming trend of increasing mental health problems and the global inability to find effective ways to address them is hampering both individual and societal good. Barriers to access mental health care are many and high, ranging from socio-economic inequalities to personal stigmas. This gives technology, especially technology based in artificial intelligence, the opportunity to help alleviate the situation and offer unique possibilities to tackle the problem. The multi- and interdisciplinary research on persuasive technology, which attempts to change behavior or attitudes without deception or coercion, shows promise in improving well-being, which results in increased equality and social good. This paper presents such systems with a brief overview of the field, and offers general, technical and critical thoughts on the implementation as well as impact. We believe that such technology can complement existing mental health care solutions to reduce inequalities in access as well as inequalities resulting from the lack of it.

1 Introduction

The trend of rising mental health issues, especially among younger people, is not a new phenomenon. World organizations, leaders and decision-makers are recognizing its devastating effect on social good, resulting in mental health well-being appearing in Goal 3 of the 17 UN Sustainable Development Goals (SDGs) [World, 2013]. Among mental health issues, stress, anxiety and depression (SAD) seem to be on the forefront, as the figures for SAD symptoms in some groups reach 74% for disabling stress [Mental, 2018], 28% for anxiety disorder [Baxter et al., 2013] and 48% for depression [Twenge, 2014]. What is more, between 76% and 85% of people in low- and middle-income countries receive no treatment for their disorder [Pigato, 2001], while in high-income countries, the treatment coverage for, e.g., depression is only 33% [Schmidtke et al., 1996] Mental health issues have large, multi-faceted effects – on the patient, on their immediate surroundings (family or caretakers) and on the wider society [World, 2003]. Individuals face decreased quality of life, worse educational outcomes, lowered productivity and potential poverty, social problems, abuse vulnerabilities and additional health problems. Caretakers face increased emotional and physical challenges as well as decreased household income and increased financial costs. Society faces the loss of several GDP percentage points and billions of dollars per nation annually, alongside with exacerbating public health issues and corrosion of social cohesion. All of these lead to an increasingly stronger positive reinforcement loop – SAD increasingly perpetuates SAD. Too often, mental health issues directly result in the worst possible outcome, loss of human life, as many countries struggle with a high suicide rate [Curtin et al., 2016]. It has been recognized that the reasons for increasing of SAD include a severe lack of mental health professionals and regulations [Winkler et al., 2017] as well as unequal access to mental health care [European, 2018]. These factors make the field ripe for technological and other scientific therapy-based interventions, especially as individuals with mental health issues prefer therapies to medication [Angermeyer and Matschinger, 1996].

Given the vast advances in behavioral sciences [Thaler and Sunstein, 2008] as well as the arrival of digital technologies, AI and big data, many efforts have been put into creating technologies that would help, motivate and affect people into bettering themselves and the world around them. Persuasive technology (PT) is designed for attempting to "change attitudes or behaviors or both (without using coercion or deception)" [Fogg, 2002, p. 20]. It is used for behavior change, a temporary or permanent effect on an individual's behavior or attitude as compared to their past. PT is already heavily used for mental health and well-being [Mohr et al., 2013; Orji and Moffatt, 2016], which advances societal efforts towards equality and social good, and offers easier access to mental health care, thus reducing the inequality resulting from such barriers [Vaidyam et al., 2019].

The paper is structured as follows: Section 2 overviews the field of PT for mental health, Section 3 presents our understanding of the problems and solutions this technology brings, and Section 4 offers some final thoughts.

2 Overview

In this section, the field that covers PT and behavior change for SAD symptoms relief is overviewed.

Behavior change is a phenomenon that is considered to be a temporary or lasting effect on an individual regarding their

behavior as compared to how they behaved in the past [Fogg, 2002], and it includes not only behavior, but attitudes and mental states as well. Behavior change interventions are a large part of PT, which are already extensively used in the health and wellness areas, where AI tracks people's behavior as well as physiological and mental states to motivate them and affect their mental states and attitudes along with AI offering people help in natural language [Orji and Moffatt, 2016].

One of the most used persuasive and behavior change frameworks that such technologies employ is Cialdini's Principles of Persuasion (CPP) [Cialdini, 2016]. Others exist as well [Mohr et al., 2013; Orji and Moffatt, 2016], but for the purposes of this work, only CPP is described. CPP's main idea is that there is no general persuasive strategy that works for all people, hence orthogonal strategies should be identified and applied to those that are most susceptible to individual strategies. There are 7 strategic bases for influencing people: 1) Authority, which targets people that are more inclined to be motivated by a legitimate authority; 2) Commitment, which targets people that tend to commit to their previous behavior; 3) Social Proof, which targets people that tend to do what others do; 4) Liking, which targets people that are more likely to be motivated by someone they like; 5) Reciprocity, which targets people that tend to return a favor; 6) Scarcity, which targets people that consider scarce things more valuable; 7) Unity, which targets people that are influenced by appealing to their group identity.

To determine the most effective strategy, PT mostly relies on personality models such as Big Five personality traits [Rammstedt and John, 2007] as well as domain specific questionnaires. Personality is measured on different dimensions (e.g., openness, conscientiousness, extroversion, agreeableness, neuroticism), which try to describe an individual's tendencies that relate to their psychological and cognitive functionalities, such as mental states and decision-making. In terms of domain specific data, SAD questionnaires [Lovibond and Lovibond, 1996] can be used to categorize people with SAD symptoms and select best strategies. Such questionnaires give insight into what influences which individuals the most.

Persuasive frameworks can be housed in various technological platforms. A recent comprehensive review of PT for health and wellness [Orji and Moffatt, 2016] found that the most frequently used platforms are mobile and handheld devices (28%), followed by games (17%), web and social networks (14%), other specialized devices (13%), desktop applications (12%), sensors and wearable devices (9%), and ambient and public displays (5%). Regarding specific form PT takes, intelligent cognitive assistants (ICAs; also known as chatbots and conversational AI) seem to be the most advanced and widely spread [Bakker et al., 2016; Laranjo et al., 2018; Montenegro et al., 2019; Orji and Moffatt, 2016; Provoost et al., 2017; Vaidyam et al., 2019]. ICAs exhibit a number of human-like abilities, as they can, to a degree, understand context, adapt, learn, communicate, collaborate, predict, perceive, act, interpret, and reason. Most importantly, ICAs possess the ability to converse in natural language, and can therefore be constructed to offer therapeutic help. The results of various review papers [Ibid.] show that ICA is an effective vessel for relieving SAD symptoms. We conducted a short overview of the papers on state-of-the-art persuasive ICAs for mental health and selected three for inclusion in this work to demonstrate their use. All three ICAs [Fitzpatrick et al., 2017; Fulmer, et al., 2018; Yorita et al., 2018] operate similarly, by using scripted conversations to offer help that depends on the user model, which holds data on users' emotions and SAD levels. The ICAs all perform better than the government-approved self-help material in relieving SAD by 15–20%.

Such technology provides a number of advantages if utilized in the mental health care field: it can be free of charge to use, making help available to socioeconomically disadvantaged people; it can be available 24/7, meaning patients do not have to wait for their next therapy; people are more comfortable disclosing their feelings and personal information to an application than to a person [Lucas et al., 2014]; technology is available in remote locations, and so on. Technology can therefore reduce burden on the health care system and its practitioners as well as reduce barriers to mental health care access overall, by complementing rather than replacing professionals [Kennedy et al., 2012; Laranjo et al., 2018]. Advantages and potential problems are more thoroughly discussed in Section 3.

3 Problems and Solutions

This section addresses the implications using PT for mental health has in terms of advancing equality for mental health care access and in general. These implications are divided into those that offer tentative solutions to existing problems and obstacles towards equality, and those that appear as problems of this technology in achieving equality. We want to reiterate once again that although PT might offer unique possibilities to tackle the problem at large, it does not represent a replacement for a holistic mental health care. Other problems, seemingly unrelated to equality, are briefly considered at the end of the section as well.

PT offers solutions in a number of categories:

Cost

The cost of service of mental health care professionals (from psychotherapists to clinical psychologists and psychiatrists) varies and is further dependent on country regulations. But the cost to the patient mostly depends on the number of practicing professionals available in a given country. Regardless, the cost presents a barrier to people from lower socio-economical backgrounds [McCrone, 2004]. PT for mental health can be realistically made free of charge (and many times is [Fitzpatrick et al., 2017]) due to the much lower costs attached to it. Three major factors contribute to this: 1) scalability, which means that one PT system can be adopted by theoretically any amount of people (the only cost that comes with scalability is server cost, which is marginal compared to human labor) – in contrast, one mental health professional is limited to a certain number of people; 2) the ability of more people to produce effective PT due to exist-

ing research that thoroughly reports effective designs; and 3) the amount of people capable of producing such systems is much larger than there is professionals that can offer help.

Availability
The problem of availability can be separated into three subcategories: 1) location-based availability, 2) time-based availability, and 3) cost-based availability. Location-based availability refers to people with mental health issues in locations that have no direct access to mental health professionals in person or even no computerized access to therapy with communication technologies [Gibson et al., 2009]. Using PT for mental health is one of few solutions in such cases. Time-based availability refers to people with mental health issues needing therapeutic help during times when their chosen professional is unavailable. PT for mental health is available around the clock, making their use complementary with the chosen mental health professional. Patients continuously report these needs, and such complementary uses already exist [Price et al., 2013]. Cost-based availability refers to people with mental health issues needing therapeutic help but not having the means to access it more than the minimum recommended amount of hours per week [Freedman et al., 1999], where consensus points at one hours per week. Research [Sandell et al., 2000] shows that more frequent therapy results in better outcomes, and complementary use of PT for mental health can bridge that gap for people not being able to afford more therapy by still having an access to help. Cost-based availability is closely connected to the wider cost problem, as discussed before.

Stigma
Self-stigma, the prejudice that people with mental illness turn against themselves, and public stigma, the reaction that the general population has to people with mental illness, are prevailing issues in the battle for mental health [Corrigan and Watson, 2002]. Both contribute to individuals with mental health issues deciding not to get treatment from mental health professionals. Up to 96% people with SAD do not seek treatment [Thornicroft et al., 2017]. Research on PT for mental health, especially on ICAs for treating SAD, has shown that people are more comfortable disclosing their feelings and personal information to a computerized or mobile system than to a person [Lucas et al., 2014]. This is because they do not fear being judged as well as having a more private channel (at least as perceived by them) for disclosing their feelings, thoughts and issues in general. People also show lower valuation fears and impression management, and increase their expression of sadness and objectively-rated disclosure. This means that the amount of people not seeking treatment can be lowered by introducing therapeutic options that they perceive to be safer.

However, there are problems that such technologies bring that have to be noted and seriously addressed**:**

Group exclusion
Some groups of people can be excluded from technology-oriented mental health care. The groups discussed are the elderly, the lowest socio-economic class, and culturally-specific groups. The group most affected by introduction of technology seems to be the elderly [Amaral and Daniel, 2016]. Their thwarted ability to incorporate technology into their lives can cause further ageistic divides between them and other generational groups. Another group of people that may be excluded from the benefits of PT for mental health are people from the lowest socio-economic class, where even PT might not be available to them [Pigato, 2001]. Creating an even bigger divide for them would result in increasingly catastrophic socio-economic living conditions. Groups that are affected in technological adoption due to the cultural differences are crucially important as well when considering how to advance equality. Research shows that cultures with less contemporary sociopolitical leanings show less adoption of technology [Lee et al., 2013]. Luckily, the research on PT seems to be fledging in certain low-income countries [Winschiers-Theophilus et al., 2018].

Researcher bias
Due to lack of evaluation standardization of PT for mental health, the research field is prone to the introduction of researcher bias. The possible problems are many: 1) PT systems that are claimed to be successful are not always studied in empirical experiments, but in quasi-experiments [Yorita et al., 2018] or no experiments at all; 2) the metric on which to evaluate such systems is unclear (usually comes indirectly from their effectiveness in an experiment where the goal is SAD symptoms relief [Vaidyam et al., 2019]); 3) no consensus on what data is needed to understand a user in way to offer effective help. as discussed before.

Using PT for mental health, as a young endeavor, also has problems not pertaining to equality. Although important, they are out of scope for this work. Here, we mention some of them: 1) the problem of personal information privacy [Avancha et al., 2012]; 2) the problem of the lack of longitudinal research on behavior change with PT [Lee et al., 2011]; 3) the ethics of using personal information for persuasion [Klein, 2004]; and 4) the potential problem of automation and job loss of mental health care professionals.

4 Conclusions

This work explored how persuasive technology can be used in the domain of mental health, which is part of the Sustainable Development Goals, to increase equality to mental health care access as well as equality in general. The work, which further focuses on stress, anxiety and depression, examines why mental health is a considerable barrier to equality and why people with mental health issues have problems accessing health care. It then lays its argument for using technology in this domain. Afterwards, it presents persuasive technology in its multi- and interdisciplinary composition of behavioral sciences and computer science. Various settings and platforms are presented, including their efficacy for relief of symptoms of stress, anxiety and depression. Lastly, it explores possibilities such technology offers in the field of mental health in relation to reducing inequality as well as possible problems that it might create.

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