There's an App for That: Information Technology Applications for Cognitive Behavioral Practitioners

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Harnessing Power of Technology

the Behavior Therapist has been at the forefront of publishing articles about opportunities to enhance CBT with technology either as therapeutic adjuncts or stand-alone interventions (e.g., Boschen, 2009a; Boschen, 2009b; Hawkins, 1989; Russo, 1984; Smith, Bobicz, & Richard, 2003; Smith, Rothbaum, & Hodges, 1999). Compared to other orientations, CBT practitioners have a long tradition of integrating technology into practice using innovations. However, this enthusiasm has not necessarily translated into CBT therapists actually using the thousands of available Web-based and mobile applications as adjuncts to care. While our patients are using these applications to do everything from tracking their mood to therapeutic breathing, how many therapists are using these applications as treatment adjuncts with their clients? In this article, we present some useful Web-based and mobile applications that can be used as treatment adjuncts for a range of disorders. We aim to highlight the need for a paradigm shift if trained mental health practitioners want to stay competitive with the range of other individuals offering mental health and behavioral health care who are embracing these new technologies as a crucial component of their services (e.g., life coaches). As technology increasingly pervades the health-care world, we should strive to ensure that principles of scientific inquiry are applied to balance out the priority of profits in the private sector. Including the experience and knowledge of researchers and practitioners during the development and iterations of applications can be particularly beneficial for vulnerable populations with mental health disorders.

More than ever there has been a call to develop innovative ways of improving the quality and reach of psychotherapies using innovative tools such as mobile phones and smartphones in particular (Boschen, 2009a; Kazdin & Blase, 2011). The use of wireless information technology in health applications is experiencing a tremendous boom, in large part as a result of ballooning health care costs and the limitations of one-on-one therapy to meet the mental health needs of the population. In particular, mobile phone applications for health have grown very rapidly and provide opportunities to expand current care beyond the clinic. While there is a large discrepancy in home Internet access between high- and low-income

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households and ethnicities, this is not the case with mobile phone use: in fact, more Americans own a mobile phone than a computer (Pew, 2010). Smartphones are powerful devices in small mobile packages that are versatile and becoming more prevalent, with over a 50% market share and rapid yearly growth. Their processing power combined with wireless connectivity allows for streamlined data collection, transmission, and analysis.

While many developers are designing applications specifically for end users, many of these can be used by therapists as adjuncts to enhance care. This is especially important because individuals typically do not use apps often after downloading them. Among all application sales for iPhone and Android systems, only 38% are opened more than once after a month— and that drops to 4% after a year (Flurry Analytics & Estimates, 2011). It is our assumption that these numbers are even lower for mental health applications as compared to popular apps such as Angry Birds. This limited adoption by the end user highlights the need for collaborative techniques to enhance and maintain usage in vivo to improve therapy outcomes.

Evidence in Mobile Mental Health

There is growing evidence that consumers of mental health services and information are interested in gaining access to information via mobile phones. For example, in an Australian sample, 76% of people were interested in using mobile phones for mental health monitoring and self-management. Importantly, people with mental health symptoms were more interested in using such services, suggesting that there is indeed an untapped market of consumers of mental health information that could benefit from psychological interventions outside of the traditional tools of psychotherapy practice (Proudfoot et al., 2010). In another study, 98% of low-income, mostly unemployed clients in outpatient substance abuse treatment were interested in using interactive text messaging to help them maintain sobriety (Muench & Weiss, 2011). Reviews have highlighted that mobile interventions are well accepted by end users and are welcome additions to physical and mental health treatments (Aguilera & Muñoz, 2011; Cole-Lewis & Kershaw, 2010; Heron & Smyth, 2010). These interventions have the benefit of ongoing contact and assessment beyond the traditional therapeutic environment.

The research base for mobile technology applications is growing but is still limited in terms of specific applications that can be applied on a broad scale. Studies using mobile phone–based text messaging have the most research basis using CBT techniques, but even those are limited beyond feasibility studies. Evidence-based smartphone applications using behavioral and cognitive methods tend to be in development stages. These include a DBT app for borderline personality disorder (Rizvi, Dimeff, Skutch, Carroll, & Linehan, 2011), a mobile therapy application using CBT techniques (Morris et al., 2010), and an Internet and mobile intervention for depression using context sensing to identify emotional states and intervene appropriately (Burns et al., 2011). Although these applications require a broader evidence base before they are ready for implementation, they foretell future applications for moving psychotherapy beyond the one-on-one encounter.

As noted in recent reviews on mobile interventions (e.g., Riley et al., 2011), the technology is advancing so quickly that research cannot keep up with development. Although there is a limited evidence base for specific mobile mental health applications, there are basic tools that take aspects of efficacious interventions and repackage them into mobile formats. It is with these tools that therapists can generalize the therapy setting to an individual's everyday environment. In essence, mobile tools should not be considered as anything more than an improvement to ideal therapeutic intervention. From self-monitoring to reminders at specific days and times to increasing salience of the therapeutic environment, a host of existing basic tools can be put into practice by psychotherapists.

We will highlight some examples of tools available that may help cognitive and behavioral psychotherapists impart skill learning and motivation. We are not endorsing any specific applications in this article, and if we do mention a specific application it is to make a point about a feature that can probably be found in many other applications. Also, all applications we mention by name are free (or close to it) to the end user. Moreover, because of the sheer number of applications available, we highly recommend doing your own search for ones that meet your specific needs. For example, a recent review of iPhone applications for intervening with alcohol use found over 150 apps available as of February 2011 (Cohn, Hunter-Reel, Hagman, & Mitchell, 2011). However, there are a number of websites that have aggregated mental health and/ or self-tracking applications (e.g., "Happtique" or the "Quantified Self") and most applications can be found using keyword searchers in the application stores. Most important, this article is designed to make the possible uses of these tools more salient to therapists. Simply searching your app store using keywords such as *depression screening* or *sleep tracking* will reveal numerous applications from which to begin.

Self-Monitoring

Perhaps the most useful applications for cognitive-behavioral therapists are self-monitoring applications. The rapid rise of these applications has been termed the "quantified self" movement. In this section we will focus exclusively on self-monitoring via homework or self-report. There are specific applications in which individuals can track everything from food intake to sleep to mood to alcohol use. The problem with these tracking applications is they are typically user initiated, which makes their actual implementation limited without support from a therapist. There are numerous studies highlighting that self-monitoring accounts for a significant portion of the variance in behavior change outcomes (e.g., Mischie et al., 2009). These outcomes can be enhanced when a therapist is holding the patient accountable. Unlike paper-and-pencil monitoring tools that are often completed retrospectively, individuals can track their thoughts and behaviors in real time. Results are typically displayed graphically, reducing the time for the therapist to review outcomes, and graphical representations can be summed over time. This can be especially powerful to show patients progress when change is smaller than expected but still significant compared to baseline. Self-monitoring tools are perhaps the greatest asset to the cognitive-behavioral therapist because they are simple tools to enhance what we are already doing in our practices. A wonderful reference source for these tools is the quantified-self website (http://

quantifiedself.com/guide), which is designed to promote self-monitoring using self-report and automated tracking tools.

Two examples of applications that are available for mood monitoring via mobile phone are Mood 247 (www.mood247.com) and the T2 Mood Tracker. Mood247 utilizes text messaging to collect data and uploads mood data to a website. The data can be shared with a health-care provider or therapist by the patient providing a code that allows one to view mood ratings over time. In addition to mood ratings, individuals can append notes related to the mood rating, potentially adding information about thoughts, behaviors, settings, and emotions that could then be further discussed in a therapy session. The T2 Mood Tracker is a smartphone application developed by the National Center for Telehealth and Technology that allows for individuals to track their mood and emotional states. There are numerous other applications for self-reported monitoring via apps and text messages that practitioners can access (e.g., "Mood Panda"). These are relatively simple technologies that can be added to existing care, and are often more reliable than other means, such as paper and pencil. For example, when patients do not track their mood throughout the week, therapists often ask patients to recall their mood over the past week, but these data are typically inaccurate as demonstrated by numerous ecological momentary assessment studies (Shiffman, Stone, & Hufford, 2008).

Information and Screening

Aside from self-monitoring, simple information applications that patients can download to learn more about their disorder are widely available. Psychoeducation can now take place on the mobile phone while a client is in the waiting room. Typically these apps have been bundled with screening and brief feedback programs, which probably represent the largest share of the mobile mental health market. For example, a range of substance abuse applications offer validated substance abuse assessments with brief feedback that can help clients obtain objective third-party information on their disorder (Cohn et al., 2011). This can help alleviate resistance or strains to therapeutic alliance with clients who may be resistant to feedback from the therapist. Moreover, as many mental health clinicians are aware, there are numerous diagnostic reference applications specifically for use by the clinician alone, from diagnostic assistance to medication interactions.

Guided Interventions

There are also numerous applications that attempt to provide overlapping services as therapists, and specifically highlight CBT theory, such as iCBT, ICouchCBT, eCBT, CBT Referee. While we do not endorse any of these programs, CBT practitioners should be aware they exist and assess their potential (or lack of potential) to enhance care. Some applications have been developed in clinical settings and take principles of CBT and transfer them to a mobile device very specifically. The VA, in particular, has embraced the use of technology and has developed applications based on evidence-based practices designed for veterans but available to all. One such application is the PTSD Coach, available on iPhone and Android platforms. The application targets the management of PTSD with four modules: education, self-assessment, symptom management, and social support. The application is targeted

towards vets but can likely be used by others dealing with PTSD. While these applications have not been directly tested either, they were developed based on empirically supported interventions and principles, providing some foundation for their use in clinical practice.

As noted above, other intervention apps have been developed for borderline personality disorder (Rizvi et al., 2011), depression using context sensing to identify emotional states and intervene appropriately (Burns et al., 2011), and substance abuse using GPS to trigger reminders when someone may be entering an area previously associated with substance use (Gustafson et al., 2011). Aside from these applications, practitioners should be aware of the numerous applications that target specific components of CBT and may complement practice—for example, programs that target gratitude, meditation, guided relaxation, therapeutic breathing, and increasing positive emotion. However, like all self-guided change programs, the question becomes, How many times will a person use an application without therapist support?

Accessing the Capabilities Built Into the Smartphone

Aside from utilizing mobile phones, other capabilities of the phone can be used today. The multiple features of smartphones make them therapeutic gold. For example, individuals can record their feelings in vivo using the simple audio recordings or videos of themselves for later review with the therapist. These features can be especially useful for child, family, and couples therapists who need to capture real-world situations, which are rarely replicated in the therapeutic environment. Clients can place their phone on the dinner table and send the recording to their therapist to review. Additionally, with new voice recognition built into newer phones, therapists can sit with a client's mobile phone and verbally cue reminders through the week until the next session and remind them of the next appointment. The camera is already being used by numerous health/eating applications (e.g., an individual takes photos of their meals, which in turn is evaluated by a third party). A therapist can ask clients to take pictures of stressful environments or other stimuli that are relevant to treatment goals. These built-in features can also be used to enhance efficacy through feed-forward audio and video modeling; for example, a person records him- or herself successfully completing a task to be replayed later—or therapists can model appropriate behaviors for clients that can offer extra support in difficult situations through video playback.

Text Messaging

Text messaging is perhaps the most widely available mobile tool. Available on nearly all phones, text messaging can be utilized by clinicians and their entire patient population. There is more research on text messaging than any other mobile format, with appointment adherence and smoking cessation showing the most promising results. Text messages can make change goals more salient in one's natural environment. Rather than relying on the client to proactively open an application, the messages push therapeutic content. This reduces the likelihood that clients will be able to ignore change goals in the face of unhealthy environment triggers. There are several simple free messaging services in which clinicians can send one time or repeated reminders to a patient at a specific day and time. There are also more interactive text messaging systems that can be utilized in conjunction

with therapeutic goals. For example, the federal government has released "smoke-freetxt," a free SMS (short message service) program for individuals attempting to quit smoking. Additionally, SMS can be used to trigger mobile web applications and cloud-based audio and video files when our clients need extra support. Most phones also have MMS (multimedia message service) capability, where pictures of a loved one or a visual goal can be sent to patients at specific times. Not only do these applications help patients make goals more salient or track progress, but they can be used as simple appointment and homework reminders.

Passive Sensing

The most rapidly growing area of mobile health that is being embraced by the general public and that can have tremendous utility to clinicians is ambulatory personal physiological, activity, and location sensing tools (Intille, 2007), which will build on some of the examples presented earlier. Many promising applications are those that passively monitor a range of stimuli, from activity level to heart rate or galvanic skin response, using external sensors. The most basic level of mobile sensing utilizes technologies built into modern smartphones such as accelerometers, gyroscopes, and GPS. A popular application of these technologies is the detection of movement and location. It may soon be common practice for therapists to monitor the activity level of patients through smartphone accelerometers and GPS. With available applications today you can monitor the activity level of depressed patients and see whether they expanded their behavioral repertoires by engaging in new pleasant activities through GPS and even mapping. Sleep disturbances associated with a range of diagnoses can be monitored with a range of apps that track and graph sleep (e.g., sleeptracker). These applications can be combined with self-monitoring to help understand the daily correlates of poor sleep.

As shown, the clear benefit of mobile phones is the ability to capture objective data; nowhere is this more pronounced than with psychophysiological assessment. While biomonitoring typically requires additional hardware, which includes a sensor, we can now review periods when our clients were most aroused or hypervigilant with objective data and help them prepare for these situations when clear patterns are taking place. These apps will increasingly include intervention components such as notifications when an individual is aroused (e.g., through galvanic skin response, heart rate variability, etc.) to engage in stress-management techniques or, as noted earlier, alerts based on GPS or geographic information to avoid high-risk situations as is currently being implemented through the CHESS system (University of Wisconsin; Gustafson et al., 2010).

With new voice capture and analysis technologies becoming more commonplace (entering the app market soon), therapists will be able to assess the emotional tone of speech or use text recognition software to assess depressive or other symptomology (De Giacomo, L'Abate, Pennebaker, & Rumbaugh, 2010; Rude, Gortner, & Pennebaker, 2004). Newer technologies also include facial scans to determine emotion from subtle facial cues. This information could be reflected back to the individual to prompt a mood promoting action or to make them more aware of their patterns. Additionally, these data could be sent to a database and/or a provider to track the occurrence of mood state over time.

Social Support

Finally, there are a number of social networking applications to help connect individuals with similar problems or disorders and provide peer social support. These applications are typically available both through websites as well as through mobile applications. For example, SupportBuddy is an app that lets users create social support networks for specific problems, which will alert individuals in your network when one indicates he or she is not doing well. This is a perfect example of connecting individuals in a therapy group to support each other outside the clinic, which could potentially enhance cohesion and independence or simply could be used by therapists as a means to be alerted when a patient indicates they are having problems. This type of application may or may not be advised, depending on rules that therapy groups have regarding contact outside of therapy. However, support applications could potentially be used after time-limited therapy groups have concluded or with substance abuse support groups. With the rise of broadband speeds mimicking wi-fi, the quality of mobile applications and Web-based mobile content will improve, using user-friendly interactive programming, which may make the numerous Web-based support groups available to individuals 24/7.

Considerations for Practice

The range of features available via mobile devices appears to be a natural extension of the spirit of CBT and can help clinicians do their jobs more effectively and efficiently. Possibly the most important realization attained in writing this article is that the overwhelming majority of these applications are not new or novel in terms of mechanisms of change but rather they are now available for use because technology has caught up with what we know helps facilitate change. These technologies can be used with the broadest range of clientele. For example, studies have already demonstrated feasibility and acceptability utilizing SMS as a monitoring adjunct to CBT in a low-income, ethnically diverse population (Aguilera & Muñoz, 2011). These patients expressed being more aware of their mood states as well as feeling a sense of support and feeling cared for by their therapist. Rather than reducing therapeutic alliance, mobile interventions can extend the reach of therapy beyond the walls of the clinic when clients need the most support. Depp and colleagues (2010) have shown initial success using mobile self-management and between-session therapist contact with patients with severe mental illness. If mobile technology is helpful in interventions for these populations that often lack resources, it is likely that it can be disseminated in other settings. Individuals without transportation or those who live in rural settings may have access to interventions that otherwise might not be available to them.

Challenges and Limitations

Although there is interest in mobile technology information and interventions, barriers still exist. For example, some patients/clients simply may not like using mobile phones. Others may find mobile technology intrusive or cite privacy concerns (Proudfoot et al., 2010). While these barriers may reduce adoption, understanding them should also be used as an important part of maximizing adoption as well. For example, Muench and Weiss (2011) found that 40% of individuals interested in using text messaging for addiction continuing care preferred *not* receiving texts that reference drug use in the messages. These findings

require us to conduct research on how to individualize applications for our clients to suit their preferences and needs. By no means are mobile applications a panacea, but they are a potentially powerful tool to increase the impact of interventions that we know work when applied properly.

In addition to challenges from patients and clients, therapists are sometimes reluctant to implement the technology. One concern that therapists often have is added ethical responsibilities and HIPAA concerns. These are valid concerns but they should not be barriers to innovation. Security steps, such as limiting the transfer of sensitive information, using code words, ensuring the information is secure on a single phone, using passwords, and deleting messages, can be implemented. Protocols that are in place to address crises should remain in place and do not need to be supplanted by the use of technology. It is important to inform patients about how to use technology and that the use of mobile technology does not necessarily mean that a therapist will be available or monitoring messages at all times. Other safety measures could include integrating safety protocols such as texting the word "HELP" to receive information about a suicide hotline and instructions on going to the emergency room (Aguilera & Munoz, 2010). There is also the concern of increased therapist time commitment if one is constantly connected to clients via technology. However, boundaries can be set up similar to boundaries used in DBT regarding phone contact.

Finally, when we inform therapists and mental health professionals about utilizing technology, oftentimes there is concern that the technology will simply duplicate their efforts and will result in reduced treatment seeking by potential clients. We assert that such thinking does not recognize that technological applications are meant to be used to enhance care, that personal contact and real-time intervention and feedback will still be required to treat most individuals seeking in-person services. Stepped-care models using these technologies as first-line treatments are already happening and there are simply not enough individual therapists to address the unmet need for mental health problems in the U.S. and globally. Furthermore, the application of technology is improved when combined with a live, trained support (Mohr, Cuijpers, & Lehman, 2011). As Kazdin and Blase (2011) have stated, we do indeed need a paradigm shift and technology will be at the center of the shift.

The future of health information technology will be best served by allowing for multiple ways of accessing data and information. Access and individual preference will determine what best suits each person. Just as it is important to stay on top of latest developments of new evidence-based prac tices, we propose that therapists should seek to improve their current practice and contribute to the evidence base of technology and mental health. These technologies will soon be able to provide intelligent interventions based on real-time data capture, helping us understand and intervene with our clients on an exponentially different level. Our enthusiasm does not support using untested applications or abandoning the empirical process; rather, we urge practitioners and researchers to use the technology— report your experiences so that trained mental health professionals can be a crucial part of the development process to improve the application of these technologies in an evidence-based manner.

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