Modes of Delivering Psychotherapy:
Investigating Technology

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ABSTRACT

The ubiquity of telecommunications technologies and the internet facilitates offering different mental health services to the public, and the ongoing advancement in technologies introduces new venues to a range of psychotherapeutic services. It is critical to all clinicians and professionals in information and communications technology to have a clear understanding of the opportunities and challenges of these technologies. This article outlines the technologies that are currently used as part of psychotherapy. In particular, the paper discusses some of the current state of clinical research, advantageous and disadvantageous that relate to the use of these technologies.

KEYWORDS

Assistant Psychotherapists, E-Mental Health, Mobile Applications, Telecounselling, Virtual Reality

INTRODUCTION: HISTORICAL BACKGROUND AND TELEPHONY-BASED APPLICATIONS

Counselling services traditionally offer 'treatment' in a private, face-to-face setting (e.g., an office or clinic). Technology-based counselling services, however, have surfaced as an alternative means of therapy where patients do not have access to in-person services. These services have been available for several decades. For example, the Australian Royal Flying Doctor Service (RFDS) used the Morse Code, a coding system to transmit messages via the electromagnetic telegraph, was used in 1928-1929 by the Royal Flying Doctor Service (RFDS) in Australia to provide telehealth to remote areas (Margolis & Ypinazar, 2008; Persson, 2010). It was in the 1930s that the service called 'Voice Radio Therapy' was introduced and serviced remote areas of Australia by telephone. The use of telephone technology in psychotherapy continued in later years. For example, in an attempt to prevent suicides, the Samaritans[1] began the first telephone counselling service (called Lifeline) in London in 1953 (Hornblow, 1986) and four years later in 1957, three telephone counselling providers were established in the United States of America (Hornblow, 1986). In Australia, the first Lifeline service was officially introduced in 1963 (Coman, Burrows, & Evans, 2001), but it was during the 1970s that telephone technology services have provided psychotherapy services (see Lester, 1974 and Regan, 1997).

Since the 1980s, telephone psychotherapy has been recognised as a valued alternative to traditional face-to-face therapy and has been used to deliver various mental health services (Reese, Conoley, & Brossart, 2006; Robinson, 2009b), for instance, to provide care for obsessive-compulsive disorder (OCD) and depression (Lam, Lutz, Preece, Cayley, & Walker, 2011; Lerman et al., 1992; Marcus et al., 1993; Turner et al., 2014). Telephone counselling has also been effective in helping clients with the psychological issues associated with cancer (Badger, Segrin, Pasvogel, & Lopez, 2013; Bastian et al., 2013), with disability as an adult (Evans, Halar, & Smith, 1985), with smoking cessation (Bastian et al., 2013; Stead, Hartmann-Boyce, Perera, & Lancaster, 2013; Zhu et al., 1996), and with HIV infection (Velthoven, Brusamento, Majeed, & Car, 2013).

Given the success of telephone counselling, it is not surprising that the usefulness and appropriateness of other technologies for therapeutic purposes has been assessed. Several studies have identified the benefits or disadvantageous of those services, ethical and organizational issues, and the therapeutic outcomes achieved using differing technologies (see Haberstroh, Parr, Bradley, Morgan-Fleming, & Gee, 2008; Lovejoy, Demireva, Grayson, & McNamara, 2009; Richards & Viganó, 2013a; Schultze, 2006). For example, instant messaging, chatting, and video conferencing facilitate a person's ability to access services in spite of one's geographical distance from the service. These telecommunication systems open up new possibilities for communication between therapists and clients. This was the reason the current article outlines the story of use of technology in psychotherapy. The review will classify the technologies that have been used in psychotherapy and will also discuss some of the advantageous and disadvantageous that relate to the use of these technologies.

As a basis for this literature review, technologies have been categorised into four categories. Firstly, Internet-based technologies are covered with attention to the advantageous and disadvantageous of these technologies as a common medium of therapeutic delivery. Secondly, stand-alone platforms including mobile applications and technologies designed for automated self-help services are reviewed elucidating some of the challenges in using such automated systems in psychotherapy. The third category covers the use of 3D, and Virtual Reality (VR) therapeutic technology tools and the final category focuses in assistant therapists.

The material for this study was mainly drawn from the peer-reviewed literature in which the terms "computer-mediated therapy," "tele-counselling," "e-health," "internet-online counselling," "videoconferencing," "asynchronous therapy," "synchronous therapy," "Virtual Reality" were used. These terms were also used in a search of the databases EMBASE, PubMed, PsychINFO, and Google Scholar to gather articles on technology-based therapies, but no specific method was used to filter the clinical or experimental content of the papers reviewed.

INTERNET-BASED TECHNOLOGIES

In addition to telephone technology, the advancement in telecommunication technologies including internet facilities has introduced new modes of providing a range of psychotherapeutic services to the public. Three forms of internet-based technology in particular have been identified as potential tools for remote forms of psychotherapy: Blogs and forums, social media and interactive technologies.

Blogging and Forums

Blogging and forums are the first routes that are not, necessarily, aimed at generating therapeutic outcomes for the user. These technologies are generally used to deliver a tutorial on potential psychological treatments (Bennett-Levy, Thwaites, Chaddock, & Davis, 2009; Farrand, Perry, & Linsley, 2010). Although not be considered psychotherapy and counselling per se, the information shared on blogs or forums shares many features with group therapy and can, potentially, be integrated into more traditional forms of psychotherapy. Specifically, blogging can provide self-help support to groups (Nagel & Anthony, 2009) and provides an opportunity for peer support (Jorm, Morgan, & Malhi, 2013). Also, blogging provides users with an opportunity to share their personal knowledge

about health (Swain, 2007), while simultaneously connecting geographically disparate groups. There, however, could comment on the threats of using community-based platforms such as blogs and forums for psychotherapeutic applications. It is expected that without proper clinical supervision by professional psychotherapists, rude or imprudent posts by other users could cause severe damage to a person who already seeks help for his/her unstable psychological state.

Social Media

There is also a growing interest in using social media, such as Facebook and Twitter, as an alternative to face-to-face therapy (Moorhead et al., 2013; Syred, Naidoo, Woodhall, & Baraitser, 2014). Similar to forums and blogs, social media can provide psychotherapeutic information, but in contrast to blogs and forums, social media allows dynamic and interactive communication between people (e.g., client and clinician) (Laranjo et al., 2014; Parikh & Huniewicz, 2015). For instance, users can communicate their concerns and seek help or advice from their 'friends' who interact with each other and who can share their responses or ideas via integrated digital media such as combinations of electronic text, graphics, moving images, and sound. Multimedia is a distinguished capability of social media which is seen rarely in forums or blogs.

Numerous free Facebook pages aim to raise awareness of, and prevention of, psychological disorders such as Depression and diseases such as Human Immunodeficiency Virus (HIV). These services are free, apart from the cost of an internet connection, and users are provided with access to the most up-to-date research and educational materials. These sites also provide psychotherapists with the opportunity to recommend their services. In short, interactivity, social and peer support, advertised services and access to inexpensive or free sources of information relating to specific mental health issues make social media appealing to potential clients (Moorhead et al., 2013). However, similar to forums the users' comments should be supervised by therapists to avoid negative impacts of improper statements or expressions on the others' psychological states.

Interactive Technologies

The new telecommunication systems have varying degrees of interactivity that enable talking backing to the user. For example, technologies which enable synchronous communication, such as Short Message Services (SMS) such as ReachOut[2] or SANE[3], video conferencing, podcasts, audio chatting, and instant text messaging (e.g., Yahoo Messenger) can also be used for instantaneous communication between a client and a clinician. Richards and Vigano (2013) suggest that clinicians and patients use these technologies because they are accessible from both desktop computers and portable devices, and thus help can be accessed easily if needed. Further, and from the client's perspective, can be accessed from almost anywhere (e.g., remote settings), and the costs are competitive relative to traditional, face-to-face sessions particularly when time and transportation expenses are considered (Chung, 2013; Griffiths, 2001; Maples & Han, 2008).

Text-based communication between the client and therapist can be conducted through e-mails, instant messages and chats. Email is amongst the most commonly used asynchronous technologies for internet-based therapy (Bellafiore, Colón, & Rosenberg, 2004). With asynchronous text-based psychotherapy (e.g., email), patients and the psychotherapists have time to consider their responses and the next steps in addressing the problem (Suler, 1997, 2000). When the synchronous text-based communication (e.g., chat mode) is employed, counselling pairs can be both sure that they are online and communicate simultaneously. (Mallen, Jenkins, Vogel, & Day, 2010; Satalkar, Shrivastava, & De Sousa, 2015). Although there is a need for appointments fixed in advance, the real-time text-based communication can provide opportunities to minimize or correct misunderstandings and have instant and supportive responses. Client anonymity is also listed as an advantage of text-based and, parenthetically, audio-based psychotherapy. This has a positive effect on therapeutic outcomes by allowing the client to be less inhibited (Suler, 2004; Tanis & Postmes, 2007).

Audio chat via standard telephone lines or sophisticated Internet-based technologies such as smartphones is found in the literature most adequate, achievable and effective method of distance mental health support (Day & Schneider, 2002; Kraus, Stricker, & Speyer, 2010; Mundt, Snyder, Cannizzaro, Chappie, & Geralts, 2007). While voice chat overcomes geographical barriers, different groups of people with various mental health issues can use this technology in a single or group psychotherapy. For example, Wiener, Spencer, Davidson, and Fair (1993) reported the effectivity of the audio-based psychosocial support for HIV-infected children and their families. Likewise, Gettings, Franco, and Santosh (2015) demonstrated that audio-conferencing was an effective method to support siblings of children with neurodevelopmental disorders. Furthermore, users of audio-based counselling services (e.g., telephone services such as Lifeline) rate the therapeutic attachment as stronger than other Internet-based counselling technologies such as text messaging (King, Bambling, Reid, & Thomas, 2006), and these services have had positive outcomes for several disorders (Choi et al., 2012; Chong & Moreno, 2012; Jang et al., 2013; Moreno, Chong, Dumbauld, Humke, & Byreddy, 2012).

When it comes to videoconferencing technologies, it is similar in many ways to face-to-face interactions. Videoconferencing sessions are a hybrid of networking, video, audio, and more that allow real-time visual and audio communication while overcoming potential issues such as travel costs, mobility challenges, socioeconomic status, and patient engagement (Casey, Joy, & Clough, 2013; Phillips, Vesmarovich, Hauber, Wiggers, & Egner, 2001). Specifically, this mode of delivery is thought to be the most credible substitute for face-to-face therapy in areas where face-to-face therapy is unlikely to be feasible, e.g., remote locations (Dongier, Tempier, Lalinec-Michaud, & Meunier, 1986; Ertelt et al., 2011).

Given the apparent benefits of using technology, it is not surprising that the usefulness and appropriateness of videoconferencing technologies for therapeutic purposes has been assessed (see Bee et al., 2008; Haberstroh, Parr, Bradley, Morgan-Fleming, & Gee, 2008; Lovejoy, Demireva, Grayson, & McNamara, 2009; Richards & Vigano, 2013; Schultze, 2006; Yuen, Goetter, Herbert, & Forman, 2012). Videoconferencing has been found to be an effective mode particularly in treating Obsessive Compulsive Disorders (Fitt & Rees, 2012), Anxiety Disorders (Rees & Maclaine, 2015), and Posttraumatic Stress Disorders (PSTD; Pelton, Wangelin, & Tuerk, 2015); the studies reported that participants experienced clinically significant reductions in their symptoms and an improved quality of life. The evidence to date is also highly suggestive that videoconferencing is comparable to face-to-face mental health care (Chakrabarti, 2015). For example, King et al. (2014) compared videoconferencing psychotherapy sessions with face-to-face counselling sessions and found that opioid-dependent individuals had responded well to treatments over the 12-week study and the two modes were equivalently effective. Further, the individuals in the videoconferencing group had high ratings of treatment satisfaction and therapeutic alliance.

In spite of positive outcomes, many practitioners and a significant research has suggested caution about the credibility and reliability of the online provision of psychotherapy (Alleman, 2002; Callahan & Inckle, 2012; Glasheen & Campbell, 2009; Lester, 2006; Robinson, 2009a; Skinner & Latchford, 2006; Wells, Mitchell, Finkelhor, & Becker-Blease, 2007). Some scholars believe it too early to be making claims regarding the long-term efficacy of online counselling for complex disorders such as depression (Dorstyn, Saniotis, & Sobhanian, 2013). These arguments are based on the belief that therapy via technology is not fully equivalent to face-to-face sessions (Barnett, 2005; DeLucia, Harold, & Tang, 2013). The main concerns address the interactivity of the session and "absence" of the counselling parties during computer-mediated psychotherapy (CMP). Taking the perspective of the clinician, therapeutic presence is the essential factor of therapeutic effectiveness (Schneider, 2015). This presence is referred as being in the moment with the client on not only physical interaction but also emotional and cognitive levels of communication (Geller & Greenberg, 2012), which the degree of such presence offered by communications media might be different than face-to-face sessions (Brahnam, 2014).

Another major area of concern is the usability of technology (McCarthy & Wright, 2004). The term usability denotes the ease with which the user can work with the technology or computerized system. Usability is the efficiency, effectiveness, and satisfaction by which users can achieve their goals with the technology (Bevan, 2001). Thus, if the user's experience includes a lack of functionality, whether a design or human factor this will impact on the communication particularly in online counselling environments (Manhal-Baugus, 2001). For example, looking at screens, or tablet or smartphone displays for extended periods of time can cause eye fatigue and may impede engagement between users during CMP sessions (Abbott, Klein, & Ciechomski, 2008). As such, Ertelt et al. (2011) have suggested studying the impact of the size of videoconferencing devices on the therapy, therapeutic relationships, and the engagement of the client. Other limits of usability in videoconferencing, may be insufficient image quality, low framing rate, flickering, and delays that make psychotherapy process unpleasant for clients and psychotherapists (Castelnuovo, Gaggioli, Mantovani, & Riva, 2003). Moreover, the angle of a webcam and the participant's distance from the video camera might also affect the relationship between psychotherapist and client. These factors can disturb eye-contact between the individuals (Manstead, Lea, & Goh, 2011).

There are also several technical issues apparent in Internet-based technologies that can impact this provision of psychotherapy negatively. Technical considerations for online providers, clinics or "lifelines" require IT support personnel and a secure web portal[4] to deliver efficient services. Difficulties with navigation and interaction due to poor quality software can also decrease the success of therapeutic communication (DeLucia et al., 2013). For example, technical glitches such as software bugs may lead to a failure or fault in the used computer program and thus can affect the efficacy of online psychotherapy (Griffiths, 2001; Mishna, Bogo, & Sawyer, 2013).

Problems with hardware are other issues which negatively impact on the effectiveness of online counselling interventions (Manhal-Baugus, 2001). The patients may be ill-equipped for interaction via Web devices, or connectivity may be poor causing delays in information transfer. Such technical barriers can be detrimental to developing a strong therapeutic alliance (Sucala, Schnur, Brackman, Constantino, & Montgomery, 2013). Fortney, Burgess, Bosworth, Booth, and Kaboli (2011) note further that data quality may impede effective counselling. For example, a low bandwidth network will provide low fidelity video and audio information and slow upload and download (Bennett & Glasgow, 2009; Meropol et al., 2011; Smith, Bensink, Armfield, Stillman, & Cattery, 2005). Similarly, low-resolution images can impede eye contact between the client and psychotherapist (Abbott et al., 2008). Abbott and colleagues (2008) also note that colour distortions can have a negative impact on videoconferencing sessions (Abbott et al., 2008). Parenthetically, the restrictive storage/memory and processing speeds of many smartphones could distort video images which can also interfere with the therapeutic alliance (Boulos, Wheeler, Tavares, & Jones, 2011).

A further issue is the lack of familiarity with technologies. Clients with little or no knowledge of computers may reject online psychotherapy out of a fear of the unknown, or they might be confused by the process (Mallen, Day, & Green, 2003). Therefore, cybertherapists must be able to help clients in solving software and technology questions. However, psychotherapists may also have low levels of computer literacy and therefore be less confident and, possibly, less effective in an online environment (Popoola & Adebowale, 2012). In text-based therapy, for instance, both parties need to be competent in conveying mental health problems and emotional states, and potentially applying emoticons (e.g., ☺) appropriately to enhance emotional engagement (Abbott et al., 2008).

Ethical and legal issues should also be included in the list of potential challenges facing online therapy (Brenes, Ingram, & Danhauer, 2011; Gamble, Boyle, & Morris, 2015; Luxton, Pruitt, & Osenbach, 2014). These include privacy and security issues. A major ethical issue is that of confirming the identity of the client, particularly when it comes to text-based communication. Clinics or 'lifelines' require IT support personnel and a secure web portal to deliver efficient services by encrypting high-risk personal data of clients and preventing them from being hacked (i.e., avoiding the ability of third parties to access the client's information). Other, related, issues include providing consent in the CMP

context (Jorm et al., 2013; Manhal-Baugus, 2001; Zack, Kraus, Stricker, & Speyer, 2010). Some argue that the identity of the therapist and client, their locations, and contact details for emergency purposes should be described in that consent form (Gamble et al., 2015). Further, some scholars maintain that it will be difficult to police practitioners' competence in computer-mediated environments (Reamer, 2013) and that accrediting bodies will have difficulty ensuring that psychotherapists are competent in delivering psychotherapy online (Chester & Glass, 2006). Therefore, the details of services provided and qualification of therapists have to be mentioned in the consent form and signed electronically or in conjunction with a hard copy. Similarly, fee arrangements to charge clients' for providing online healthcare and the health care coverage by health insurance companies should be discussed by authorities. In addition, a cybertherapist should be aware of cyber law to protect the clients' privacy and confidentiality. Given the number of potential ethical concerns, clear guidelines should be developed (Gholami-Kordkheili, Wild, & Strech, 2013; Grajales III, Sheps, Ho, Novak-Lauscher, & Eysenbach, 2014; Kramer, Mishkind, Luxton, & Shore, 2013). Table 1 outlines the general advantages

Table 1. A comprehensive outlook of advantages and disadvantages of cybertherapy

Advantages of Virtual Counselling	Disadvantages of Virtual Counselling
Privacy	Feeling of being rushed
Anonymity from family, friends and coworkers	Time gap in response between client and psychotherapist during e-mail therapy
Emotionally safe environment	Feeling of not being valued
Empowerment; equal relationship with clinician	Difficulty in expressing emotions through text-based communication
Protection from negative counsellor emotions, such as boredom or criticism	Lack of emotional connection, rapport, and empathy
Convenience/Access	Experiencing a reduction of intimacy, trust, and commitment
Cost effectiveness / Affordability	Lack of privacy
Controllability of relationship and therapy	Lack of security and confidentiality
Greater ease with self-disclosing; less awkward and intimidating than face-to-face counselling	Stigma; Concerns about being caught by spouse or employer
Disinhibition/freedom to express themselves without embarrassment or fear of judgment from clinicians	Problems with the technology (malfunctions, glitches, and hardware failures)
Ability to be completely honest and open	Sense of loss from not having nonverbal cues or the personal warmth received from face-to-face contact
Responsiveness to clients needs during all clinical interaction	Absence of verbal and nonverbal cues (facial expressions, vocal signals or body language)
Various ways to communicate (e.g., telephone or email)	Lack of effectiveness/ clinical efficacy
Avoiding social stigma	Inaccessibility of ICT resources and knowledge; technical abilities of the participants
Accessibility	Clinicians' Credibility
Flexibility	Clinicians' lack of training
Time delay for review, evaluation and decision making of therapeutic communication	Legal and Ethical issues
Fewer unnecessary transfers and relocation of one or both counselling parties	
Re-readability of materials	
Services to remote area	

and disadvantages in psychotherapy via technology. The primary content of this table is adapted from Robinson (2009a), Shiller (2009) and Centore (2006).

STAND-ALONE PLATFORMS

Stand-alone platforms are alternatives that can provide simultaneous, automated counselling. These tools aim to provide clients with the ability to identify their problematic thoughts, emotions, and behaviours without the help of a psychotherapist. In other words, they are online, open-access programs that have been designed to provide an individual with the ability to self-diagnose.

In Australia, MoodGYM[5] and E-Couch[6] are the most well-known of these technologies (Klein & Cook, 2010; Klein et al., 2014). They have been developed by the Centre for Mental Health Research at the Australian National University. Addressing the question of design, the current technologies are self-tailored treatment programs based on computational models of psychotherapy. MoodGYM, for example, was coded to provide a computer-based version of Cognitive Behaviour Therapy (CBT) with five modules including an interactive game, anxiety and depression assessments, downloadable audio-based relaxation files, a workbook, and feedback based on the assessments, each of which is thought to assist the client in the self-treatment of their issue. Similarly, E-Couch is an internet-delivered, psychotherapy platform. It provides therapy for depression, generalised anxiety, social anxiety, relationship breakdowns, and loss and grief based on a CBT method. Outside Australia, PAXonline[7] was introduced in 2010 as a web-based platform to prevent and treat anxiety disorders in the Romanian population (Miclea, Miclea, Ciuca, & Budau, 2010). Other notable platforms available globally are Beating the Blue, Down Your Drink or Fear Fighter, Living Life To the Full, Beating Bipolar, Blues Begone, Mood Control, CopingTutor, Good Days Ahead, and ODIN[8].

Along with the increase in number of stand-alone therapies, the issue relating to their applicability is an ongoing debate in psychotherapy research. On the positive side, there are suggestions that the consistent positive outcomes of these therapies might, one day, lead to the replacement of human therapists (Foroushani, Schneider, & Assareh, 2011; Green & Iverson, 2009; Kaltenthaler, Parry, Beverley, & Ferriter, 2008). Other are more modest and claim that current stand-alone platforms are 'acceptable' in treating clients' mental disorders (Cavanagh & Shapiro, 2004; Marks, Cavanagh, & Gega, 2007) and have the benefit of cost effectiveness and accessibility to clients. Others have argued that the algorithm-based responses to psychological problems of stand-alone platforms are questionable (Christensen, Griffiths, & Farrer, 2009; Tantam, 2006). This has been supported by the dropout rates for computerized self-counselling services (Marks et al., 2007). For example, a recent study showed that a large proportion of clients (74%) assigned to MoodGYM psychotherapy dropped out (Donker et al., 2013). The same study reported that only 31.8% of participants finished half or more of the MoodGYM program. This rate is similar to that reported in earlier studies (Cavanagh & Shapiro, 2004; Clarke et al., 2005; Clarke et al., 2002; O'Kearney, Kang, Christensen, & Griffiths, 2009; Proudfoot et al., 2004), and hint at the possibility that people become frustrated or disenfranchised by stand-alone platforms.

Other, seemingly, important issues include the fact the stand-alone platforms cannot offer an effective therapeutic alliance between the clinician and client (Peck, 2010). Algorithmic programs are limited to one-way communication, although multimedia may add some human-like interactions. Further, these programs have a mechanistic design that impedes engagement between the user and the program. Besides the 'click and read' style of interaction, the programs incorporate only procedural and solid therapeutic interventions. They provide programmed therapeutic tasks for the clients to run in a predetermined order, which might not be followed or might become monotonous causing the client to quit the therapy. Therefore, although the effectiveness of these platforms seems strong and promising, therapist-client relationships should be considered in evaluation because that relationship is an important factor in transmitting therapeutic activities (Peck, 2010). This online transmission

might be improved by investigating how psychotherapists act and develop reliable and valid therapeutic factors (Bachelor & Horvath, 1999).

Mobile Applications

Mobile software applications (called apps) are another group of emerging technologies. They are programs designed to run operations for various purposes on a mobile device such as smartphones or tablets. Although they are in the early stages of production, an increasing number of these apps come from to health sector (Handel, 2011; Ventola, 2014). Specifically, psychotherapy-centred apps available for what are considered to be the primary emotions (e.g., sadness; Hogan & Kerin, 2012; Marks, 2013). The main goal of these apps is to allow users to explore their moods/emotions. 'Emotion Sense', for example, records the moods of the users by means of their voice patterns or collects emotional data from text messages (Fox & Duggan, 2012; Sciences, 2013). This enables people to get an insight into their moods over a certain period of time.

However, these apps are not limited to recording and collecting data about people's emotional states. They contain a variety of strategies to assist individuals with therapy. These tools not only improve the accessibility of mental health care services beyond the clinic, but also enhance the efficiency of traditional care by providing coaching or self-help services (e.g., behaviour change management). FOCUS, for example, is a smartphone app that was developed to assist people with schizophrenia by helping them to self-manage their condition; interestingly, FOCUS has a high rate of acceptability and efficacy (Ben-Zeev et al., 2014). Other apps are based on psychological treatment methods such as Cognitive Behavioural Therapy (CBT) (e.g., eCBT, Calm[9]) or Dialectical Behaviour Therapy (DBT) (e.g., DBT Diary Card, Skills Coach[10]). These apps are designed to help people with anxiety, stress, depression and bipolar disorders.

Some mental health mobile apps attempt to conduct part of the therapeutic process. They collect statistics for the psychometric and diagnostic analyses of individuals, and have been designed for educational purposes (East & Havard, 2015). They aim to assess the wellbeing of clients and suggest possible therapeutic interventions. These technologies also enable clients to share relevant data with counsellors so that the health care professional can monitor the client's progress. NeuroAssess[11], launched in July 2013, is an example of this type of app. NeuroAssess captures information about a client's psychopathology and, using an automatic algorithm, measures the suicidal ideation of the client.

Psychology-centred applications are very useful portable programs, but they have limitations. They are similar to stand-alone platforms in that they are basically designed for one-way interaction, although there are some exceptions (see Luxton, McCann, Bush, Mishkind, and Reger (2011, p. 506). More importantly, their adequacy as therapeutic tools for serious psychological disorders is questionable. These apps generally assess, monitor, and track the intensity levels of factors (e.g., heart rate) associated with a small number of disorders (e.g., stress, anxiety, and sleep disorders) – 'Depressioncheck', for example, is an iPhone-based app of this range.

It is evident, therefore, that these tools do not provide clients with care as complex and complete as that received in face-to-face sessions. This has been noted by de Alva, Wadley, and Lederman (2015) who report dissatisfaction with applications when compared with face-to-face interventions. The participants in this study revealed that app-oriented health-tasks such as working and studying provided less support for them to deal with their life situations and reduce anxiety. It was also reported that the apps did not assist users in understanding, dealing with, or managing the real life activities of a person with mental problems.

Another limitation is associated with the recording of online and offline information relating to clients'/users' behaviours. Although the recorded/stored data enables mental health practitioners to track a user's mood and mental state, the recorded information may not be reliable due to the calibration of the sensors or devices. Similarly, problems might arise if the apps interpret this data in

place of a clinician. They might generate a generic interpretation without considering the subtleties that a clinician might deem important.

Additionally, and much like stand-alone platforms, there is the problem of protecting personal data (Luxton et al., 2011). The apps might not have been created by ethical and creditable organisations and it is possible that many non-accredited or open source apps may not have the client's best interests at heart. Not all apps are developed by authorized centres, such as 'PTSD Coach' developed by the USA's Department of Veterans' Affairs which is dependable in terms of privacy, safety, and accuracy of functioning.

Automated Self-Help Services

Other programs at the intersection of technology and mental health care are the fully automated self-help systems. Historically, debates concerning the automatized therapy date back to the 1960s with the development of 'ELIZA' (see Weizenbaum (1966)), and 'PlatoDoc' and 'MORTAN' which went live as automated therapy programs in the 1980s, or 'Dear Uncle Ezra' created in 1986 as the first web-based help service advising students at Cornell University. Based on the principles of cognitive therapy, these systems were designed to help people make decisions regarding their mental health; they were specifically designed to help clients' moderate the symptoms of depression (Granello, 2000; Selmi, Klein, Greist, Johnson, & Harris, 1982; Wagman & Kerber, 1984). It was expected at this time that artificial intelligence (AI) would replace human-to-human therapeutic interaction with a human-independent computerized environment. However, the developed programs were not successful.

With respect to technical and treatment history, debate regarding the possibility of automated psychotherapy can be generally placed at one (or the other) end of a spectrum. On one end is the full automatization of therapy. This is justified with the progress in technology and high level artificial intelligence becoming more like face-to-face therapy (Block, 2009; Newell & Simon, 1963; Turing, 1950). With this scenario, the computer becomes the psychotherapist with full treatment strategies. That said, automated therapists will require extensive databases of therapeutic and clinical knowledge, natural language processing, affective computing ability to calculate mental states via machine learning algorithms (Luxton, 2015). With current data-driven methods that are capable of mimicking, understanding and assisting animated and artificial information processing, proponents of this strong position cite successes in areas such as automated agents and avatars in virtual environments where it is claimed that disorders such as PTSD have been successfully treated (Reger, Rizzo, & Gahm, 2015).

At the other end of the spectrum is the idea that the best we can hope for are technologies that enhance communication between individuals. This weak view argues against fully automated therapy because of moral and ethical issues and technical and physical limitations such as memory capacity, low-level sensorimotor skills, and limited ability in affective and language processing (Dreyfus & Dreyfus, 2000; Dreyfus, 1992; Searle, 1992). Proponents of this view believe that automated therapists have failed in the past and will continue to fail because they cannot match a human therapist's capabilities, and have not passed the Turing test [12] (Luxton, 2015; Saygin, Cicekli, & Akman, 2003). It was also the view of the designer of ELIZA that important decisions cannot and should not be expected by computerized systems because these technologies equipped with AI techniques lack the human's cognitive qualities such as empathy and perception (Weizenbaum, 1966). In other words, because theory of mind is an essential component of humans' interactions with one another, automated psychotherapy is unlikely to succeed until artificial agents become self-aware (Vardi, 2014). If this proves to be the case, should intelligent telecommunication applications and the intelligent technologies be put aside or can they be consolidated into new premises?

VIRTUAL REALITY

The 2D space of video-based technologies is fundamentally different from the usual, three-dimensional experience of in-person therapy (Manstead et al., 2011). Some of the drawbacks of 2D spaces are that

the movements of therapy pairs (consultant and consultee) are limited relative to one another. Thus, Second Life technologies and other online virtual realities (VR)[13] have been introduced as ways of overcoming the negative influences of limited movement in 2D space.

There are different motivations that drive the widespread adoption of VR in psychotherapy. One has been the need for the collection of better information at the point of mental health servicing. To enable this, counsellors can provide stimuli to clients in virtual environments (VEs) that are similar to those in the real world (Clough & Casey, 2011). Threatening situations can be introduced safely on role-plays in VR using simulated avatars, easing the therapeutic process (Carey, 2010). That is, dangerous situations can be avoided as during the treatment of some phobias, allowing the fear to be attenuated (Riva, 2005). Virtual environments also simulate the triggers of social anxiety and provide opportunities to practise social interactions safely (Gaggioli, Gorini, & Riva, 2007) and, be observed unobtrusively by the clinician (Nagel & Anthony, 2011). The client and clinician can both use avatars to express mental problems verbally and mimic behavioural cues, while allowing the client to remain anonymous and reducing the stigma associated with psychological concerns (Quackenbush & Krasner, 2012). Virtual Reality also offers a rich medium for training and helping counsellors (Székely & Satava, 1999). Cybertherapists can practise and improve their skills by way of virtualized scenarios, clients, and clinical settings (Bennett-Levy & Perry, 2009; Kenny, Parsons, Gratch, Leuski, & Rizzo, 2007; Parsons, Buckwalter, Lange, & Kenny, 2014; Rizzo, D.Parsons, Kenny, & Buckwalter, 2012).

In light of these advantages, it is no surprise that VR is becoming increasing prevalent in therapy and is being employed by some psychotherapists (Gaggioli & Riva, 2007; Good, Gnanayutham, Sambhanthan, & Panjganj, 2013; Gregg & Tarrier, 2007; Riva, 2003; Riva, Wiederhold, & Molinari, 1998; Russ, 2012; Välimäki et al., 2012). For example, video games are being trialled as therapeutic tools in the treatment of autistic children (Fernández-Aranda et al., 2012). 'PlayMancer' is an example of a collaborative VE developed for the treatment of specific mental health issues (e.g., eating disorders) and pain rehabilitation[14] (Jiménez-Murcia et al., 2009). The authors of the game have found that patients with Impulse Control Disorder (ICD) felt comfortable using such a video game; participants' physiological and emotional reactions were attenuated by means of the reduction in their stress level. PlayMancer had also helped people with eating disorders and pain rehabilitation (Jiménez-Murcia et al., 2009). The game Pico's Adventures is another Kinect-based game which was employed to promote social initiation in children with Autism Spectrum Disorder (ASD; Malinverni et al., 2016). The early findings from field observations and video analysis have shown that children with ASD accepted the game positively and developed their social behaviours.

'Pesky Nates!!!' is a similar program that uses gaming technology. It is based on CBT and is aimed at helping children with anxiety and depression[15]. Other developments including 'SimCoach', 'Virtual Justina', 'Bravemind', and 'STRIVE' are virtual reality platforms that create life-like characters and realistic environments to provide therapeutic help. 'SimCoach', for instance, has been developed to assist military personnel and their families to alleviate mental health issues, trauma, and addiction issues (Rizzo, Forbell, et al., 2012). This prototype also assists with other issues such as the welfare of, and the economic stress on, military families. 'Virtual Justina' is another prototype designed for patients with Post Traumatic Stress Disorder (PTSD) (Kenny, Parsons, Gratch, & Rizzo, 2008). Here, real dialogue (between a patient and a clinician) is conducted between avatars (Rizzo, D.Parsons, et al., 2012). 'Virtual Justina' is also being used as a virtual medium to train psychotherapists. The trainee can either communicate with real clients via virtual mediums or apply therapeutic principles to virtual patients (Kenny, Parsons, Pataki, et al., 2008; Kenny et al., 2007).

Although virtual environments hold substantial promise, there are some challenges facing psychotherapy using VR. Complex input and output devices and the graphics and animations of VEs need to be more sophisticated to more closely simulate real clinical spaces. Also, virtual worlds need to be realistic for treating disorders such phobias (Kenny et al., 2007). These design challenges continue in spite of considerable advances in simulation. For example, avatars used in VR clinics or hospitals need to simulate more than the human body. Avatars need to be equipped with human-like

facial expressions and behavioural mannerisms which are taken for granted in face-to-face therapy sessions. Parenthetically, there is also the issue of the 'uncanny valley' whereby virtual people too closely mimic 'real' people causing disquiet or revulsion among users (see, for example, Mori, MacDorman, & Kageki, 2012; Morie, 2008; Nowak, 2015). Currently, some pilot studies have employed virtual reality equipment in treating mental disorders such as Complex Regional Pain Syndrome (CRPS) (Won et al., 2015) and social phobia (Gebara, Barros-Neto, Gertsenchtein, & Lotufo-Neto, 2016). From a clinical viewpoint, although the technologies have had positive impacts on the participants' psychological states, the virtual experience of objects, movements such as body language of others and the perception of clients' presence is not still satisfiable. It is expected that the development of virtual reality headsets and glasses such as Oculus Rift[16] may help to solve these issues (see Chang, Liu, Kang, Kao, & Chang, 2016). It is also expected that holographic telepresence be employed in psychotherapy as it can provide a live full-motion of remote users by three-dimensional (3D) videoconferencing (Hu, Baldwin, Niederberger, & Fattal, 2015). The technology will enable counselling pairs to communicate as natural as face-to-face by reconstructing, compressing and transmitting their models anywhere in the world in real time.

ASSISTANT PSYCHOTHERAPISTS

Although "immersive virtual environment(s) offer new possibilities for therapy, for example by providing realistic but not actual exposure" (Tantam, 2006, p. 419), fully automated psychotherapy is not currently possible. A significant part of this difficulty is replication of the relationship that clients form with their therapists (Duggan, 2016). Consequently, several researchers have suggested that automated psychotherapeutic systems might be better suited to acting as 'illusory therapist[s]' (Helgadóttir, Menzies, Onslow, Packman, & O'Brian, 2009a, p. 251), 'Virtual Consumer Consultant[s]' (Griffiths, 2013) or assistant therapists who enhance interactions between counselling pairs. That is, the assistant therapist acts as a coach (rather a therapist) and is equipped with self-management programs to help organise, process and progress treatment. It is proposed that assistant therapists might increase a cybertherapist's understanding of a client's mental health issues, reduce recovery time, and improve the quality of treatment (Bauer & Moessner, 2012; Howell & Muller, 2000). Assistant therapist programs can also be equipped with the technology to gather bio-sensory, behavioural, speech and/or neural data from clients to assist with correct diagnosis and therapeutic intervention (Griffiths, 2013).

There have been several assistant therapists developed that have achieved some level of success in regulating moods and attenuating depression (Both & Hoogendoorn, 2011; Both, Hoogendoorn, Klein, & Treur, 2010; Helgadóttir, Menzies, Onslow, Packman, & O'Brian, 2009b). However, and consistent with other cybertherapy tools, there are some concerns associated with assistant therapist technologies. Firstly, these technologies must be user-friendly and secure with any data kept confidential (Green & Iverson, 2009). Secondly, evidence of the validity and efficacy of the data collected is currently lacking. Further, assistant therapist technologies cannot provide corrective feedback to clients' responses (Helgadóttir et al., 2009a) and, as such, this may contribute to program dropout. To overcome this limitation, Helgadóttir et al. (2009a) suggest that client engagement should be increased in some way. They suggest providing a reminder service (e.g., reminder emails) to users, or designing task-relevant deadlines. Interestingly, the latter approach received positive feedback from clients in a study by Klein and Richards (2001). They specified time-limited access for clients in their online treatment program, and only one person in their trial dropped out.

While there is positive evidence for automated therapy (see, for example, Helgadóttir, Menzies, Onslow, Packman, & O'Brian, 2014), none of the current online 'assistant therapist' platforms adequately address all of the criteria necessary for successful online psychotherapy. Similar to stand-alone and automated therapists, it seems that the therapeutic alliance generated via online assistant therapists still lacks the productive personal connection between the clinician and client. Specifically,

the emotional engagement present in face-to-face therapy is impaired via computerized systems (Reynolds, Stiles, Bailer, & Hughes, 2013; Reynolds JR, Stiles, & Grohol, 2006). Furthermore, diagnosing disorders becomes difficult because of the lack of non-verbal and/or behavioural cues (Li, Jaladin, & Abdullah, 2013). Moreover, Bambling (2008) claims that the lack of non-verbal cues reduces the emotional proximity and cognitive interaction between the clinician and client in online platforms and, consequently, client issues were often assessed inaccurately. Currently, with this technology, it is uncertain whether it is the client who has difficulty expressing their concerns or the psychotherapist who has difficulty identifying these concerns. It also remains unclear what impact technologies have on the clinician's ability to empathise and on the eventual diagnosis. These questions point to the necessity for detailed investigations in this area.

CONCLUSION

Psychotherapy has used telecommunications technologies to deliver remote therapy for many years. In this review article, several forms of telecommunications technologies have been outlined. Initially, a short history of the telephone used in psychotherapy was provided. Then, it was demonstrated that later advancements including the Internet, text-messaging services, and videoconferencing systems created new possibilities for remote therapy. While a large number of services via these technologies have demonstrated positive outcomes, the therapeutic experience itself remains of concern. The therapeutic relationship during technology-based sessions might be influenced due to compromised clinical, technical and ethical factors.

The article also described the expanding area of computerized systems employed in psychotherapy. It was revealed that some of the mental health issues (e.g., phobias, bulimia) had been treated effectively by using virtual therapy programs. However, although several stand-alone platforms and computerized therapists appear promising, it has been argued that the most promising use of online and virtual therapy programs is data gathering to compliment treatments of a 'real' psychotherapist. The suggestion is not that computerized systems are less effective, but that they should not be dismissed by providers and designers of online healthcare programs. The validating and evaluating of human-like relationships, and particularly those between counsellors and clients, is needed to ensure best-practice in simulated environments.

The future of the profession, particularly with reference to technological advancements which have shown substantial growth concerned with the video streaming quality, will be affected by the use of videoconferencing systems. It was discussed that these systems are most promising as they can allow the therapist and client to feel as if they were present in the clinic. Virtual reality can also be used as an alternative to a great extent by enhanced graphics and design of environments and devices. There is also an exciting voyage to the cutting edge of upcoming technologies such as mobile holographical telepresence that can offer clinicians, psychotherapists, and their clients a bit of different language. These people can experience psychotherapy session, as natural as face-to-face communication. However, other than the applicability and ethical frameworks, the main question that remains to be addressed is how this possibility will be provided to the community on a large scale and affordable.

REFERENCES

Abbott, J.-A. M., Klein, B., & Ciechomski, L. (2008). Best practices in online therapy. *Journal of Technology in Human Services*, *26*(2-4), 360–375. doi:10.1080/15228830802097257

Alleman, J. R. (2002). Online counseling: The Internet and mental health treatment. *Psychotherapy (Chicago, Ill.)*, *39*(2), 199–209. doi:10.1037/0033-3204.39.2.199

Bachelor, A., & Horvath, A. (1999). The therapeutic relationship. In M. A. Hubble, B. L. Duncan, & S. D. Miller (Eds.), *The heart and soul of change: What works in therapy* (pp. 133–178). Washington, DC, US: American Psychological Association. doi:10.1037/11132-004

Badger, T., Segrin, C., Pasvogel, A., & Lopez, A. M. (2013). The effect of psychosocial interventions delivered by telephone and videophone on quality of life in early-stage breast cancer survivors and their supportive partners. *Journal of Telemedicine and Telecare*, *19*(5), 260–265. doi:10.1177/1357633X13492289 PMID:24163235

Bambling, M., King, R., Reid, W., & Wegner, K. (2008). Online counselling: The experience of counsellors providing synchronous single-session counselling to young people. *Counselling & Psychotherapy Research*, *8*(2), 110–116. doi:10.1080/14733140802055011

Barnett, J. E. (2005). Online Counseling New Entity, New Challenges. *The Counseling Psychologist*, *33*(6), 872–880. doi:10.1177/0011000005279961

Bastian, L. A., Fish, L. J., Peterson, B. L., Biddle, A. K., Garst, J., Lyna, P., & Keefe, F. J. et al. (2013). Assessment of the Impact of Adjunctive Proactive Telephone Counseling to Promote Smoking Cessation Among Lung Cancer Patients Social Networks. *American Journal of Health Promotion*, *27*(3), 181–190. doi:10.4278/ajhp.101122-QUAN-387 PMID:23286595

Bauer, S., & Moessner, M. (2012). Technology-enhanced monitoring in psychotherapy and e-mental health. *Journal of Mental Health (Abingdon, England)*, *21*(4), 355–363. doi:10.3109/09638237.2012.667886 PMID:22548363

Bee, P. E., Bower, P., Lovell, K., Gilbody, S., Richards, D., Gask, L., & Roach, P. (2008). Psychotherapy mediated by remote communication technologies: A meta-analytic review. *BMC Psychiatry*, *8*(1), 60. doi:10.1186/1471-244X-8-60 PMID:18647396

Bellafiore, D. R., Colón, Y., & Rosenberg, P. (2004). Online counseling groups. In R. Kraus, J. Zack, & G. Stricker (Eds.), *Online counseling: A handbook for mental health professionals* (pp. 197–216). San Diego, CA: Academic Press.

Ben-Zeev, D., Brenner, C. J., Begale, M., Duffecy, J., Mohr, D. C., & Mueser, K. T. (2014). Feasibility, Acceptability, and Preliminary Efficacy of a Smartphone Intervention for Schizophrenia. *Schizophrenia Bulletin*, *40*(6), 1244–1253. doi:10.1093/schbul/sbu033 PMID:24609454

Bennett, G. G., & Glasgow, R. E. (2009). The delivery of public health interventions via the Internet: Actualizing their potential. *Annual Review of Public Health*, *30*(1), 273–292. doi:10.1146/annurev.publhealth.031308.100235 PMID:19296777

Bennett-Levy, J., & Perry, H. (2009). The promise of online cognitive behavioural therapy training for rural and remote mental health professionals. *Australasian Psychiatry*, *17*(Suppl. 1), S121–S124. doi:10.1080/10398560902948126 PMID:19579124

Bennett-Levy, J., Thwaites, R., Chaddock, A., & Davis, M. (2009). Reflective practice in cognitive behavioural therapy: the engine of lifelong learning. In *Reflective practice in psychotherapy and counselling* (pp. 115-135).

Bevan, N. (2001). International standards for HCI and usability. *International Journal of Human-Computer Studies*, *55*(4), 533–552. doi:10.1006/ijhc.2001.0483

Block, N. (2009). The mind as the software of the brain. In *Science fiction and philosophy: From time travel to superintelligence* (pp. 170-185).

Both, F., & Hoogendoorn, M. (2011). Utilization of a virtual patient model to enable tailored therapy for depressed patients. *Paper presented at the Neural Information Processing*. doi:10.1007/978-3-642-24965-5_79

Both, F., Hoogendoorn, M., Klein, M. C., & Treur, J. (2010). *Computational modeling and analysis of the role of physical activity in mood regulation and depression Neural Information Processing. Theory and Algorithms* (pp. 270–281). Springer.

Boulos, M. N., Wheeler, S., Tavares, C., & Jones, R. (2011). How smartphones are changing the face of mobile and participatory healthcare: An overview, with example from eCAALYX. *Biomedical Engineering Online*, *10*(1), 24. doi:10.1186/1475-925X-10-24 PMID:21466669

Brahnam, S. (2014). Therapeutic Presence in Mediated Psychotherapy: the Uncanny Stranger in the Room. In G. Riva, J. Waterworth, & D. Murray (Eds.), *Interacting with Presence: HCI and the Sense of Presence in Computer-mediated Environments* (pp. 123–138). Warsaw, Poland: De Gruyter Open.

Brenes, G. A., Ingram, C. W., & Danhauer, S. C. (2011). Benefits and challenges of conducting psychotherapy by telephone. *Professional Psychology, Research and Practice*, *42*(6), 543–549. doi:10.1037/a0026135 PMID:22247588

Callahan, A., & Inckle, K. (2012). Cybertherapy or psychobabble? A mixed methods study of online emotional support. *British Journal of Guidance & Counselling*, *40*(3), 261–278. doi:10.1080/03069885.2012.681768

Carey, B. (2010). In Cybertherapy Avatars Assist With Healing. *New York Times*.

Casey, L. M., Joy, A., & Clough, B. A. (2013). The Impact of Information on attitudes Toward E-Mental Health Services. *Cyberpsycology, Behavior, and Scoial Netwroking*, *16*(8), 593–598. doi:10.1089/cyber.2012.0515 PMID:23679567

Castelnuovo, G., Gaggioli, A., Mantovani, F., & Riva, G. (2003). From psychotherapy to e-therapy: The integration of traditional techniques and new communication tools in clinical settings. *Cyberpsychology & Behavior*, *6*(4), 375–382. doi:10.1089/109493103322278754 PMID:14511449

Cavanagh, K., & Shapiro, D. A. (2004). Computer treatment for common mental health problems. *Journal of Clinical Psychology*, *60*(3), 239–251. doi:10.1002/jclp.10261 PMID:14981789

Centore, A. (2006). The ecounseling controversy: Advantages and disadvantages of telephone and Internet therapy. *Christian Counseling Today*, *14*(4), 26–30.

Chakrabarti, S. (2015). Usefulness of telepsychiatry: A critical evaluation of videoconferencing-based approaches. *World journal of psychiatry, 5*(3), 286-304.

Chang, Y.-J., Liu, H.-H., Kang, Y.-s., Kao, C. C., & Chang, Y.-S. (2016). Using augmented reality smart glasses to design games for cognitive training. *Proceeding of 2016 13th International Conference on Remote Engineering and Virtual Instrumentation (REV)* (pp. 252-253).

Chester, A., & Glass, C. A. (2006). Online counselling: A descriptive analysis of therapy services on the Internet. *British Journal of Guidance & Counselling*, *34*(2), 145–160. doi:10.1080/03069880600583170

Choi, I., Zou, J., Titov, N., Dear, B. F., Li, S., Johnston, L., & Hunt, C. et al. (2012). Culturally attuned Internet treatment for depression amongst Chinese Australians: A randomised controlled trial. *Journal of Affective Disorders*, *136*(3), 459–468. doi:10.1016/j.jad.2011.11.003 PMID:22177742

Chong, J., & Moreno, F. (2012). Feasibility and acceptability of clinic-based telepsychiatry for low-income Hispanic primary care patients. *Telemedicine Journal and e-Health*, *18*(4), 297–304. doi:10.1089/tmj.2011.0126 PMID:22424078

Christensen, H., Griffiths, K. M., & Farrer, L. (2009). Adherence in Internet interventions for anxiety and depression: Systematic review. *Journal of Medical Internet Research*, *11*(2), e13. doi:10.2196/jmir.1194 PMID:19403466

Chung, J. E. (2013). Social interaction in online support groups: Preference for online social interaction over offline social interaction. *Computers in Human Behavior*, *29*(4), 1408–1414. doi:10.1016/j.chb.2013.01.019

Clarke, G., Eubanks, D., Reid, C. K., OConnor, E., DeBar, L. L., Lynch, F., & Gullion, C. et al. (2005). Overcoming Depression on the Internet (ODIN)(2): A randomized trial of a self-help depression skills program with reminders. *Journal of Medical Internet Research*, *7*(2), e16. doi:10.2196/jmir.7.2.e16 PMID:15998607

Clarke, G., Reid, D. E., OConnor, E., DeBar, L. L., Kelleher, C., Lynch, F., & Nunley, S. (2002). Overcoming depression on the Internet (ODIN): A randomized controlled trial of an Internet depression skills intervention program. *Journal of Medical Internet Research*, *4*(3), e14. doi:10.2196/jmir.4.3.e14 PMID:12554545

Clough, B. A., & Casey, L. M. (2011). Technological adjuncts to enhance current psychotherapy practices: A review. *Clinical Psychology Review*, *31*(3), 279–292. doi:10.1016/j.cpr.2010.12.008 PMID:21382535

Coman, G. J., Burrows, G. D., & Evans, B. J. (2001). Telephone counselling in Australia: Applications and considerations for use. *British Journal of Guidance & Counselling*, *29*(2), 247–258. doi:10.1080/03069880124904

Copeland, B. J. (2003). *The turing test The Turing Test* (pp. 1–21). Netherlands: Springer. doi:10.1007/978-94-010-0105-2_1

Day, S. X., & Schneider, P. L. (2002). Psychotherapy using distance technology: A comparison of face-to-face, video, and audio treatment. *Journal of Counseling Psychology*, *49*(4), 499–503. doi:10.1037/0022-0167.49.4.499

de Alva, F. E. M., Wadley, G., & Lederman, R. (2015). It feels different from real life: Users' Opinions of Mobile Applications for Mental Health. *Paper presented at the Annual Meeting of the Australian Special Interest Group for Computer Human Interaction* (pp. 598-602). ACM. doi:10.1145/2838739.2838806

DeLucia, P. R., Harold, S. A., & Tang, Y.-Y. (2013). Innovation in technology-aided psychotherapy through human factors/ergonomics: Toward a collaborative approach. *Journal of Contemporary Psychotherapy*, *43*(4), 253–260. doi:10.1007/s10879-013-9238-8

Dongier, M., Tempier, R., Lalinec-Michaud, M., & Meunier, D. (1986). Telepsychiatry: Psychiatric consultation through two-way television: A controlled study. *Canadian Journal of Psychiatry*, *31*(1), 32–34. PMID:3512068

Donker, T., Bennett, K., Bennett, A., Mackinnon, A., van Straten, A., Cuijpers, P., & Griffiths, K. M. et al. (2013). Internet-Delivered Interpersonal Psychotherapy Versus Internet-Delivered Cognitive Behavioral Therapy for Adults With Depressive Symptoms: Randomized Controlled Noninferiority Trial. *Journal of Medical Internet Research*, *15*(5), e82. doi:10.2196/jmir.2307 PMID:23669884

Dorstyn, D. S., Saniotis, A., & Sobhanian, F. (2013). A systematic review of telecounselling and its effectiveness in managing depression amongst minority ethnic communities. *Journal of Telemedicine and Telecare*, *19*(6), 338–346. doi:10.1177/1357633X13501767 PMID:24163298

Dreyfus, H., & Dreyfus, S. E. (2000). *Mind over machine*. Simon and Schuster.

Dreyfus, H. L. (1992). *What computers still can't do: a critique of artificial reason*. The MIT Press.

Duggan, G. B. (2016). Applying psychology to understand relationships with technology: From ELIZA to interactive healthcare. *Behaviour & Information Technology*.

East, M. L., & Havard, B. C. (2015). Mental Health Mobile Apps: From Infusion to Diffusion in the Mental Health Social System. *JMIR Mental Health*, *2*(1), e10. doi:10.2196/mental.3954 PMID:26543907

Ertelt, T. W., Crosby, R. D., Marino, J. M., Mitchell, J. E., Lancaster, K., & Crow, S. J. (2011). Therapeutic factors affecting the cognitive behavioral treatment of bulimia nervosa via telemedicine versus face-to-face delivery. *International Journal of Eating Disorders*, *44*(8), 687–691. doi:10.1002/eat.20874 PMID:22072405

Evans, R., Halar, E., & Smith, K. (1985). Cognitive therapy to achieve personal goals: Results of telephone group counseling with disabled adults. *Archives of Physical Medicine and Rehabilitation*, *66*(10), 693–696. PMID:2932085

Farrand, P., Perry, J., & Linsley, S. (2010). Enhancing self-practice/self-reflection (SP/SR) approach to cognitive behaviour training through the use of reflective blogs. *Behavioural and Cognitive Psychotherapy*, *38*(04), 473–477. doi:10.1017/S1352465810000238 PMID:20459878

Fernández-Aranda, F., Jiménez-Murcia, S., Santamaría, J. J., Gunnard, K., Soto, A., Kalapanidas, E., & Granero, R. et al. (2012). Video games as a complementary therapy tool in mental disorders: PlayMancer, a European multicentre study. *Journal of Mental Health (Abingdon, England)*, *21*(4), 364–374. doi:10.3109/09638237.2012.664302 PMID:22548300

Fitt, S., & Rees, C. S. (2012). Metacognitive Therapy for Obsessive Compulsive Disorder By Videoconference: A Preliminary Study. *Behaviour Change*, *29*(4), 213–229. doi:10.1017/bec.2012.21

Foroushani, P. S., Schneider, J., & Assareh, N. (2011). Meta-review of the effectiveness of computerised CBT in treating depression. *BMC Psychiatry*, *11*(1), 131–137. doi:10.1186/1471-244X-11-131 PMID:21838902

Fox, S., & Duggan, M. (2012). Mobile health 2012. *Pew Research Center's Internet & American Life Project.* Retrieved from http://emr-matrix.org/wp-content/uploads/2012/2012/PIP_MobileHealth2012.pdf

Gaggioli, A., Gorini, A., & Riva, G. (2007). Prospects for the use of multiplayer online games in psychological rehabilitation. In *Virtual Rehabilitation* (pp. 131-137).

Gaggioli, A., & Riva, G. (2007). A Second Life for Telehealth? *Annual Review of Cybertherapy and Telemedicine*, *5*, 29–36.

Gamble, N., Boyle, C., & Morris, Z. A. (2015). Ethical practice in telepsychology. *Australian Psychologist*, *50*(4), 292–298. doi:10.1111/ap.12133

Gebara, C. M., Barros-Neto, T. P., Gertsenchtein, L., & Lotufo-Neto, F. (2016). Virtual reality exposure using three-dimensional images for the treatment of social phobia. *Revista Brasiliera de Psiquiatria (Sao Paulo, Brazil)*, *38*(1), 24–29. doi:10.1590/1516-4446-2014-1560 PMID:26561376

Geller, S. M., & Greenberg, L. S. (2012). *Therapeutic presence: A mindful approach to effective therapy*. American Psychological Association. doi:10.1037/13485-000

Gettings, S., Franco, F., & Santosh, P. J. (2015). Facilitating support groups for siblings of children with neurodevelopmental disorders using audio-conferencing: A longitudinal feasibility study. *Child and Adolescent Psychiatry and Mental Health*, *9*(1), 1–15. doi:10.1186/s13034-015-0041-z PMID:25866558

Gholami-Kordkheili, F., Wild, V., & Strech, D. (2013). The impact of social media on medical professionalism: A systematic qualitative review of challenges and opportunities. *Journal of Medical Internet Research*, *15*(8), e184. doi:10.2196/jmir.2708 PMID:23985172

Glasheen, K. J., & Campbell, M. A. (2009). The use of online counselling within an Australian secondary school setting: A practitioner's viewpoint. *Counselling Psychology Review*, *24*(2), 42–51.

Good, A., Gnanayutham, P., Sambhanthan, A., & Panjganj, V. (2013). HCI considerations in designing a Second Life virtual therapeutic community for the support & treatment of people with Borderline Personality Disorder. *Proceedings of the 7th Annual International Conference on Computer Science and Information Systems*, Athens.

Grajales, F. J. III, Sheps, S., Ho, K., Novak-Lauscher, H., & Eysenbach, G. (2014). Social media: A review and tutorial of applications in medicine and health care. *Journal of Medical Internet Research*, *16*(2), e13. doi:10.2196/jmir.2912 PMID:24518354

Granello, P. F. (2000). Historical context: The relationship of computer technologies and counseling. In J. W. Bloom & G. R. Walz (Eds.), *Cybercounseling and cyberlearning: Strategies and resources for the millennium* (pp. 3–16). Alexandria, VA: American Counseling Association.

Green, K. E., & Iverson, K. M. (2009). Computerized cognitive-behavioral therapy in a stepped care model of treatment. *Professional Psychology, Research and Practice*, *40*(1), 96–103. doi:10.1037/a0012847

Gregg, L., & Tarrier, N. (2007). Virtual reality in mental health. *Social Psychiatry and Psychiatric Epidemiology*, *42*(5), 343–354. doi:10.1007/s00127-007-0173-4 PMID:17431528

Griffiths, K. M. (2013). A virtual mental health community–A future scenario. *The Australian and New Zealand Journal of Psychiatry*, *47*(2), 109–110. doi:10.1177/0004867412471440 PMID:23382506

Griffiths, M. (2001). Online therapy: A cause for concern? *The Psychologist*, *14*(5), 244–248.

Haberstroh, S., Parr, G., Bradley, L., Morgan-Fleming, B., & Gee, R. (2008). Facilitating online counseling: Perspectives from counselors in training. *Journal of Counseling and Development*, *86*(4), 460–470. doi:10.1002/j.1556-6678.2008.tb00534.x

Handel, M. J. (2011). mHealth (mobile health)—using apps for health and wellness. *Explore (New York, N.Y.)*, *7*(4), 256–261. doi:10.1016/j.explore.2011.04.011 PMID:21724160

Helgadóttir, F. D., Menzies, R. G., Onslow, M., Packman, A., & OBrian, S. (2009a). Online CBT I: Bridging the Gap Between Eliza and Modern Online CBT Treatment Packages. *Behaviour Change*, *26*(04), 245–253. doi:10.1375/bech.26.4.245

Helgadóttir, F. D., Menzies, R. G., Onslow, M., Packman, A., & OBrian, S. (2009b). Online CBT II: A Phase I trial of a standalone, online CBT treatment program for social anxiety in stuttering. *Behaviour Change*, *26*(4), 254–270. doi:10.1375/bech.26.4.254

Helgadóttir, F. D., Menzies, R. G., Onslow, M., Packman, A., & OBrian, S. (2014). A standalone Internet cognitive behavior therapy treatment for social anxiety in adults who stutter: CBTpsych. *Journal of Fluency Disorders*, *41*, 47–54. doi:10.1016/j.jfludis.2014.04.001 PMID:25173456

Hogan, N. M., & Kerin, M. J. (2012). Smart phone apps: Smart patients, steer clear. *Patient Education and Counseling*, *89*(2), 360–361. doi:10.1016/j.pec.2012.07.016 PMID:22897983

Hornblow, A. R. (1986). The evolution and effectiveness of telephone counseling services. *Hospital & Community Psychiatry*, *37*(7), 731–733. PMID:3721441

Howell, S. R., & Muller, R. (2000). Computers in psychotherapy: a new prescription. Retrieved from http://www.psychology.mcmaster.ca/beckerlab/showell/ComputerTherapy.PDF

Hu, S. Y., Baldwin, J., Niederberger, A., & Fattal, D. (2015). I3. 2: Invited Paper: A Multiview 3D Holochat System. *SID Symposium Digest of Technical Papers*, *46*(1), 286-289.

Jang, Y., Chiriboga, D. A., Molinari, V., Roh, S., Park, Y., Kwon, S., & Cha, H. (2013). Telecounseling for the Linguistically Isolated: A Pilot Study With Older Korean Immigrants. *The Gerontologist*, *54*(2), 290–296. doi:10.1093/geront/gns196 PMID:23355448

Jiménez-Murcia, S., Fernández-Aranda, F., Kalapanidas, E., Konstantas, D., Ganchev, T., Kocsis, O., & Breiteneder, C. et al. (2009). Playmancer project: A serious videogame as an additional therapy tool for eating and impulse control disorders. *Studies in Health Technology and Informatics*, *144*, 163–166. PMID:19592756

Jorm, A. F., Morgan, A. J., & Malhi, G. S. (2013). The future of e-mental health. *The Australian and New Zealand Journal of Psychiatry*, *47*(2), 104–106. doi:10.1177/0004867412474076 PMID:23382504

Kaltenthaler, E., Parry, G., Beverley, C., & Ferriter, M. (2008). Computerised cognitive–behavioural therapy for depression: Systematic review. *The British Journal of Psychiatry*, *193*(3), 181–184. doi:10.1192/bjp.bp.106.025981 PMID:18757972

Kenny, P., Parsons, T., Gratch, J., & Rizzo, A. A. (2008). Evaluation of Justina: a virtual patient with PTSD. *Paper presented at the Intelligent virtual agents*. doi:10.1007/978-3-540-85483-8_40

Kenny, P., Parsons, T., Pataki, C., Pato, M., St-George, C., Sugar, J., & Rizzo, A. A. (2008). Virtual Justina: A PTSD virtual patient for clinical classroom training. *Annual Review of Cybertherapy and Telemedicine*, *6*(1), 113–118.

Kenny, P., Parsons, T. D., Gratch, J., Leuski, A., & Rizzo, A. A. (2007). Virtual patients for clinical therapist skills training. *Proceedings of the International Workshop on Intelligent Virtual Agents* (pp. 197-210). doi:10.1007/978-3-540-74997-4_19

King, R., Bambling, M., Reid, W., & Thomas, I. (2006). Telephone and online counselling for young people: A naturalistic comparison of session outcome, session impact and therapeutic alliance. *Counselling & Psychotherapy Research*, *6*(3), 175–181. doi:10.1080/14733140600874084

King, V. L., Brooner, R. K., Peirce, J. M., Kolodner, K., & Kidorf, M. S. (2014). A randomized trial of Web-based videoconferencing for substance abuse counseling. *Journal of Substance Abuse Treatment*, *46*(1), 36–42. doi:10.1016/j.jsat.2013.08.009 PMID:24035556

Klein, B., & Cook, S. (2010). Preferences for e-mental health services amongst an online Australian sample? *Sensoria: A Journal of Mind. Brain & Culture*, *6*(1), 28–39.

Klein, B., Kavanagh, D., Andrews, G., Thomas, N., Scharr, S., & Spence, S. (2014). E-mental health services in Australia 2014: current and future. Retrieved from https://emhalliance.fedehealth.org.au/wp-content/uploads/sites/42/2014/2010/e-Mental-Health-in-Australia-2014.pdf

Klein, B., & Richards, J. C. (2001). A brief internet-based treatment for panic disorder. *Behavioural and Cognitive Psychotherapy*, *29*(01), 113–117. doi:10.1017/S1352465801001138

Kramer, G. M., Mishkind, M. C., Luxton, D. D., & Shore, J. H. (2013). 6 - Managing Risk and Protecting Privacy in Telemental Health: An Overview of Legal, Regulatory, and Risk-Management Issues. In K. Myers & C. L. Turvey (Eds.), *Telemental Health* (pp. 83–107). Oxford: Elsevier. doi:10.1016/B978-0-12-416048-4.00006-3

Kraus, R., Stricker, G., & Speyer, C. (2010). *Online counseling: A handbook for mental health professionals*. Academic Press.

Lam, R. W., Lutz, K., Preece, M., Cayley, P. M., & Walker, A. B. (2011). Telephone-administered cognitive-behavioral therapy for clients with depressive symptoms in an employee assistance program: A pilot study. *Annals of Clinical Psychiatry*, *23*(1), 11–16. PMID:21318191

Laranjo, L., Arguel, A., Neves, A. L., Gallagher, A. M., Kaplan, R., Mortimer, N., . . . Lau, A. Y. (2014). The influence of social networking sites on health behavior change: a systematic review and meta-analysis. *Journal of the American Medical Informatics Association*.

Lerman, C., Hanjani, P., Caputo, C., Miller, S., Delmoor, E., Nolte, S., & Engstrom, P. (1992). Telephone counseling improves adherence to colposcopy among lower-income minority women. *Journal of Clinical Oncology*, *10*(2), 330–333. PMID:1732434

Lester, D. (2006). E-therapy: Caveats from experiences with telephone therapy. *Psychological Reports*, *99*(3), 894–896. doi:10.2466/PR0.99.3.894-896 PMID:17305208

Li, L., Jaladin, R. A. M., & Abdullah, H. S. (2013). Understanding the Two Sides of Online Counseling and their Ethical and Legal Ramifications. *Procedia: Social and Behavioral Sciences*, *103*, 1243–1251. doi:10.1016/j.sbspro.2013.10.453

Lovejoy, T. I., Demireva, P. D., Grayson, J. L., & McNamara, J. R. (2009). Advancing the practice of online psychotherapy: An application of Rogers diffusion of innovations theory. *Psychotherapy (Chicago, Ill.)*, *46*(1), 112–124. doi:10.1037/a0015153 PMID:22122574

Luxton, D. D. (2015). *Artificial Intelligence in Behavioral and Mental Health Care*. Academic Press.

Luxton, D. D., McCann, R. A., Bush, N. E., Mishkind, M. C., & Reger, G. M. (2011). mHealth for mental health: Integrating smartphone technology in behavioral healthcare. *Professional Psychology, Research and Practice*, *42*(6), 505–512. doi:10.1037/a0024485

Luxton, D. D., Pruitt, L. D., & Osenbach, J. E. (2014). Best practices for remote psychological assessment via telehealth technologies. *Professional Psychology, Research and Practice*, *45*(1), 27–35. doi:10.1037/a0034547

Malinverni, L., Mora-Guiard, J., Padillo, V., Valero, L., Hervás, A., & Pares, N. (2016). An inclusive design approach for developing video games for children with Autism Spectrum Disorder. *Computers in Human Behavior*. doi:10.1016/j.chb.2016.01.018

Mallen, M., Jenkins, I. M., Vogel, D. L., & Day, S. X. (2010). Online counselling: An initial examination of the process in a synchronous chat environment. *Counselling & Psychotherapy Research*, *11*(3), 220–227. doi:10.1080/14733145.2010.486865

Manhal-Baugus, M. (2001). E-therapy: Practical, ethical, and legal issues. *Cyberpsychology & Behavior*, *4*(5), 551–563. doi:10.1089/109493101753235142 PMID:11725648

Manstead, A. S., Lea, M., & Goh, J. (2011). Facing the future: Emotion communication and the presence of others in the age of video-mediated communication. In *Face-to-face communication over the internet: Issues, research, challenges* (pp. 144-175).

Maples, M. F., & Han, S. (2008). Cybercounseling in the United States and South Korea: Implications for counseling college students of the millennial generation and the networked generation. *Journal of Counseling and Development*, *86*(2), 178–183. doi:10.1002/j.1556-6678.2008.tb00495.x

Marcus, A. C., Cella, D., Sedlacek, S., Crawford, E. D., Crane, L. A., Garrett, K., & Gonin, R. et al. (1993). Psychosocial counseling of cancer patients by telephone: A brief note on patient acceptance of an outcall strategy. *Psycho-Oncology*, *2*(3), 209–214. doi:10.1002/pon.2960020307

Margolis, S., & Ypinazar, V. (2008). Tele-pharmacy in remote medical practice: The Royal Flying Doctor Service Medical Chest Program. *Rural and Remote Health*, 8(2). PMID:18489239

Marks, I. M., Cavanagh, K., & Gega, L. (2007). *Hands-on help: Computer-aided psychotherapy* (Vol. 49). Cambridge Univ Press.

Marks, P. (2013). App listens to your voice to judge your mood. *New Scientist*, *217*(2905), 20. doi:10.1016/S0262-4079(13)60474-1

McCarthy, J., & Wright, P. (2004). Technology as experience. *interactions, 11*(5), 42-43.

McCloy, R., & Stone, R. (2001). Virtual reality in surgery. British Medical Journal, International edition, 323(7318), 912-915.

Meropol, N. J., Daly, M. B., Vig, H. S., Manion, F. J., Manne, S. L., Mazar, C., & Zubarev, V. et al. (2011). Delivery of Internet-based cancer genetic counselling services to patients homes: A feasibility study. *Journal of Telemedicine and Telecare*, *17*(1), 36–40. doi:10.1258/jtt.2010.100116 PMID:21097566

Miclea, M., Miclea, Ş., Ciuca, A. M., & Budau, O. (2010). Computer-mediated psychotherapy. Present and prospects. A developer perspective.

Mishna, F., Bogo, M., & Sawyer, J.-L. (2013). Cyber Counseling: Illuminating Benefits and Challenges. *Clinical Social Work Journal*, *43*(2), 169–178. doi:10.1007/s10615-013-0470-1

Moorhead, S. A., Hazlett, D. E., Harrison, L., Carroll, J. K., Irwin, A., & Hoving, C. (2013). A new dimension of health care: Systematic review of the uses, benefits, and limitations of social media for health communication. *Journal of Medical Internet Research*, *15*(4), e85. doi:10.2196/jmir.1933 PMID:23615206

Moreno, F. A., Chong, J., Dumbauld, J., Humke, M., & Byreddy, S. (2012). Use of standard webcam and internet equipment for telepsychiatry treatment of depression among underserved Hispanics. *Psychiatric Services (Washington, D.C.)*, *63*(12), 1213–1217. doi:10.1176/appi.ps.201100274 PMID:23026854

Mori, M., MacDorman, K. F., & Kageki, N. (2012). The uncanny valley [from the field]. *Robotics & Automation Magazine, IEEE*, *19*(2), 98–100. doi:10.1109/MRA.2012.2192811

Morie, J. F. (2008). The Performance of the Self and Its Effect on Presence in Virtual Worlds. *Proceedings of the 11th Annual International Workshop on Presence* (pp. 265-269).

Mundt, J. C., Snyder, P. J., Cannizzaro, M. S., Chappie, K., & Geralts, D. S. (2007). Voice acoustic measures of depression severity and treatment response collected via interactive voice response (IVR) technology. *Journal of Neurolinguistics*, *20*(1), 50–64. doi:10.1016/j.jneuroling.2006.04.001 PMID:21253440

Nagel, D., & Anthony, K. (2009). Writing therapy using new technologies—The art of blogging. *Journal of Poetry Therapy*, *22*(1), 41–45. doi:10.1080/08893670802708001

Nagel, D. M., & Anthony, K. (2011). Avatar Therapy. *The Counsellors and Psychotherapists Association of New South Wales Inc.,* 3, 7-9.

Newell, A., & Simon, H. A. (1963). General Problem Solver: a program that simulates human thought. In E. A. Feigenbaum & J. Feldman (Eds.), *Computers and thought* (pp. 279–293). New York: McGraw-Hill.

Nowak, K. L. (2015). *Examining Perception and Identification in Avatar-mediated Interaction*. Hoboken, NJ, USA: Wiley-Blackwell. doi:10.1002/9781118426456.ch4

OKearney, R., Kang, K., Christensen, H., & Griffiths, K. (2009). A controlled trial of a school-based Internet program for reducing depressive symptoms in adolescent girls. *Depression and Anxiety*, *26*(1), 65–72. doi:10.1002/da.20507 PMID:18828141

Parikh, S. V., & Huniewicz, P. (2015). E-health: An overview of the uses of the Internet, social media, apps, and websites for mood disorders. *Current Opinion in Psychiatry*, *28*(1), 13–17. doi:10.1097/YCO.0000000000000123 PMID:25420193

Parsons, T., Buckwalter, J. G., Lange, B., & Kenny, P. (2014). A New Generation of Intelligent Virtual Patients for Clinical Training. *The American Behavioral Scientist.* Retrieved from http://ict.usc.edu/pubs/A%20New%20Generation%20of%20Intelligent%20Virtual%20Patients%20for%20Clinical%20Training-ABS.pdf

Peck, D. F. (2010). The therapist–client relationship, computerized self-help and active therapy ingredients. *Clinical Psychology & Psychotherapy*, *17*(2), 147–153. PMID:19946947

Pelton, D., Wangelin, B., & Tuerk, P. (2015). Utilizing Telehealth to Support Treatment of Acute Stress Disorder in a Theater of War: Prolonged Exposure via Clinical Videoconferencing. *Telemedicine Journal and e-Health*, *21*(5), 382–387. doi:10.1089/tmj.2014.0111 PMID:25764266

Persson, S. (2010). *The Royal Flying Doctor Service of Australia: Pioneering Commitment, Courage and Success* (Vol. 4). Exisle Publishing.

Phillips, V., Vesmarovich, S., Hauber, R., Wiggers, E., & Egner, A. (2001). Telehealth: Reaching out to newly injured spinal cord patients. *Public Health Reports*, *116*(Suppl. 1), 94–102. doi:10.1093/phr/116.S1.94 PMID:11889278

Popoola, B. I., & Adebowale, O. (2012). *Online Guidance and Counseling: Toward Effectively Applying Technology*. Hershey, PA: Information Science Reference (an imprint of IGI Global). doi:10.4018/978-1-61350-204-4

Proudfoot, J., Everitt, B., Shapiro, D. A., Goldberg, D., Mann, A., Tylee, A., & Gray, J. A. et al. (2004). Clinical efficacy of computerised cognitive–behavioural therapy for anxiety and depression in primary care: Randomised controlled trial. *The British Journal of Psychiatry*, *185*(1), 46–54. doi:10.1192/bjp.185.1.46 PMID:15231555

Quackenbush, D. M., & Krasner, A. (2012). Avatar Therapy: Where Technology, Symbols, Culture, and Connection Collide. *Journal of Psychiatric Practice*, *18*(6), 451–459. doi:10.1097/01.pra.0000422745.17990.be PMID:23160252

Reamer, F. G. (2013). Social Work in a Digital Age: Ethical and Risk Management Challenges. *Social Work*, *58*(2), 163–172. doi:10.1093/sw/swt003 PMID:23724579

Rees, C. S., & Maclaine, E. (2015). A Systematic Review of Videoconference-Delivered Psychological Treatment for Anxiety Disorders. *Australian Psychologist*, *50*(4), 259–264. doi:10.1111/ap.12122

Reese, R. J., Conoley, C. W., & Brossart, D. F. (2006). The attractiveness of telephone counseling: An empirical investigation of client perceptions. *Journal of Counseling and Development*, *84*(1), 54–60. doi:10.1002/j.1556-6678.2006.tb00379.x

Regan, S. (1997). Overcoming the tyranny of distance: Exploring the use of teleconferencing group counselling. *Australian Social Work*, *50*(1), 9–14. doi:10.1080/03124079708415202

Reger, G. M., Rizzo, A. A., & Gahm, G. A. (2015). Initial development and dissemination of virtual reality exposure therapy for combat-related PTSD. In M. P. Safir, H. S. Wallach, & A. Rizzo (Eds.), *Future Directions in Post-Traumatic Stress Disorder* (pp. 289–302). Springer. doi:10.1007/978-1-4899-7522-5_15

Reynolds, D. A. J. Jr, Stiles, W. B., & Grohol, J. M. (2006). An investigation of session impact and alliance in internet based psychotherapy: Preliminary results. *Counselling & Psychotherapy Research*, *6*(3), 164–168. doi:10.1080/14733140600853617

Reynolds, J. D. A. J. Jr, Stiles, W. B., Bailer, A. J., & Hughes, M. R. (2013). Impact of Exchanges and Client–Therapist Alliance in Online-Text Psychotherapy. *Cyberpsychology, Behavior, and Social Networking*, *16*(5), 370–377. doi:10.1089/cyber.2012.0195 PMID:23530546

Richards, D., & Vigano, N. (2013). Online Counseling: A Narrative and Critical Review of the Literature. *Journal of Clinical Psychology*, *69*(9), 994–1011. doi:10.1002/jclp.21974 PMID:23630010

Riva, G. (2003). Virtual environments in clinical psychology. *Psychotherapy (Chicago, Ill.)*, *40*(1-2), 68–76. doi:10.1037/0033-3204.40.1-2.68

Riva, G. (2005). Virtual reality in psychotherapy [review]. *Cyberpsychology & Behavior*, *8*(3), 220–230. doi:10.1089/cpb.2005.8.220 PMID:15971972

Riva, G., Wiederhold, B. K., & Molinari, E. (1998). *Virtual environments in clinical psychology and neuroscience: Methods and techniques in advanced patient-therapist interaction* (Vol. 58). IOS press.

Rizzo, A., Forbell, E., Lange, B., Buckwalter, J. G., Williams, J., Sagae, K., & Traum, D. (2012). SimCoach: An Online Intelligent Virtual Agent System for Breaking Down Barriers to Care for Service Members and Veterans. In Healing War Trauma: A Handbook of Creative Approaches (pp. 238-250).

Rizzo, A. D., Parsons, T., Kenny, P., & Buckwalter, J. G. (2012). Using virtual reality for clinical assessment and intervention. In Handbook of technology in psychology, psychiatry, and neurology: Theory, research, and practice (pp. 277-318).

Robinson, E. (2009a). Online counselling, therapy and dispute resolution. Australian Institute of Family Studies. *Family Relationships Quarterly,* 15. Retrieved from https://aifs.gov.au/cfca/sites/default/files/publication-documents/bp15.pdf

Robinson, E. (2009b). Telephone counselling and therapy in family relationship services. *Family Relationships Quarterly,* 13, 13-14.

Russ, D. P. (2012). Considerations for Providing Counseling Services in Second Life. *SAGE Open*, *2*(4), 1–3. doi:10.1177/2158244012465762

Satalkar, P., Shrivastava, S., & De Sousa, A. (2015). Internet-mediated psychotherapy: Are we ready for the ethical challenges? *Indian journal of medical ethics, 12*(4), 220-227.

Saygin, A. P., Cicekli, I., & Akman, V. (2003). *Turing test: 50 years later. In The Turing Test* (pp. 23–78). Springer. doi:10.1007/978-94-010-0105-2_2

Schneider, K. (2015). Presence: The core contextual factor of effective psychotherapy. *Existential Analysis*, *26*(2), 304–313.

Schultze, N.-G. (2006). Success factors in Internet-based psychological counseling. *Cyberpsychology & Behavior*, *9*(5), 623–626. doi:10.1089/cpb.2006.9.623 PMID:17034332

Sciences, E. C. U. C. A. H. (2013). Health apps for smartphones and ipads 9 th mills health symposium. Retrieved from https://www.ecu.edu/cs-dhs/ah/upload/Apps-List-Mills-2_28_13.pdf

Searle, J. R. (1992). *The rediscovery of the mind*: the MIT Press.

Selmi, P. M., Klein, M. H., Greist, J. H., Johnson, J. H., & Harris, W. G. (1982). An investigation of computer-assisted cognitive-behavior therapy in the treatment of depression. *Behavior Research Methods and Instrumentation*, *14*(2), 181–185. doi:10.3758/BF03202150

Shiller, I. (2009). Online Counselling: A Review of The Literature Retrieved from http://www.emys.on.ca/pdfs_fordownload/onlinecounselling_literaturereview.pdf

Skinner, A. E., & Latchford, G. (2006). Attitudes to counselling via the Internet: A comparison between in-person counselling clients and Internet support group users. *Counselling & Psychotherapy Research*, *6*(3), 158–163. doi:10.1080/14733140600853641

Smith, A. C., Bensink, M., Armfield, N., Stillman, J., & Cattery, L. (2005). Telemedicine and rural health care applications. *Journal of Postgraduate Medicine*, *51*(4), 286–293. PMID:16388171

Stead, L. F., Hartmann-Boyce, J., Perera, R., & Lancaster, T. (2013). Telephone counselling for smoking cessation [Review]. *Cochrane Database of Systematic Reviews*, (8), 1–134. doi:10.1002/14651858.CD002850.pub3 PMID:23934971

Sucala, M., Schnur, J. B., Brackman, E. H., Constantino, M. J., & Montgomery, G. H. (2013). Clinicians Attitudes Toward Therapeutic Alliance in E-Therapy. *The Journal of General Psychology*, *140*(4), 282–293. doi:10.108 0/00221309.2013.830590 PMID:24837821

Suler, J. R. (1997). The black hole of cyberspace. In *The psychology of cyberspace*. Retrieved from http://users.rider.edu/~suler/psycyber/blackhole.html

Suler, J. R. (2000). Psychotherapy in cyberspace: A 5-dimensional model of online and computer-mediated psychotherapy. *Cyberpsychology & Behavior*, *3*(2), 151–159. doi:10.1089/109493100315996

Suler, J. R. (2004). The online disinhibition effect. *Cyberpsychology & Behavior*, *7*(3), 321–326. doi:10.1089/1094931041291295 PMID:15257832

Swain, D. (2007). Can blogging be used to improve medication error collection as part of health informatics knowledge management. In *Creating collaborative advantage through knowledge and innovation* (pp. 301-313).

Syred, J., Naidoo, C., Woodhall, S. C., & Baraitser, P. (2014). Would you tell everyone this? Facebook conversations as health promotion interventions. *Journal of Medical Internet Research*, *16*(4), e108. doi:10.2196/jmir.3231 PMID:24727742

Székely, G., & Satava, R. M. (1999). Virtual reality in medicine. *BMJ: British Medical Journal*, *319*(7220), 1305. doi:10.1136/bmj.319.7220.1305 PMID:10559057

Tanis, M., & Postmes, T. (2007). Two faces of anonymity: Paradoxical effects of cues to identity in CMC. *Computers in Human Behavior*, *23*(2), 955–970. doi:10.1016/j.chb.2005.08.004

Tantam, D. (2006). The Machine as Psychotherapist: Impersonal communication with a machine. *Advances in Psychiatric Treatment*, *12*(6), 416–426. doi:10.1192/apt.12.6.416

Turing, A. M. (1950). Computing machinery and intelligence. *Mind*, *59*(236), 433–460. doi:10.1093/mind/LIX.236.433

Turner, C. M., Mataix-Cols, D., Lovell, K., Krebs, G., Lang, K., Byford, S., & Heyman, I. (2014). Telephone cognitive-behavioral therapy for adolescents with obsessive-compulsive disorder: a randomized controlled non-inferiority trial. *Journal of the American Academy of Child & Adolescent Psychiatry, 53*(12), 1298-1307.

Välimäki, M., Hätönen, H., Lahti, M., Kurki, M., Hottinen, A., Metsaranta, K., & Adams, C. E. (2012). *Virtual reality for treatment compliance for people with serious mental illness*. Cochrane Database Sys Rev.

Vardi, M. Y. (2014). Would Turing Have Passed the Turing Test? *Communications of the ACM*, *57*(9), 5–5. doi:10.1145/2643596

Velthoven, M., Brusamento, S., Majeed, A., & Car, J. (2013). Scope and effectiveness of mobile phone messaging for HIV/AIDS care: A systematic review. *Psychology Health and Medicine*, *18*(2), 182–202. doi:10.1080/13548506.2012.701310 PMID:22788357

Ventola, C. L. (2014). Mobile devices and apps for health care professionals: Uses and benefits. *Pharmacy and Therapeutics*, *39*(5), 356–364. PMID:24883008

Wagman, M., & Kerber, K. W. (1984). Computer-Assisted Counseling: Problems and Prospects. *Counselor Education and Supervision*, *24*(2), 142–154. doi:10.1002/j.1556-6978.1984.tb00644.x

Weizenbaum, J. (1966). ELIZA—a computer program for the study of natural language communication between man and machine. *Communications of the ACM*, *9*(1), 36–45. doi:10.1145/365153.365168

Wells, M., Mitchell, K. J., Finkelhor, D., & Becker-Blease, K. A. (2007). Online mental health treatment: Concerns and considerations. *Cyberpsychology & Behavior*, *10*(3), 453–459. doi:10.1089/cpb.2006.9933 PMID:17594270

Wiener, L. S., Spencer, E. D., Davidson, R., & Fair, C. (1993). National telephone support groups: A new avenue toward psychosocial support for HIV-infected children and their families. *Social Work with Groups*, *16*(3), 55–71. doi:10.1300/J009v16n03_05

Won, A. S., Tataru, C. A., Cojocaru, C. M., Krane, E. J., Bailenson, J. N., Niswonger, S., & Golianu, B. (2015). Two Virtual Reality Pilot Studies for the Treatment of Pediatric CRPS. *Pain Medicine*, *16*(8), 1644–1647. doi:10.1111/pme.12755 PMID:25930099

Yuen, E. K., Goetter, E. M., Herbert, J. D., & Forman, E. M. (2012). Challenges and opportunities in internet-mediated telemental health. *Professional Psychology, Research and Practice*, *43*(1), 1–8. doi:10.1037/a0025524

Zack, J., Kraus, R., Stricker, G., & Speyer, C. (2010). Legal issues for online counselors. In *Online counseling: A handbook for mental health professionals* (pp. 107-127).

Zhu, S.-H., Stretch, V., Balabanis, M., Rosbrook, B., Sadler, G., & Pierce, J. P. (1996). Telephone counseling for smoking cessation: Effects of single-session and multiple-session interventions. *Journal of Consulting and Clinical Psychology*, *64*(1), 202–211. doi:10.1037/0022-006X.64.1.202 PMID:8907100

ENDNOTES

1   http://www.samaritans.org/about-us/history-samaritans
2   http://forums.au.reachout.com/
3   http://saneforums.org/
4   see: http://fftimes.com/node/262761
5   https://moodgym.anu.edu.au
6   https://ecouch.anu.edu.au
7   https://www.paxonline.ro
8   The links for these and similar programs can be found at: https://www.beacon.anu.edu.au/service/website/browse/1/Depression
9   http://www.mymindapps.com/
10 http://www.diarycard.net/dbt-self-help/
11 http://neurobalance.com.au/
12 Alan Turing (23 June, 1912 – 7 June, 1954) was a mathematician and philosopher who proposed a thought experiment whereby a machine would be considered intelligent if a person communicating with the machine was not able to discern that it was a machine. This imitation game is discussed as a basic theoretical and practical challenge for Artificial Intelligence (see Copeland, 2003; Turing, 1950)
13 VR is defined as "a collection of technologies that allow people to interact efficiently with 3D computerized databases in real time using their natural senses and skills" (McCloy & Stone, 2001, p. 912).
14 See for more information: http://www.playmancer.eu/
15 See for more information: http://www.PeskyGnats.com/
16 See for more information: https://www.oculus.com/en-us/rift/

Ebrahim Oshni Alvandi has a PhD degree in Applied Cognitive Sciences from Monash University. Ebrahim has worked on a cognitive model of emotional agency for telecounselling on his PhD studies. Computer-human interaction, cyber-psychology and engineering psychology have been the focus of his research goal. In particular, emotions that are transferred via computer-mediated communication have been the main targets of his research. Ebrahim also has received his Master of Science degree in Philosophy of Science and Mind. In his Master degree, he has specialized in philosophy of cognitive sciences and artificial intelligence and developed a cognitive and informational modelling of emotions. Recently, Ebrahim works on computational methods and social robots for psychotherapy.

George Van Doorn's main research interest is in exploring perception. He has conducted several experiments exploring how we perceive temperature via self- and externally-generated movements, how vision and touch work together in virtual reality, how colour and temperature interact (e.g., hot is associated with red), and the influence of colours on the perception of taste (e.g., work with Charles Spence on how the colour of the mug can influence the perception of the taste of coffee). Recently, George has merged his interest in touch with illusions – which are useful in that they can tell us about errors in perception, and thus about perception itself. George and colleagues recently generated a body-swapping illusion and had people either tickle themselves or be tickled by someone else, and much of his current work is devoted to exploring PEM by incorporating sensory integration, self- and externally-generated movements, and various illusions.

Mark Symmons' fields of research interest include road safety, counselling psychology, haptics, and distance learning.