ISSN 1577-7057

Volume 21, number 3 October 1, 2021
Volumen 21, número 3 1 Octubre, 2021

ISSN: 1577-7057

IJP&PT

International Journal of Psychology & Psychological Therapy

https://www.ijpsy.com

International Journal of Psychology & Psychological Therapy
https://www.ijpsy.com

Volume 21, number 3, October 1, 2021
Volumen 21, número 3, 1 Octubre, 2021

Theoretical and Review Articles // Artículos teóricos y de revisión

Research Articles // Artículos de investigación

Notes and Editorial Information // Avisos e Información Editorial

Publicada por/Published by: ***Asociación de Análisis del Comportamiento*** **(AAC, Madrid, España) &** ***Madrid Institute of Contextual Psychology*** **(MICPSY, Madrid, España)**

Depósito legal: GR-1332-2001 Printed on / Impreso en**: Copias Centro, Madrid (España)**

IJP&PT is included in the following indexing and documentation Centers












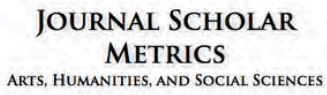






International Journal of Psychology & Psychological Therapy, 2021, 21, 3, 289-304

Advanced Technological Support in Psychotherapy

P Adu*
Technical University of Munich, Germany
T Jurcik
National Research University, Russian Federation
K Aduo-Adjei
University of Technology Sydney, Australia

Abstract

Increasingly, mental health has become a global public health concern warranting evidenced-based studies to promulgate effective ways of ensuring good mental health among individuals. In recent times, technology has become an inherent part of psychotherapy delivery. This paper examines how information technology in the delivery of psychotherapy improves mental health outcomes and helps eradicate stigmatisation of patients with mental-illness. Relevant empirical studies and reviews from psychology, psychiatry, mental health, telemental health, and the psychotherapy literature were synthesized, and findings guided the discussions on policy and practice implications. Results revealed that the use of advanced technological support in psychotherapy delivery can avert challenges with individuals' unwillingness to disclose sensitive issues about their lives, help overcome scarcity of mental facilities and skilled professionals, and improve help-seeking. Finally, the results revealed that the use of technological methods of psychotherapy may help reduce stigmatisation associated with utilising mental health facilities. Findings from this review have implications for psychotherapy delivery and anti-stigma campaigns.
Key words: mental health, psychotherapy, stigma, information communication technology.

How to cite this paper: Adu P, Jurcik T, & Aduo-Adjei K (2021). Advanced Technological Support in Psychotherapy. *International Journal of Psychology & Psychological Therapy, 21, 3,* 289-304.

Novelty and Significance

What is already known about the topic?

- Available literature provides a relatively plethora of evidence for the advantages of telemental health services pertaining to the diagnosis and treatment of several mental disorders.
- Specific benefits of using telemental health includes increase access to mental healthcare services, enhancement of therapy efficacy, etc.

What this paper adds?

- Provides up to date assessment of telememtal health as a strategy for anti-stigma in mental health.
- Review data related to the effectiveness of a pathway for clinicians to stay in contact with their patients or clients. Of special interest due to the protocols associated with the current pandemic.

Ensuring the health and well-being of individuals in society is essential to most countries, and is of paramount concern to national governments and policymakers alike. According to Huber, Knottnerus, Green, van der Horst, Jadad, Kromhout, & Schnabel (2011, p.2) "health involves one's ability to adapt and to self-manage in three domains of life, social, physical and mental". This review is concerned about the latter domain. Mental health is defined as a state of well-being in which individuals realise their own abilities to cope effectively with the everyday stresses of life, work productively and fruitfully, and contribute to their communities (Galderisi, Heinz, Kastrup, Beezhold, & Sartorius, 2015). The above definition suggests that good mental health is essential for an individual to be able to adaptively function in society. Nonetheless, mental disorders are common in every population including its associated stigmatizing attitudes (Adu,

* Correspondence: Peter Adu, Technical University of Munich, Germany, Email: p.adu@tum.de

Jurcik, & Grigoryev, 2021). A report from the World Health Organisation (WHO) (2001) indicated that about 25% of any population will suffer from a psychiatric condition in their lifetime. For instance, Merikangas, He, Burstein, Swanson, Avenevoli, Cui, Benjet, Georgiades, & Swendsen (2010) reported that the overall prevalence rate of mood disorders, anxiety disorders, and disruptive behaviour disorders among US adolescents was 22.2%. Against this backdrop there has been a dramatic increase in technology available to society since the last century. Technology is defined as a system created by humans that uses knowledge and organization to produce objects and techniques for the attainment of specific goals (Voltic, 2009). The intersection between mental health and information technology, specifically, is the focus of this paper.

The quest to make life easier and more straightforward has led to the introduction of numerous new technologies in our societies since the industrial revolution, and this advancement has carried on more rapidly since the information age that led to a substantial expansion in communication technologies since the 1970s. There are many forms of technology, for instance, industrial technology, agricultural technology, and information technology. More relevant to the current paper, the use of information technology is being increasingly adopted in enhancing the efficiency of mental health services in most developed countries (Clough & Casey, 2011; Barak, Hen, Boniel-Nissim, & Shapira, 2008; Bee, Bower, Lovell, Gilbody, Richards, Gask, & Roach, 2008). Essentially, Information Technology (IT) has become a conduit in treating psychological disorders. Initially, psychotherapists were reluctant in adopting the use of certain types of IT (David, Cristea, & Hofmann, 2018). With time, the use of technological devices such as chatbots, web and video conferencing, fixed-mobile convergence, email, voicemail, fax, speech recognition, and virtual realities have proven to be beneficial in treating and preventing the reoccurance of related mental disorders (Figueroa & Aguilera, 2020; Paul, 2005).

A recent report by the WHO (2017) revealed that the universal aim of promoting efficient mental health care could be realised only if there are better mental health policies, programmes, laws, and services. Meanwhile, inadequate facilities along with insufficient personnel and funding primarily drive the ailing mental health situation in the world, especially in most developing countries, in delivering professional and evidence-based mental health services (Barke, Nyarko, & Klecha, 2010; Castaño, Biever, González, & Anderson, 2007). For instance, a study in Ghana revealed that one contributory factor for the low patronage of mental health facilities was lack of mental health personnel and stigma associated with accessing mental health facilities (Asare, 2012; see also Adu, Jurcik, & Grigoryev, 2021). Amidst the numerous service and administrative challenges, there have been existing regulatory actions that have propelled recent mental health awareness campaigns on the world stage (WHO, 2017; Parliament of the Republic of Ghana, 2012). These findings indicate that there is a need to examine possible ways through which mental health can be improved in various countries. A review of related empirical literature is one way of identifying possible patterns that may lead to improvements in mental health care. Mainly, this review of literature provides ways of incorporating information technology in psychotherapy towards improving mental health and accessibility to care.

Common psychotherapies in mental healthcare are psychodynamic therapy, humanistic therapy, systemic as well as Cognitive and Behavioural Therapies (CBT), the latter of which has been found to be effective therapies for treating the most common psychological disorders (David, Cristea & Hofmann, 2018). Emerging adaptations of psychotherapy involve the interactions between individuals and technology (Barak,

& Grohol, 2011; Murphy, MacFadden, & Mitchell, 2008; Robinson & Serfaty, 2008; Spek, Cuijpers, Nyklícek, Riper, Keyzer, & Pop, 2008). Indeed, more recently during the controversial lockdowns associated with COVID-19, telehealth technologies such as ZOOM and similar platforms became increasingly used by practitioners in numerous countries (Jurcik *et alia*, 2020). We therefore feel that such a review is especially timely.

Notably, despite the increasing availability of technology in developing countries (Benjanovic, 2010), the application of advanced technology in psychotherapy is especially lacking in the developing world (Brenes, Ingram, & Danhauer, 2011). This deficiency can sometimes render exisiting mental health services obsolete and lacking the needed support to provide efficient patient-centred care, especially during crisis situations (e.g., COVID-19 mass quarantines). Resonating among clinicians, researchers and policy actors alike, is the question of how can technology be used to improve mental health care as well as eradicating its associated stigmatisation?

Therefore, this paper explores the challenges and opportunities of mental health services in addressing the question above. It further argues ways through which technology in psychotherapy improves mental health care accessibility and delivery and reduces stigma. Hence, the goal for the current paper was to review and summarize empirical (including case studies and larger scale research) and review articles that provided or discussed outcome data for specific interventions. The final section of the paper provides recommendations to policymakers and practitioners on integrating information technology in psychotherapy.

Method

Search and Study Selection

The review adopted a non-systematic internet search and content analysis of peer-reviewed published papers from selected academic databases: Emerald Insight, PubMed, BioMed, and Google Scholar. That is, the internet search was conducted using search keywords and phrases that reflected exposure variables of interest (e.g., "Information Communication Technology [ICT] and mental health", "technology and mental health", and "technology and psychotherapy", "stigma reduction and psychotherapy", mental health stigma and technological psychotherapy", "counselling and technology," "telemental health and stigma"). Most searches were performed during late 2018 and early 2019 (i.e., between August and February). Studies were included in the review if they provided some evidence for psychotherapy and technology; this included meta-analyses, randomized controlled trials (RCTs), cohort studies, larger scale research and case-control studies.

Articles were retained for detailed analysis if they provided or discussed some evidence (including outcome studies) relating to mental health and technological psychotherapy methods, such as the use of mobile phones in psychotherapies, telemental health methods, computer assisted therapies, virtual/augmented realities, and artificial intelligence; reported stigma reduction using any of the aforementioned technologically assisted ways of conducting psychotherapy; and finally, review papers including meta-analyses on mental health and technological psychotherapy methods were also included. Articles were excluded if they were not written in the Enlish Language, the text could not be located, no adequate information on the methodology used in the study was provided, the study was published before 2000, and finally, if the study provided no evidence linking technology to psychotherapy outcome.

Results and Discussion

A summary of the articles that we selected for this review is included in Table 1. In general, these articles reported findings related to the effectiveness of technological applications in psychotherapy. We synthesised these articles to provide evidence for the use of technology in psychotherapy as a means of improving mental health care accessibility and delivery, and reducing stigma.

Studies indicated that many mental health professionals are not well trained in Evidenced Based Treatments (EBTs); these professionals sometimes fail to apply the proper guidelines for the EBTs they are aware of (Cartreine, Ahem & Locke 2010; Shafran *et alia*, 2009; Woody, Weisz & McLean, 2005; Azocar *et alia*, 2003). There is also the problem of cost, accessibility, availability, and anonymity for the use of mental health facilities. According to Lin *et alia* (2013), some of these problems can be minimised by the use of a computer or internet-based delivery of psychotherapy. A review by Cartreine, Ahem, and Locke (2010) revealed that mental health care delivery can be improved through the use of a computer or internet-based delivery of psychotherapy. When computers were accepted in the mental health profession, their primary purpose was for administering tests and questionnaires (see a review by Paul, 2005). Currently, there is evidence supporting the effectiveness of computer-based and online assessments. That is, the web-based assessments have been found to produce less social desirability compared to paper-and-pencil type, as clients reported greater confidence in revealing more information to computers than to professionals, indicating higher reliability levels and precision (Greiff, Holt, & Funke, 2013).

These advantages of web-based assessment led to the conclusion that this modality produces more quantity and high-quality data about clients than paper-and-pencil forms (Krkovic, Pasztor-Kovacs, Molnar, & Greiff, 2014). Moreover, computer-based Cognitive Behaviour Therapy (cCBT) has been found to be effective in the treatment of depression, social phobia, panic disorder, and anxiety disorders in adults (Haug *et alia,* 2012; Hedman, Ljotsson, & Lindefors, 2012). Haug *et alia* (2012), conducted a meta-analysis for self-help interventions for anxiety disorders, evaluating internet-based treatments for anxiety. This study revealed that compared with placebo treatment the internet-based treatments for anxiety yielded a moderate to large pooled mean effect size (d= 0.78). In another meta-analysis, Hedman *et alia* (2012), found that internet-based Cognitive Behavioural Therapy (iCBT) was as effective as Cognitive Behavioural Group Therapy (CBGT) for treating social anxiety disorder in clinical settings. That is, using the Liebowitz social anxiety scale as an outcome, at post-treatment and follow-up respectively, both groups made large improvements. At follow-up, 41 (64%) participants in the iCBT group were classified as responders (95% *CI*: 52%–76%). In the CBGT group, 28 participants (45%) responded to the treatment (95% *CI*: 33%–58%). At post-treatment and follow-up respectively, the 95% *CI* of the LSAS mean difference was 0.68–17.66 (Cohen's d between group= 0.41) and -2.51–15.69 (Cohen's d between group= 0.36) favoring iCBT, which was well within the non-inferiority margin. Mixed effects models analyses showed no significant interaction effect for LSAS, indicating similar improvement across treatments (F= 1.58; df=2, 219; p= .21). Researchers concluded that iCBT can be effective in clinical settings in treating social anxiety disorders. Bergstron et alia, (2009) also reported both CBT and iCBT are effective for treating panic disorders as both treatments yielded a mean effect size of 1.73 for the treatment of panic disoders (see also Andersson & Hedman, 2013).

Table 1: Synthesis of literature evidence on technology and psychotherapy.

Studies	Objectives	Main results/findings
Miles (2020)	Online factorial simulation assessed how perceived stigma and severity of health issues are associated with acceptability for a health consultation source: General Practitioner (GP) vs chatbot.	Resutls showed that Chatbots may be more acceptable for consultations regarding more stigmatised health and less acceptable for conditions of higher perceived severity.
George (2018)	Experiemental study determining the efficacy of two novel self-administered mechanisms for social anxiety disorder: (a) delivery of treatment on mobile smartphone; (b) gamification of the treatment.	Gamification application may be effective as a stand-alone treatment for social anxiety disorder.
Fitzpatrick, Darcy, & Vierhile (2017)	Experimental study to determine feasibility, acceptability, and preliminary efficacy of a fully automated conversational agent to deliver a self-help program for college students with symptoms of anxiety and depression.	Conversational agents appear to be a feasible, engaging, and effective way to deliver CBT
Gleeson, Lederman, Koval, Wadley, Bendall, Cotton, & Álvarez Jiménez (2017)	A single group intervention study assessing the effectiveness of moderated online social therapy (MOST) program for caregivers.	There was a significant reduction in self-reported stress levels among caregivers and this change in stress correlated with the use of the MOST system.
Silva, Albuquerque, Muniz, Ribeiro, Pinheiro, & Albuquerque (2017)	This quasi-experiemental study proposes a new tool based on augmented reality to reduce the stigma related to psychotic episode.	Model is a robust and realistic tool, very promising in reducing stigma associated with schizophrenia by instilling in the observer a greater comprehension of any person experiencing schizophrenia outbreak.
Christofi & Michael-Grigoriou (2017)	The review paper gives an up-to-date overview of research about Virtual Reality (VR) for inducing empathy and reducing prejudice towards stigmatised groups and the measurements used in the studies.	Outcomes from the studies reviewed provide only preliminary support for the use of VR for successfully inducing empathy in people and reducing their prejudice towards stigmatised groups.
Ebert, Zarski, Christensen, Stikkelbroek, Cuijpers, Berking, & Riper (2015)	The meta-analysis aimed to evaluate whether CBT is effective for treating symptoms of anxiety and depression in youth	CBT is efficacious in the treatment of anxiety and depressive symptoms in youth. May be a promising treatment alternative when evidence-based face-to-face treatment is not feasible.
Lederman, Wadley, Gleeson, Bendall, & Álvarez Jiménez (2014)	A qualitative study design determining appropriate design guidelines using suportive accountability and positive psychology theory for increasing engagement.	Implementation achieved the design goals; the MOST model can inform the development of more effective and engaging online therapies.
Norris, Swartz, & Tomlinson (2013)	A review investigating the potential and current uses of mobile phones in the mental health field in South Africa.	Mobile phones seem most suited to enhancing CBT; mobile phones seem to have many other benefits, such as increasing adherence to medication, etc.
Watts, Mackenzie, Thomas, Griskaitis, Mewton, Williams, & Andrews (2013)	A RCT aimed to establish whether a previously validated computerised program (The Sadness Program) remained efficacious when delivered via a mobile application.	Both Mobile and Computer Groups were associated with statistically significantly improvement in the PHQ-9 at post-test. 3 months follow up, reduction for both groups remained significant.
Haug, Nordgreen, Öst, & Havik (2012)	To review the literature on self-help treatment (S-HT) for anxiety disorders among adults, with a total sample of 56 articles with 82 comparisons.	For S-HT compared to placebo, meta-analysis indicated a moderate to large effect size (d= 0.78) for anxiety disorders. S-HT should be offered as part of stepped care treatment models in community services.
Clough & Casey (2011)	Identified and reviewed technological adjuncts to increase client adherence to therapy	Use of technological adjuncts may improve client adherence to psychotherapy. Specifically, with respect to attendance, engagement and aftercare.
Kessler, Lewis, Kaur, Wiles, King, Weich, & Peters (2009)	A RCT to study the effectiveness of CBT delivered online in real-time by a therapist for patients with depression in primary care, and usual traditional care by GP.	The online CBT seems to be effective in real time, with benefits maintained over 8 months.
Matthews, Doherty, Sharry, & Fitzpatrick (2008)	This RCT study examined the potential benefits of mobile phones for self-charting moods in comparison to paper charts.	Compliance significantly higher on mobile phones than with paper, and the task was not found to be any more difficult to complete using mobile phones.
Bee, Bower, Lovell, Gilbody, Richards, Gask, & Roach (2008)	To determine clinical effectiveness of remotely communicated therapist delivered psychotherapy (meta-anlaysis).	Remote therapy has the potential to overcome some of the barriers to conventional psychological therapy services.
Peñate, Pitti, Bethencourt, de la Fuente, & Gracia (2008)	Experimental study to test a combined treatment, virtual reality exposure and cognitive behavioural treatment (VRET), compared with a traditional CBT, for reducing agoraphobia symptoms.	Significant improvement in agoraphobia symptoms in both groups. However, the VRET group showed a slight amelioration of symptoms compared with CBT group.
Reger & Gahm (2008)	Authors reviewed the rationale for Virtual Reality Exposure (VRE) and its key processes.	Outcomes parallel to those reported in the research with other disorders and suggest the applicability of VRE in treating active duty soldiers with combat related Post Traumatic Stress Disorders.
Finkelstein & Lapshin (2007)	Study designed to investigate the efficacy and feasibility of a web-based depression stigma education tool for healthcare professionals	Computer-assisted education was effective in reducing the stigma of depression and increasing knowledge about depressive disorder.
Griffiths, Christensen, Jorm, Evans, & Groves (2004)	RCT investigating effects on stigma of two internet depression sites.	Relative to the control (i.e. attention control), the internet sites (BluePages) significantly reduced personal stigma, however the effect size was small.

In a meta-analysis, searches resulted in identifying 13 randomized trials, including 796 children and adolescents that met inclusion criteria. Seven studies were directed at treating anxiety, four studies at depression, and two were of a transdiagnostic nature, targeting both anxiety and depression. The overall mean effect size (Hedges' *g*) of cCBT on symptoms of anxiety or depression at post-test was *g*= 0.72 (95% *CI*: 0.55–0.90, Numbers Needed to be Treated (*NNT*)= 2.56). Heterogeneity was low (I^2= 20.14%, 95% *CI*: 0–58%). The superiority of cCBT over controls was evident for interventions targeting anxiety (*g*= 0.68; 95% *CI*: 0.45–0.92; *p* <.001; *NNT*= 2.70) and for interventions targeting depression (*g*= 0.76; 95% *CI*: 0.41–0.12; *p* <.001; *NNT*= 2.44) as well as for transdiagnostic interventions (*g*= 0.94; 95% *CI*: 0.23–2.66; *p* <.001; *NNT*= 2.60). Most, but not all, of the treatments identified involved guidance by a professional (Ebert *et alia*, 2015). In sum, Computer-Assisted Therapy can facilitate the work of practitioners and has the potential to ameliorate mental health through the provision of high quality and reliable interventions via distance technology. Given the effect sizes that were yielded in the reviewed studies above, there is no doubt that technology can play an important role in the application of psychotherapy.

The International Test Commission (ITC, 2006) has outlined international guidelines for using computer-based and internet-delivery testing. These recommendations were developed in relation to CBT and internet based testing. The guidelines outline the responsibilities of the developer, publisher, and the user of CBT and internet-based testing. Examples of recommendations include: develop the CBT/internet test to be compatible with country specific health and safety, legal, and union regulations and rules; where appropriate, collect data to monitor group differences in group scores; give appropriate documentation for the psychomentric properties of the CBT/internet test (refer to ITC, 2006 for detailed guidelines). Therapists who rely on telemental health in one way or another are encouraged to take these guidelines into consideration.

Currently, Artificial Intelligence (AI) is one of the fastest growing technologies in the world. Many spheres in daily life involve interactions with AI. For instance, inmany western countries, robotics are now replacing human labour in some companies (Loebbecke & Picot, 2015). AI is a scientific way of making computers perceive, reason and act in ways that are similar to humans (Buchanan, 2005). AI is recently used in developing chatbots and smartphone apps to serve as a virtual therapist for individuals with psychological problems. AI is now being integrated into psychotherapy. That is, experts have devised ways through which individuals can receive therapeutic treatments without the intervention of a practitioner. A typical and recent reference can be made to Alison Darcy, a clinical psychologist at Stanford University and colleagues who founded the Woebot in 2017. The Woebot is a free online Chabot that is used to treat depression in a form of brief, daily conversation and mood monitoring. Fitzpatrick, Darcy, and Vierhile (2017) developed the Woebot based on one of the most researched approaches to treating depression, CBT. These researchers incorporated therapy into a smartphone application due to the commonness of smartphones in the world. Compared with information controls, during an analysis of primary outcomes the Woebot was found to be effective in the treatment of depression (*d*= 0.44) using the principles of CBT (Fitzpatrick *et alia*, 2017). According to the researchers, the invention of the Woebot does not intend to replace traditional psychotherapy but rather to complement the process, especially where the person cannot get access to a psychotherapist (i.e., incorporating the less advantaged in society). Research on the effectiveness of the Woebot revealed that compared to information control, there was a significant reduction of depressive symptoms for the Woebot group over a study period measured by the Patient Health Questionnaire (PHQ-9) (i.e. a moderate between-group effect size; *d*= 0.44). Nevertheless, this type of technology should be used with caution as researchers identified only one

study to support the effectiveness and the efficacy of the Woebot. Given the promising findings, future studies in various cultural settings arewarranted to test the potency of CBT in the Woebot.

Additionally, long-distance psychotherapy (telemental health) can be made possible through the following technological mediums such as Skype, VSee, iChat, chat rooms, audio type, telephone, television satellite hook-up, chatbot, or videoconferences, ZOOM, and email. It has been reported that 100 million Americans seek assistance for mental health issues online (Chang, 2005); it is likely that these numbers have increased over the last 15 years due to the continuous growth and availability of internet technology. Moreover, with the recent and controversial lockdowns over the COVID-19 pandemic, it appears that an increasing number of therapists internationally are beginning to use videoconferencing technology, including those at more traditional face-to-face sites such as hospitals (Jurcik *et alia*, 2020).

In videoconferencing, both the client and psychotherapist use webcams to broadcast their images and sound through the use of the internet after which psychotherapy starts. The two participants are often apart in terms of geographical location, but at times it may be at the same clinical site, when a distance is deliberately created between the patient and therapist, to reduce the spread of an infectious agent (e.g., Jurcik *et alia*, 2020). It has been reported that video conferencing shares similar characteristics with face-to-face psychotherapy in terms of rapport creation and effectiveness in treating disorders like schizophrenia and obsessive-compulsive disorder (Rummell & Joyce, 2010). A meta-analysis reported that in comparison to controls, telephone and video conferencing therapy revealed a pooled mean effect size of 0.44 for depression, and 1.55 for anxiety disorders (Bee *et alia*, 2008), indicating the effectiveness of remote therapy. Kessler *et alia* (2009) found that 38% of patients in distance therapy recovered from depression compared to 26% in the control condition, who received traditional care from their general practitioner.

Some studies argue that traditional psychological treatment methods cannot always be successful as there are issues of patient dropout, low engagement, and limited homework adherence. These factors are found to impede the success of traditional psychological treatment methods (Detweiler-Bedell & Whisman, 2005; Olfson *et alia*, 2009). Again, research has reported that even treatments that are considered to be successful still have associated relapse rates and often do not lead to symptom-free outcomes (Taylor, Walters, Vittengl, Krebaum & Jarrett, 2010). While the effectiveness of traditional psychological treatments cannot be underestimated, as with any treatment, clinicians and researchers recognize the need to improve their effectiveness. One of the critical areas in technologies which have been integrated into psychotherapy practice is the use of mobile phones. The sales of smartphones are increasing worldwide; data available reveals that the copious numbers of smartphones in developing countries are growing faster and approaching those of developed countries (Benjanovic, 2010). Mobile phone use and applications have the potential to assist with some of the aforementioned concerns including homework adherence and engagement, through reminders, increased accessibilty, and useful graphics.

Some studies have found that mobile phones can be used to improve data collection in Ecological Momentary Assessments (EMA) (Clough & Case, 2011). Matthew *et alia*, (2008) examined the benefits of mobile phones for self-charting moods compared with traditional methods. Results from the survey revealed that compliance was significantly higher on mobile phones compared with conventional paper-and-pen approaches. That is, 88.7% of participants preferred to use mobile phones, with 11.3% preferring the use of paper. Axelson *et alia* (2003) reported a similar finding in a study on the use of interviews to collect EMA data. Based on the results, these researchers

concluded that mobile phones have a greater propensity of increasing data collection in clinical settings. Other advantages of mobile phone use in psychotherapy were also found by Boschen and Casey (2008). These researchers argued that mobile phones give clinicians direct access to clients, especially at locations where traditional methods are not feasible. Many people develop personal relationships with mobile phones; this connection can result in increased client compliance with a particular task conveyed through this medium (Clough & Casey, 2011).

Moreover, George (2018) found that treatment of social anxiety disorders through the use of smartphones and a gamified mobile application may be effective as a stand-alone treatment. In this study, the researcher found a significant mean decrease in the anxiety levels of participants (i.e., d=1.23 on Liebowitz Social Anxiety Scale Report [LSAS-SR], and d= 1.46 on Brief Fear of Negative Evaluation Scale [BFNES]). This intervention included psychoeducation, cognitive restructuring, mindfulness, acceptance, and exposure, which were incorporated in a computer game. Grassi *et alia* (2007) used mobile phone technology to convey relaxation exercises to 120 university computer science students. Results showed that there was a significant decrease in state and trait anxiety levels (d= 1.15), and an increase in self-efficacy reported by the participants at posttest.

Improvements in natural processing and the commonness of smartphones have made chatbots the new trend of AI for mental health. Another virtual therapist, called Ellie, was also launched at the University of Southern California. This virtual therapist can detect nonverbal cues in a client's behaviour (e.g., facial expressions, gestures, postures) to help in the therapeutic process. This virtual therapist is purported to advance mental health and advance diagnostic accuracy (Rucker, 2018). Nevertheless, we alert readers to the fact that at the time of our review, Rucker's work was a web publication rather than published in a peer reviewed journal.

Researchers at the National Centre of Excellence in Youth Mental Health in Melbourne, Australia have used AI to develop Moderate Online Social Therapy (MOST) to help people feel more socially connected. This technology is typically used to help individuals who are recovering from psychosis or depression. A study indicates that out of a total of 275 individuals who used this system for a period of 3 to 4 weeks reported a decrease in depressive symptoms at one-month follow-up; 60% of participants reported a significant increase in their social connectedness, 55% reported being empowered in their recovery process, 70% considered the system to be a long term helpful treatment, and finally, the use of the system was associated with a significant stress reduction on the perceived stress scale (d= 0.40) (Lederman, Wadley, Bendall, & Álvarez Jiménez, 2014; Gleeson *et alia*, 2017). Next, the Mental Health Gap Action Programme App (mhGAP) was found to be effective in the treatments of mental, and substance use disorders, including depression (WHO, 2017). This app also provides information to non-specialised health workers on how to diagnose and treat the conditions noted above. This application is available freely online. The WHO (2017) reported that the app is helping in the improvement of mental health in many countries.

Another technology that is applied in psychotherapy is referred to as Immersive Technology: the use of virtual realities and augmented realities. These technologies work similarly as they both provide visual communication in the treatment of psychological disorders. Immersive technology involves the use of computer graphics to imitate or create a real-life situation (Burdea & Coiffet, 2003). It may involve the use of senses like vision, touch, hearing and even smell. It tricks the senses into believing that they are involved in a real-life situation. Participants are usually fitted with Head Mounted Displays (HMDs) which are also fitted with head-tracking devices that allow changes in the image as a person moves along. Tracking devices allow participants to interact with

objects. In Virtual Reality Exposure Treatment (VRET), participants are gradually exposed to the anxiety-provoking situation until anxiety is reduced. There is evidence supporting the use of VRET in the treatments of some psychological disorders, especially anxiety disorders, as a substitute for in vivo treatment (Riva, 2003). However, psychological research on virtual realities were originally done in laboratory settings, and more effectiveness studies in the community are needed.

More recently, the use of virtual reality outside the laboratory has been increasing since it is becoming relatively affordable (Riva, 2003). Peñate *et alia* (2007) compared traditional CBT and Virtual Reality Exposure Therapy (VRET) in treating agoraphobia. Results from the study revealed that both traditional CBT and VRET were able to achieve a significant improvement in agoraphobia reduction. Nevethelesss, a comparison of these two treatments at the post treatment level revealed that both CBT and VRET group exhibited greater improvement (i.e. agoraphobia cognition questionnaire d= 0.70; and Beck Anxiety Inventory, d= 0.78). Researchers reported that improvement in the groups remained for a period of three months.

Additionally, a few case studies reported similar supporting evidence. Riva (2005) combined virtual reality with his Experiential Cognitive Therapy, and he was able to make changes in a person's perception of his body image. Reger and Cahm (2008) treated one returned soldier suffering from post-traumatic stress disorder (PSTD) using virtual reality and CBT; results from the treament was promising. Wallach and Bar-Zvi (2007) reported that four patients who had a fear of flying showed a significant decrease in fear of flying after being treated with virtual reality exposure (attitudes towards flying questionnaire, d= 3.13). Other advantages of VRET have been reported in the literature. Thus, in a review, Paul (2005) revealed that VRET may be useful in treating not only the disorders mentioned above, but also, for treating patients with eating disorders and obesity, impotence and premature ejaculation in men, narcotic addictions and opioid dependence patients, rehabilitation of patients suffering from stroke and dementia, and finally, attention deficit hyperactive disorders. Numerous studies have also used immersive technology in the treatment of specific animal phobias, such as arachnophobia (De Witte, Scheveneels, Sels, Debard, Hermans & Van Daele, 2020).

According to Goffman (1963), stigma is an attribute that extensively discredits an individual, reducing him or her from a whole and usual person to a tainted, discounted one. That is, people either think or wrongly conceive that an individual possesses characteristics which are different from the broader population, which leads to ill repute. The concept of stigma is culturally constructed, suggesting what is stigmatised in one cultural setting might be seen as normal in another context (Park & Aggleton, 2003). Goffman (1963) acknowledges three main types of stigma: (1) physical disadvantage, (2) blemish of individual character and (3) tribal stigma. Mental illness is often related to the stigma of one's character.

Psychotherapeutic treatments are one of the effective ways of preventing mental disorders. One meta-analysis revealed that in general, therapy works better than nothing or placebo (e.g., Lambert & Shimokawa, 2011). However, research has found out that one problem that prevents individuals from seeking psychotherapy treatment is stigma (e.g., Livingston & Boyd 2010; Kapungwe *et alia*, 2010). Mental health stigma is more common in most developing countries (Lauber & Rössler, 2007). A qualitative study in Zambia showed that Zambians hold stigmatised attitudes about the mentally ill as mentally ill patients were perceived as exhibiting bizarre behaviours. That is, participants were fearful of patients and also perceived patients as dangerous. These attitudes were not found to be limited to the mentally ill alone, but rather families, friends and mental health care personnel were also affected (Kapungwe *et alia*, 2010). Barke, Nyarko and Klecha (2010) examined stigma among the mentally ill and the perception of these

stigmas by patients in Southern Ghana. Findings from this study revealed that patients were viewed as dangerous in society, and as such, most people were not willing to be associated with them. Approximately 80% of the paticipants agreed that individuals were perceived to be less of a person if they used a mental health facility, and 70.5% were regarded as less intelligent. Eighty per cent of the participants were not willing to marry a person who had at least once used a mental health facility. Perhaps more concerning is a study by Lyons *et alia* (2015). This study revealed that both Ghanaian and Australian medical students held stigmatising attitudes towards individuals with mental disorders. However, these attitudes were higher among the Ghanaian group (see also Cavanagh, Jurcik & Chakrabis, 2021).

A review by Angermeyer and Dietrich (2006), revealed that the mentally ill are highly stigmatised. Specifically, schizophrenia and even depression are highly stigmatised in numerous industrialized and non-indistrialized countries (see also Adu *et alia*, 2021; Nersessova, Jurcik, & Hulsey, 2019). Egbe *et alia* (2014) found that family, friends, employers, community members and health providers discriminate against the mentally ill in South Africa. They reported that the primary basis for stigmatising attitudes was a misconception of the causes of mental illness. Also, they concluded that stigma leads to delays in help-seeking and impedes recovery. Mental illness diagnosis and following stigmatisation lead not only to discrimination, but also to social and existential threat (Krendl & Freeman, 2019). These findings clearly show that stigma exists in the general population, especially in developing countries.

As alluded to above, mental health stigma is a large factor preventing the effective treatment of mental disorders, and sabotaging the quality of life and advancement of people with mental illness (Amering & Schmolke, 2009; Satcher, 2000; Barke, Nyarko, & Klecha, 2011). Researchers and other stakeholders are continually seeking mechanisms to effectively address this canker in societies (Ghana Mental Health Act -Parliament of the Republic of Ghana, 2012). There is considerable evidence supporting how technology in psychotherapy reduces various types of stigma among those with mental illness and their families (Moreau *et alia*, 2018; Cartreine, Aher, & Locke, 2010). Researchers have found that technologies like computer-mediated distance therapy, and telephone therapy, among others can help deal with mental health stigma (Finkelstein & Lapshin, 2007). A review by Cartreine *et alia* (2010), revealed that one advantage of using computer-mediated distance therapy is stigma reduction. That is, for example, the use of self-guided treatment programs provide patients the opportunity and the flexibility to be interactive with texts, animations and other presentations via the internet or on the computer without direct contact with mental health facilities. Thus, patients do not go to designated mental health facilities or therapist offices, which may be a source of stigma in smaller, less industrialized communities (Ali & Agyapong, 2015). Evidently, this type of remote therapy has been linked to reduced self-perceived and public stigmas (see Griffiths, Christensen, Jorm, Evans, & Groves 2004; Casey & Halford, 2010). Taking into account the sparsity of mental health professionals and limited facilities, especially in most developing countries, using this method of psychotherapy can help reach out to more individuals with mental health problems from the comfort of their homes (Cartreine *et alia*, 2010).

Furthermore, treatments that require exposure of clients to a particular stimulus can be done by the use of virtual or augmented realities. The use of immersive technology which provides virtual stimuli during therapy sessions can help reduce the experience of mental health stigma especially in situations where where exposing the client to real-life stimuli in public could lead to stigmatising attitudes in the community. For clients who are uncomfortable with in vivo exposures, virtual stimuli may provide an equivalent

option in terms of effectiveness (see a review by Christofi & Michael-Grigoriou, 2017; Silva *et alia*, 2017).

Krkovic *et alia* (2014) indicated that individuals are comfortable to reveal more sensitive information about themselves to computers than to fellow humans during therapy sessions. As a result, clients held less mental health self-stigma. Lawlor and Kirakowski (2014) reported that being active on an online mental health social support group has a positive association with recovery from self-stigma. Further, Chatbots can provide treatments to clients without the assistance of a professional (e.g. Woebot). Considering these factors, the use of chatbots may help reduce the stigma associated with the patronage of mental health facilities (Miles, 2020). Most of these chatbots are free to download online, and clients can have treatments in the comfort of their own homes without being exposed to the public and tagged negatively.

It can be deduced from the foregoing arguments that the use of information technology in psychotherapy could be a great boon to society: ranging from improving psychotherapy to reducing stigma. However, the application of this method of psychotherapy is associated with ethical and legal problems. In other words, there are cons related to telemental health. To highlight, but a few, the efficacy and effectiveness of most apps are difficult to ascertain at this early stage of research. For example, the current review found it difficult to provide more evidence regarding the use of the Woebot. There is also a challenge of regulating these app developers and designers as it is difficult to authenticate if designers and developers of these apps applied the well-documented guidelines of regulatory bodies such as the WHO guidelines for treating mental disorders (Mook, 2014). A review revealed that telemental health may jeopardise the privacy of non-clients and clients alike (Drum & Littleton, 2014). For example, family pictures on walls and other personal contents of the client may unintentionally be visible to the therapist during a video therapy session. These unintentional self-disclosures may inadvertently affect the therapy process. Also, researchers reported that the flexibilities associated with this type of treatment makes it difficult to ensure the confidentiality of clients. For instance, the use of an unsecure internet connection at a public place may give others the opportunity to access the personal information of clients. This limitation has the potential to lead to legal and professional concequences (Drum & Littleton, 2014), which is why it is necessary as part of the informed consent to clarify to clients that there may be unintentional breaches of confidentiality.

The current review makes an important contribution to synthesizing recent evidence in the area of mental health, IT, and stigma reduction. We hope that it will highlight important progress and gaps in the literature and be of use to clinicians and researchers alike. However, our narrative review is not devoid of limitations. Firstly, mental health is impacted by an individual's physical health conditions (Galderosi *et alia*, 2015). For instance, chronic diseases such as hypertension and diabetes impact mental health in diverse ways, and vice versa. However, the current review excluded the intersection between the fields of health psychology and IT. Moreover, our review is not free from search biases. For instance, although we did use various search engines and databases, we did not use PsycInfo (note that we used PubMed which includes Medline citations), nor did we systematically review the literature. Perhaps a more comprehensive systematic review in the future is warranted to document more detailed findings in this area of research.

Telehealthcare has become part of the fabric of mental health interventions in numerous countries as the COVID-19 pandemic impacted the world early in 2020 (Jurcik *et alia*, 2020). The pandemic came with its associated controversial protocols such as lockdowns, social distancing, among others. As clinicians became increasingly restricted and isolated from the physical sphere during lockdowns, some of the aforementioned

technological ways of administering psychotherapy provide opportunities for practitioners to stay connected to their patients (Jurcik *et alia*, 2020). The above strands of evidence clearly show that reliance on information and communication technology in delivering psychotherapy has numerous advantages ranging from improving accessibility to mental health care to reducing stigma. Further, therapists can rest assured that the evidence available suggests that adapting psychological interventions using telehealth technology is an effective form of treatment delivery, as is the use of various technologies (e.g., AR and VR) in psychotherapy. Non-human interventions (e.g., AI chatbots) also hold promise and deserve further investigation.

It should also be acknowledged, however, that not all individuals have or will have access to these technologies, especially in most developing countries, where access to phones and computers is relatively limited compared with developed regions. Therefore, it will be vital, that more remote ways of applying some of these technologies will become known and accessible to the World population at large in the near future (Jurcik *et alia*, 2020). Moreover, as with much other psychological literature (Henrich *et alia*, 2011), most of the reviewed treatment literature in this area is limited to the Western World (see also Jurcik *et alia*, 2013). More research is needed on how the findings generalize to clients and patients in developing countries, and whether cultural adaptations outperform unadapted treatments, which tends to be the case in the traditional psychotherapy literature (Griner & Smith, 2006).

Although this review focused mostly on the benefits of online interventions, there is, however, the paradoxical risk that as we "go online," we may inadvertently aggravate or unintentionally suppress some forms of stigma: we reduce exposure of the public to those with mental illness, and those with mental health conditions may consciously or unconsciously circumvent certain types of public exposure and be negatively reinforced for such behaviour. Research shows that contact between patients and the general public may be an effective form of stigma reduction (Stuart, 2016). It is therefore imperative that stigma research and effective stigma reduction efforts do not become more lax as psychological interventions increasingly take place in the home -where one's patient or client status can become less visible, as opposed to those clients who will inevitably continue to seek care at public hospitals, outpatient clinics, or can be found in the private practice waiting rooms of psychotherapists. Even during the pandemic, mental health services were still considered to be essential in many jurisdictions, thus at least partly facilitating ongoing face-to-face contact with clinicians (see Jurcik *et alia*, 2020).

Despite the many advantages of telehealth that we have reviewed, our clinical experience has taught us that many clients show a clear preference for in-person meetings, and this form of traditional therapy is likely here to stay. After all, we have evolved to interact with each other face-to-face, rather than through an electronic medium. More qualitative and quantitative research is needed on the characteristics of patients who prefer one modality of therapy over another.

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Received, April 6, 2021
Final Acceptance, July 25, 2021