August 2014

A Randomized Waitlist-controlled Trial of Voice Over Internet Protocol-delivered Behavior Therapy for Chronic Tic Disorders

Emily Julia Ricketts
University of Wisconsin-Milwaukee

A RANDOMIZED WAITLIST-CONTROLLED TRIAL OF VOICE OVER INTERNET PROTOCOL-DELIVERED BEHAVIOR THERAPY FOR CHRONIC TIC DISORDERS

by

Emily J. Ricketts

A Dissertation Submitted in

Partial Fulfillment of the

Requirements for the Degree of

Doctorate of Philosophy

in Psychology

at

The University of Wisconsin-Milwaukee

August 2014

ABSTRACT

A RANDOMIZED WAITLIST-CONTROLLED TRIAL OF VOICE OVER INTERNET PROTOCOL-DELIVERED BEHAVIOR THERAPY FOR CHRONIC TIC DISORDERS

by

Emily J. Ricketts

The University of Wisconsin-Milwaukee, 2014
Under the Supervision of Bonnie Klein-Tasman, Ph.D.

Videoconferencing is efficacious, acceptable and equivalent to face to face for a range of psychotherapies, including a Comprehensive Behavioral Interventions for Tics (CBIT), but limited due to lack of portability, and restricted accessibility. An alternative is Voice over Internet Protocol (VoIP) transmission, allowing home delivery of treatment. The present study examined the preliminary efficacy, feasibility, and acceptability of CBIT-VoIP. Twenty youth (8-17) with CTDs participated in a randomized, waitlist-controlled trial of CBIT. Assessments were conducted via VoIP and internet surveys. Significantly greater reductions in total clinician-rated and parent-reported tic severity were found in the CBIT relative to the waitlist-control group, with 33.3% of those in CBIT considered treatment responders. Treatment satisfaction and the therapeutic alliance were high. Higher parent satisfaction with videoconferencing was associated with higher decreases in clinician-rated tic severity. Positive relationships were found between child computer usage at baseline and satisfaction with videoconferencing at post-assessment. VoIP was generally feasible, with some challenges due to audio and visual disruptions.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

Introduction

Chronic Tic Disorders (CTDs) are neuropsychiatric in nature and marked by sudden, repetitive involuntary motor and/or vocal tics (American Psychiatric Association; APA, 2000). Behavior therapy has been shown to be efficacious in the treatment of tics (Piacentini et al., 2010) and a viable alternative to pharmacotherapy, which often has aversive side effects (Scahill et al., 2006). Despite the benefits of behavior therapy, access to the treatment is limited for many families, as there may not be treatment providers in their area, or families may perceive the time commitment of treatment or travel distance burdensome (Woods, Conelea, & Himle, 2010). One way to increase treatment access among underserved populations is through videoconferencing (VC) technologies, allowing treatment providers and their patients to communicate directly, even when physically separated. VC has been shown to be efficacious, feasible, and acceptable when used to deliver interventions for a range of psychological disorders (Capner, 2000; Simpson, 2009). It has also been successfully used to implement behavior therapy for CTDs (Himle et al., 2012; Himle, Olufs, Himle, Tucker, & Woods, 2010).

Despite the utility of traditional VC, it has several limitations. It typically requires that patients travel to a local hospital or clinic for services. Additionally, VC equipment may be costly, difficult to access, and difficult to transport. To address these limitations, clinicians have begun to seek newer, more-accessible forms of VC to reach patients. One such alternative is web-based VC, which allows patients to be seen in their own homes, by experts, with free software downloadable software, and an inexpensive web camera. This approach can further bridge the gap between patient and treatment provider, and reduce time commitment and travel. Although there is a paucity of research examining

web-based VC-delivered psychological interventions, preliminary findings indicate they are effective, acceptable, and feasible. Therefore this modality may also be helpful in providing behavior therapy to patients with CTDs.

Background on Chronic Tic Disorders

Subsumed under the category of CTDs are Tourette Syndrome (TS) and Chronic Motor or Vocal Tic Disorder. The primary diagnostic criteria for TS are multiple motor tics and one or more vocal tics lasting for longer than one year, with a tic-free period no longer than 3 months. The distinguishing features of Chronic Motor or Vocal Tic Disorder are the presence of one or more motor tics or one or more vocal tics for more than a year (APA, 2000). The prevalence of TS ranges from .4 to 3.8% in children and adolescents (Kraft et al., 2012; Robertson, 2008). The prevalence of Chronic Motor or Vocal Tic Disorder is less clear, but estimates suggest it ranges from 1 to 4% (Khalifa & von Knorring, 2006; Scahill, Williams, Schwab-Stone, Applegate, & Leckman, 2009; Scharf, Miller, Mathews, Ben-Shlomo, 2012; Stefanoff et al., 2008). Prevalence estimates for all tic disorders in youth range from 0.03 to 17% (Knight et al., 2012). The average age of onset ranges from 5.6 to 7.6 years of age (Cubo et al., 2011; Freeman et al., 2000; Janik, Kalbarczyk, & Sitek, 2007; Leckman, 2002), and the disorder occurs more commonly in males than females (Elstner, Selai, Trimble, & Robertson, 2001; Freeman et al., 2000; Khalifa & von Knorring, 2003).

CTDs are associated with impairment in physical, psychological, social, and family functioning, in addition to overall quality of life (Conelea et al., 2011; Cooper, Robertson, & Livingston, 2003; Cutler, Murphy, Gilmour, & Heyman, 2009; Storch et al., 2007). Findings have shown that level of impairment is positively associated with tic

severity in children and adults (Conelea et al., 2011; Eddy et al., 2011) and the presence of comorbid disorders, particularly Attention Deficit Hyperactivity Disorder (ADHD), and Obsessive-Compulsive Disorder (OCD; Eddy et al., 2011). Antipsychotic medications are effective for TS, but may be associated with significant adverse side effects, including weight gain, sedation, cognitive dulling, and depressive symptoms. Continued use may also lead to neurological side effects (e.g., tardive dyskinesia, dystonia; Scahill et al., 2006). An effective non pharmacological treatment option is Habit Reversal Training (HRT; Cook & Blacher, 2007; Himle, Woods, Piacentini, & Walkup, 2006).

Description of Habit Reversal Training for Chronic Tic Disorders

In a recent review of empirical support for psychosocial treatments of CTDs, HRT has been classified as the only well-established nonpharmacological/non-surgical intervention for CTDs (Cook & Blacher, 2007; Task Force on Promotion and Dissemination of Psychological Procedures, 1995). HRT consists of awareness training, competing response training, and social support. Awareness training involves teaching the patient to detect occurrences of the tic as well as any accompanying premonitory urges. Patients are then trained to do a behavior that is incompatible with the tic (i.e., competing response) for 1 min or until the premonitory urge diminishes, each time the tic begins to occur or the patient senses the premonitory urge. Social support involves having a significant other praise correct implementation of the competing response and prompt use of the competing response if they notice the patient has had tics, but forgotten to use the competing behavior (Woods, 2001). The efficacy of HRT for children with CTDs has been reported in multiple case reports (Azrin & Nunn, 1973; Woods, Twohig, Flessner,

& Roloff, 2003), controlled single-subject experiments, open trials (Miltenberger, Fuqua, & McKinley, 1985; Woods, Miltenberger, & Lumley, 1996; Woods & Twohig, 2002), and randomized-controlled trials (RCTs; Azrin, Nunn, & Frantz, 1980; Azrin & Peterson, 1990; Deckersbach, Rauch, Buhlman, & Wilhelm, 2006; Wilhelm et al., 2003).

Effectiveness of a Comprehensive Behavioral Intervention for Tics in Children and Adults with Chronic Tic Disorders

More recently, a behavioral treatment package, blending several behavioral components including psychoeducation, HRT, function-based assessment and intervention (referring to identifying and reducing the impact of any environmental variables associated with tic exacerbation), self-monitoring, relaxation training, and behavioral rewards, has been developed (Woods et al., 2008). The efficacy of this Comprehensive Behavioral Intervention for Tics (CBIT) has been evaluated against psychoeducation and supportive psychotherapy (PST) in two separate multi-site RCTs involving 8 treatment sessions in a 10-week period in 126 children (Piacentini et al., 2010) and 122 adults (Wilhelm et al., 2012). In children, results showed 52.5% of the participants in CBIT were considered acute phase treatment responders, defined as ‘very much improved’ or ‘much improved’ on a measure of global functioning, compared to 18.5% of those in PST at the post-assessment. Significantly greater improvements in global severity were found in the CBIT group (17.6%) compared to the control group (8.1%). There were significantly greater reductions in clinician-rated tic severity in the CBIT group (30.8%) relative to the PST group (14.2%), and in clinician-rated tic-related impairment in the CBIT group (51.2%), compared to the PST group (29.9%). Treatment

gains were maintained through 6-month follow-up for 87% of treatment responders (Piacentini et al., 2010).

CBIT is also associated with improvements in psychosocial functioning in children. In a comparison of secondary psychiatric and psychosocial outcomes between CBIT and PST, no differences were found between groups. However, additional analyses showed that positive responders to CBIT showed decreases in disruptive behavior and obsessive-compulsive symptoms from baseline to 6-month follow-up, and decreases in child-reported anxiety, through 3- and 6-month follow-up. Additionally, significant decreases in problems with social adjustment in the domain of friendships were noted through 3- and 6-month follow-up (Woods et al., 2011).

In the adult trial, the treatment response rate was also significantly higher in CBIT (38.1%) relative to PST (6.8%). A 25.8% reduction in clinician-rated tic severity was noted in CBIT, compared to an 11.5% decrease in PST. There were also significantly greater reductions in clinician-rated tic-related impairment in CBIT (38.2%) relative to PST (23.3%). CBIT was associated with a 40% decrease in child-reported tic severity, compared to a 12.2% decrease in the control group. Eighty percent of the 15 available CBIT responders showed continued gains through 6-month follow-up (Wilhelm et al., 2012). Given this evidence, it is clear that when administered in traditional mental health settings, CBIT can be efficacious.

Lack of Access to Behavioral Treatment for Chronic Tic Disorders

Despite the efficacy of CBIT, many families of children with CTDs are unable to access the treatment. Findings from a national survey examining treatment utilization in children and adults with chronic tic disorders showed that 23% of families reported

barriers to access to behavior therapy that can be addressed by VC. Specifically, 3% reported that they did not have time to attend weekly therapy, 13% indicated that there were no treatment providers in their location, and 7% reported that travelling the distance needed to receive behavior therapy posed too much of a challenge (Woods et al., 2010).

Videoconference-delivery May Address Potential Barriers to Treatment Utilization

Broadly, lack of access to behavioral treatments is an issue extending beyond individuals with CTDs to the general population. eisSuch barriers to access include rural area of residence (Bird, Dempsey, & Hartley, 2001; Fox, Blank, Rovnyak, & Barnett, 2001), travel distance (Vanheusden et al., 2008), a lack of transportation (Mojtabai et al., 2011), and a lack of specialists (Eisenberg,Golberstein, & Gollust, 2007; Pepin et al., 2009). Over the years researchers have attempted to address these barriers by developing and implementing treatments incorporating computer self-help modules, phone therapy, text messaging, and email. Psychological interventions delivered via these treatment modalities have been shown to be efficacious and comparable to conventional treatment delivery (Barak, Hen, Boniel-Nissim, & Shapira, 2008; Day & Schneider, 2002).

Despite the effectiveness of such interventions, a newer technology, VC, in which treatment is delivered via a live video camera, improves upon prior technologies through the addition of a visual component. VC is particularly attractive, as patients do not need to be in the same room as the therapist, but can still see and communicate with the therapist from clinic- or home-based settings (Hilty, Marks, Urness, Yellowlees, & Nesbitt, 2004). Additionally, it connects specialists at academic or regional clinics with the patients of health care professionals in underserved areas (Nesbitt, Hilty, Kuenneth, & Siefkin, 2000). There are two main types of VC systems that have been used in treatment

settings. The first are dedicated VC systems, consisting of a single piece of equipment with a video camera designed to sit on or beside a television monitor, with an audio unit and remote control. The second are desktop VC systems, requiring a personal computer, hardware and software add-ons, a web camera, and a microphone. Both have typically transmitted audio and video through dial-up integrated services digital network (ISDN) lines (telephone lines) requiring a modem, or T1 or T3 lines (high performance telephone lines), with transmission speeds that have ranged from 128 to 512 kilobytes per second (kbps) in studies (Hilty, Luo, Morache, Marcelo, & Nesbitt, 2002; Stamm, 1998; Wood, Miller, & Hargrove, 2005). These lines were typically installed in corporate settings and allowed users to access the internet through telephone lines without missing phone calls (James, 2010; Rouse, 2005; What is My IP Address, 2012).

Effectiveness of Videoconference-delivered Psychological Interventions

VC-delivered psychological interventions have been tested for a range of disorders and chronic conditions (Capner, 2000; Gros et al., 2013; Simpson, 2009). The effectiveness of VC-delivered psychological interventions for the treatment of psychiatric disorders has been shown in case studies, pilot studies, open trials, group comparisons, and randomized-controlled trials (Capner, 2000; Hilty et al., 2013; Simpson, 2009).

Case Reports. Positive findings for VC delivered interventions have been documented in several case studies. Specifically, improvements in primary presenting symptoms and psychosocial impairment have been observed in Anorexia Nervosa (Goldfield & Boachie, 2003), Panic disorder with Agoraphobia (Cowain, 2001), pathological gambling (Oakes, Battersby, Pols, & Cromarty, 2008), and anxiety and depression (Manchanda & McLaren, 1998). Findings have also been reported in case

series. In an examination of VC-delivered Cognitive-behavioral therapy (CBT) for two patients with Bulimia Nervosa, an absence of bingeing and purging was shown at post-treatment and 1-month follow-up (Bakke, Mitchell, Wonderlich, & Erickson, 2001). Reductions in depressive symptoms in three older adults have also been found (Lazzari, Egan, & Rees, 2011).

Open Trial Designs. There have also been at least three open trials of VC for psychological disorders. An open trial of VC- and cellular phone-delivered CBT for OCD in 6 patients produced symptom reductions of 50% or greater. However, beyond the obvious open trial design, it is difficult to draw conclusions regarding VC, as cellular phones were also used (Vogel et al., 2012). In an examination of Prolonged Exposure, Cognitive Processing Therapy, and Motivational Interviewing delivered via VC for 15 sexual assault or domestic violence victims, researchers found high reductions in posttraumatic stress disorder (PTSD) symptoms (Hassija & Gray, 2011). In an open trial of CBT for depression and anxiety in 25 cancer patients, researchers noted significant reductions in anxiety and overall distress, through 1-month follow-up (Shepherd et al., 2006). These case reports and open trials establish the preliminary effectiveness of VC-delivered psychological interventions; however, the internal validity of the interventions cannot be determined due to the absence of a multiple baseline design, waitlist, or active face-to-face treatment comparison group.

Multiple Baseline Designs. At least three published studies utilized multiple baseline designs. This format increases the internal validity of the treatment outcomes, as it controls for the effects of some extraneous variables on the participants' symptoms, and involves a replicated demonstration that changes in the dependent variable are associated

with implementation of the intervention (Kazdin & Kopel, 1975). In a multiple baseline study of VC-delivered CBT for Bulimia Nervosa in six patients, the treatment resulted in significant reductions in bingeing in 50% of the sample, purging in 17%, depressive symptoms in 83%, and symptoms of borderline personality in 60% (Simpson et al., 2006). In a multiple baseline study of VC-delivered CBT across 3 patients with OCD, pre-post treatment reductions in OCD symptoms, ranging from 44% to 55%, were noted, with gains maintained at 3-month follow-up for the two participants assessed. Improvements in occupational and social functioning were noted in two of the three participants from pre- to post-treatment (Himle et al., 2006).

Non-randomized Comparisons of Videoconference- and In-person Delivery. There have also been two non-randomized comparisons of VC and in-person delivered psychological interventions. One study compared VC- and in-person delivery of exposure and response prevention therapy for PTSD. Significant decreases in PTSD symptoms, anxiety, depression, and psychosocial functioning in both treatment groups were shown, with no significant differences found between groups (Germain, Marchand, Bouchard, Drouin, & Guay, 2009). In a comparison of VC-delivered and in-person exposure therapy for PTSD significant reductions in PTSD symptoms, anxiety, depression, stress, and psychosocial functioning were found across treatment groups; however, significantly greater reductions in PTSD and depressive symptoms were found for the in-person group (Gros, Yoder, Tuerk, Lozano, and Acierno, 2011).

Researchers also compared VC- and in-person delivery of CBT in 21 participants with Panic Disorder with Agoraphobia. Significant reductions in panic and agoraphobia symptoms, anxiety, depression, and impairment were found in both groups. Gains were

maintained through 6-month follow-up. At post-treatment, those in the VC group had significantly lower panic frequency ratings relative to the in-person group; however, no differences between groups were found at 6-month follow-up (Bouchard et al., 2004).

Randomized-controlled Comparisons of Videoconference- and In-person Delivery. The efficacy of VC-delivered interventions has been established through several randomized-controlled trails, considered the gold standard for determining the presence of a causal relationship between treatment intervention and outcome (Sibbald & Roland, 1998). The first is a randomized waitlist-controlled comparison of VC-, audio, and in-person delivery of CBT for an array of mild to moderate psychiatric symptoms in a community sample of 80 participants. There were significantly greater symptom improvements in the three treatment groups compared to waitlist, but no significant differences in treatment outcome between the three treatment groups (Day & Schneider, 2002). Researchers also compared VC-delivered and in-person coping skills group therapy in 17 rural veterans with PTSD in a RCT. PTSD symptoms were not tracked, but results showed no significant differences in knowledge gained from the intervention at the post-treatment assessment (Morland, Pierce, & Wong, 2004).

Researchers compared VC-delivered and face-to-face group CBT for social and emotional difficulties in veterans with PTSD in a RCT. No significant differences in PTSD symptom severity, depression, general psychiatric functioning, and social outcomes at post and 3-month follow-up were found (Frueh et al., 2007b). In a large (N = 125) randomized controlled comparison of VC- and conventionally-delivered anger management therapy for PTSD, researchers found that participants in both groups showed marked symptom reductions. VC-delivered treatment was as good as

conventional delivery in reducing anger symptoms at post-treatment, and 3- and 6-month follow-up. Significant reductions in PTSD symptoms were found in both groups at post-treatment; however, results showed that VC was not as good as traditional delivery at reducing PTSD symptoms (Morland et al., 2010).

In the largest (N = 128) randomized-controlled comparison of VC-delivered and conventional CBT, researchers targeted those with Bulimia Nervosa and found no significant differences in abstinence from binge eating and purging at post-treatment between VC and face-to face groups. Additionally, no significant differences in binge eating episode frequency were found between groups. However, purging episodes occurred at a significantly lower frequency in the face-to-face group at 12-month follow-up. There were significantly greater decreases in eating worries, and shape concerns among individuals in the face-to-face group at post-treatment, with sustained differences through 3-month and 12-month follow-up, respectively. Overall, the authors concluded that VC-delivered CBT was generally equivalent to conventional delivery, and that differences were not clinically meaningful; however, the data suggest that face-to-face treatment resulted in significantly better treatment outcomes than VC (Mitchell et al. 2008).

Only one randomized-controlled trial of a VC-delivered psychological intervention has been performed in children. Researchers compared VC- and face-to-face delivery of CBT for 28 children with depression. Decreases in depressive symptoms were significantly greater in the VC condition compared to the in-person group – a finding the authors attributed to the novelty of VC (Nelson, Barnard, & Cain, 2003). Overall, research shows that VC-delivered psychotherapy is associated with reductions in

psychiatric symptoms. VC-delivered treatments have also been shown to be generally equivalent to face-to-face treatment in terms of outcomes.

Feasibility Issues in Videoconference-delivered Psychological Interventions

In addition to efficacy of VC-delivered psychological interventions, feasibility, referring to the capability of researchers to implement a treatment via VC, is an important factor in determining the utility of VC in providing access to psychological interventions. Of particular interest is the feasibility of technological equipment, communication, room set-up, and the ability to adapt a manualized treatment for use with VC. Few studies have addressed these issues systematically, but some qualitative information is available. From this anecdotal information, several issues emerge.

Technological Issues. Technological difficulties may occur during VC (Mitchell et al., 2008). For example there may be problems with the sound, such as an echo, or time delays in the audio transmission, leading to choppy or stilted communication (Bakke et al., 2001; Cowain, 2001; Vogel et al., 2012). For these reasons, a telephone in the room is useful in order to continue the session or reschedule if necessary (Vogel et al., 2012). The video feed may freeze or appear grainy, making the picture unclear, or may fail to appear (Bakke et al., 2001). If the video feed fails for only one person, the individual speaking to a blank screen may feel odd. However, the therapist might feel less anxious, as this allows time to review session notes (Manchanda & McLaren, 1998). If technological problems do occur, assistance from a technician may be needed (Oakes et al., 2008), but one may not always be readily available.

Audio and visual quality are influenced in part by bandwidth, which refers to the amount of data, (typically measured in bits) transmitted from a sender to a recipient over

a network in a given time frame (usually a second). Higher bandwidth allows for faster and larger data transfer over the internet, making computer programs that function through the internet run more smoothly (Lakshmanan, 2008). There is some evidence to suggest that bandwidth may play a role in patient satisfaction and outcomes. In a comparison of satisfaction of 33.6 and 512 kbps connections, 84% of participants preferred the 512 kbps per second line in terms of communication quality (Wakefield, Holman, Ray, Morse, & Kienzle, 2004). In a separate comparison, a 384 kbps per second line was associated with higher interrater reliability and higher satisfaction for the delivery of psychiatric interviews compared to a 128 kbps line (Zarate et al., 1997). Another study found significantly higher interrater reliability of psychiatric interviews at 2 megabytes per second relative to a 128 kbps connection (Yoshino et al., 2001).

On the contrary, additional research has shown that bandwidth may not actually contribute so much to satisfaction and outcomes. In one study, no significant differences in interrater reliability between psychiatric interviews conducted via VC at bandwidths of 28 and 384 kbps (Matsuura et al., 2000). Additionally, the majority of studies assessing VC-delivered psychological interventions have included lines of 128 or 384 kbps per second with reports of high satisfaction (Simpson, 2001), and research has shown that clients have reported comfort with VC at speeds as low as 56 kbps per second (Lemaire, Boudrias, & Greene, 2001). Likewise, high acceptability of VC, with respect to comfort, ease of self-expression, therapeutic relationship, and usability has been reported at speeds as low as 33 kbps per second (Chae, Park, Cho, Hong, & Cheon, 2000; Wakefield et al., 2004). In summary, when given a choice, a higher internet connection speed will likely

result in higher acceptability, and interrater reliability; however, if unavailable, lower bandwidths are adequate in terms of satisfaction and reliability.

Communication. Several communication issues may arise between the client and the therapist during VC. For example, making frequent eye contact with the client may pose a problem. Therapists will need to remember to look at the camera instead of the monitor or it will appear to the client that they are looking down instead of into their eyes (Manchanda & McLaren, 1998; Vogel et al., 2012). Additionally, video feed may dull other forms of body language, leading some therapists to account for this by exaggerating their actions, through nodding vigorously in approval or leaning into the camera, for example (Manchanda & McLaren, 1998). Also, therapists may instead rely more on verbal forms of social praise (Himle et al, 2006). With respect to patient communication, despite expectations to the contrary, they are still able to express the full spectrum of emotions via VC. Receiving treatment via VC has actually been shown to be associated with reduced patient inhibition, self-consciousness, and worry about exhibiting distress, especially when performing specific session tasks (Himle et al., 2006; Manchanda & McLaren, 1998) in certain instances.

Room Set-up. The layout of the room in which the VC equipment is located may impact VC session quality. The room housing the equipment may not be ideal for conducting therapy. For example, in many facilities, VC equipment sits in a conference room, instead of a therapy room (Mitchell et al., 2008). Such a set-up may result in frequent disruptions caused by individuals entering the room by accident, which may lead to patient perceptions of a lack of privacy (Cowain, 2001). Room lighting and chair positioning are also important for optimal session quality (Mitchell et al., 2008).

Additionally, the ideal therapist distance from the camera needs to be decided upon, and possibly adjusted depending on the session activities (Bakke et al., 2001).

Treatment Adherence. The therapist's ability to properly adhere to a treatment protocol, especially a manualized one, is another concern. For example, in exposure and response prevention for PTSD, certain procedures, including forming imaginary scenarios, practicing relaxation techniques, and being present with clients during invivo exposures can be more challenging over VC (Germain et al., 2009). In an examination of exposure and response prevention for OCD, therapists noted that extra preparation was required to ensure that stimuli were present at both the treatment site and clinic where the patient is located so that the therapist could model exposures and have the client practice. Also, therapists needed to rely more on verbal report to judge patients' anxiety. Despite these adaptations, modeling of exposures was still effective, and patients seemed more confident in their ability to complete exposures independently for homework, as they had already become accustomed to working with the therapist at a distance in sessions (Himle et al., 2006). Performing other treatments over VC may be easier. For example, in a randomized comparison of therapist adherence and competence in group VC-delivered or face-to-face CBT geared towards social and emotional impairments in veterans with PTSD, results showed no significant differences in several aspects of treatment, including the session structure, management of session time, implementation of session activities, delivery of feedback, ability to handle problems, conveyance of empathy, and development of rapport, as assessed by independent blind raters. Only one significant difference was found in therapist competence and adherence. Therapists in the VC group

were rated more positively with respect to their ability to introduce and explain a "flexibility" exercise (Frueh et al., 2007a).

Drawing and showing the client diagrams of treatment concepts, and viewing the client's homework or symptom monitoring forms may also pose a challenge for the therapist (Himle et al., 2006; Germain et al., 2009). Having a document camera or similar equipment to allow real-time images of documents to show on the patient's screen may solve this issue (Himle et al., 2006); however, many treatment sites do not have this additional equipment (Cowain, 2001). Homework could be faxed or held up to the camera but this might be less practical, depending on the set-up. Utilizing a therapist manual and patient workbook may solve some of these issues (Himle et al., 2006). Client's motivation to complete homework assignments or weekly self-report assessment measures may be lower over VC, as they may be feel therapist instructions are less official (Manchanda & McLaren, 1998). For example, in the randomized controlled comparison of VC and in-person social skills training for veterans with PTSD, results showed significantly greater adherence to the treatment, in the form of homework completion, for those in the in-person group, (Frueh et al., 2007b).

Acceptability of Videoconference-delivered Psychological Interventions

Patient Satisfaction. VC-delivered psychological interventions have been shown to be acceptable to a range of populations, with patients generally reporting high satisfaction (Grealish, Hunter, Glaze, & Potter, 2005; Nelson et al., 2003; Tuerk, Yoder, Ruggiero, Gros, & Acierno, 2010). In an examination of VC-delivered psychological services in Scotland, 9 of the 10 patients expressed satisfaction with the service. Several patients reported a preference for VC-delivered services, as they felt less embarrassed,

less threatened, and more comfortable speaking and expressing their emotions than in previous conventional treatment. Additionally some reported feeling that their privacy was more protected in this format (Simpson, Deans, & Brebner, 2001). In another study examining VC-delivered brief counseling for 13 participants, patients reported that services decreased travel costs, travel time, and lost work productivity (Bose, McLaren, Riley, & Mohammedali, 2001). In an examination of counseling for anxious and depressive symptoms in cancer patients, 92% of the sample agreed that the distance traveled for VC sessions was acceptable (Shepherd et al., 2006).

With respect to patient preferences following treatment, many have reported they would be interested in using VC again in the future (Frueh et al., 2007b; Nelson et al., 2003; Shepherd et al., 2006), and would recommend the service to others (Frueh et al., 2007b; Shepherd et al., 2006); however it is important to note that these patients did not have the opportunity to access the face-to-face treatment, making their report more biased.

Patients typically report being satisfied with the audio and visual quality of VC (Goldfield & Boachie, 2003; Hassija & Gray, 2011); however, on occasion they do report some dissatisfaction with aspects of visual (Bakke et al., 2001) or sound quality. For example, in a randomized comparison of VC and in-person CBT for depressed children, the most common complaint from a satisfaction questionnaire was that it was difficult to hear via VC, which was reported by 3 of 14 children, and 4 of 14 parents (Nelson et al., 2003).

Patients also generally appear to be comfortable with VC communication. In a multiple baseline study of CBT for Social Phobia, researchers found that comfort with

VC increased across the treatment period (Pelletier, 2006). In an assessment of VC-delivered CBT for PTSD, Germain and colleagues (2009) found that comfort with VC was high throughout treatment. In an examination of psychological services for cancer patients with anxiety and depressive symptoms, 88% of the participants indicated that they felt comfortable speaking with a psychologist via VC (Shepherd et al., 2006). In an examination of CBT for depressed children, most parents and children reported that they were not worried about using the equipment (Nelson et al., 2003).

When compared to traditional therapy, VC is typically shown to be equivalent in terms of patient satisfaction. In a randomized-controlled comparison of VC- and in-person delivered group coping skills therapy for veterans with PTSD, no significant differences in general satisfaction were found between groups (Morland et al., 2004). In a separate randomized controlled comparison of VC-delivered and face-to-face Group CBT for social and emotional difficulties in PTSD, researchers found no significant differences in satisfaction variables, excepting comfort speaking with the therapist, which was significantly higher in the in-person group (Frueh et al., 2007b).

Clinician Satisfaction. Research examining clinician satisfaction during the delivery of specific psychological interventions is relatively limited. In one study, CBT for depression and anxiety delivered via VC was found to be acceptable to the case managers performing therapy, with ratings ranging from average to much higher than average (Griffiths, Blignault, & Yellowlees, 2006). In a randomized controlled comparison of VC- and in-person delivered group coping skills therapy for PTSD, no significant differences in clinician satisfaction between groups were found (Morland et al., 2004).

Therapeutic Alliance. Therapeutic alliance refers to the relationship quality between patient and therapist (Adam & Luborsky, 1993), and it has been shown to be high in several studies of VC (Himle et al., 2006; Simpson et al., 2001). In several studies the alliance has been found to be high at treatment outset, and remain high through termination (Bouchard et al., 2004; Pelletier, 2006; Vogel et al., 2012).

In comparison to face-to-face therapy, the therapeutic alliance in VC-delivered treatment is generally equivalent (Bouchard et al., 2004). In a non-randomized comparison of VC-delivered and in-person CBT for PTSD, the therapeutic alliance increased over time, and no significant differences between groups were found (Germain, Marchand, Bouchard, Guay, & Drouin, 2010). These same findings occurred in a randomized comparison of VC- and in-person delivered CBT for Bulimia Nervosa (Ertelt et al., 2011). However, significant differences have been found between modalities. In a randomized controlled analogue study comparing VC, audio, and face-to-face CBT for a variety of mild to moderate symptoms, outside observers found significantly greater client participation when clients were not face to face with their therapist (Day & Schneider, 2002). This may be because participants feel more comfortable sharing personal information with their therapist from a distance (Simpson et al., 2001). On the contrary, in a randomized controlled comparison of VC-delivered and in-person group anger management therapy for PTSD, the therapeutic alliance was significantly higher in conventional treatment (Morland et al., 2010). Similar results were observed in a nonrandomized comparison of VC and face-to-face treatment for patients with Panic Disorder and Agoraphobia (Bouchard et al., 2004). Based on these mixed findings,

conclusions regarding the therapeutic alliance from the patient's perspective cannot be drawn.

There is a lack of research on the therapeutic alliance from the therapist's perspective. In a randomized comparison of the therapeutic alliance in VC and in-person delivered CBT for Bulimia Nervosa, the therapeutic alliance increased significantly with respect to the therapeutic bond and goals across treatment. Also, therapist ratings of all aspects of the therapeutic alliance were significantly more positive in face-to-face treatment than in VC, whereas patient ratings did not differ significantly between treatment conditions (Ertelt et al., 2011). Findings also suggest that clinicians may actually hold biases regarding how VC affects the therapeutic alliance. Rees and Stone (2005) randomized psychologists to watch and rate the same therapy session performed either in-person or via VC. Psychologists rating the VC-delivered session reported a significantly lower therapeutic alliance than those rating conventional treatment.

Telepresence. Another indicator of satisfaction that has been used less often in research is telepresence, or the degree to which patients receiving VC-delivered treatments feel they are in the same room with their therapist (Bouchard & Robillard, 2000). In an examination of CBT for PTSD, telepresence was found to be high throughout treatment (Germain et al., 2009). In a case series examining VC and cell-phone delivered CBT for OCD, researchers found that four of six participants rated treatment as quite natural (Vogel et al., 2012). In a separate case series of VC-delivered CBT for OCD, researchers found that telepresence ratings were high at treatment onset and increased from pre to post treatment (Himle et al., 2006).

Videoconference-delivered Assessment

The delivery of psychotherapy via VC raises the question of whether symptom assessment is also valid when performed over VC. Several studies have compared VC and in-person assessments. In one study the reliability of psychodiagnostic interviews delivered to 23 children over VC was examined. Although there were significant sound difficulties and some problems with the video feed at times, the interrater reliability for diagnoses and treatment recommendations was 96%. Overall, psychiatrists and participants were satisfied with VC. Children endorsed a future preference for VC, but parents and psychiatrists reported a preference for future face to face assessment (Elford et al., 2000). A lack of significant differences between VC and in-person delivery have also been shown for the administration of a structured psychodiagnostic interview to American Indians (Shore, Savin, Orton, Beals, & Manson, 2007).

The interrater reliability of symptom-specific measures has also been assessed. Kobak (2004) compared independent clinician ratings of a measure of depressive symptoms. Interrater reliability between in-person and VC settings was .88, and patient satisfaction and willingness to be interviewed via VC in the future was high (Kobak, 2004). Kobak and colleagues later performed a more rigorous test of interrater reliability. The researchers included four independent raters: two assigned to independently interview the same participants via VC, and two who independently interviewed the same participants face-to-face. Interrater reliability scores were high at .90 and .93, respectively (Kobak, Williams, & Engelhardt, 2008). In another comparison, VC- and in-person delivery of a PTSD diagnostic measure yielded interrater reliability ratings

ranging from adequate to excellent. Overall, clients were satisfied with VC, but the majority endorsed a preference for future in-person services (Porcari et al., 2009).

In another study, neuropsychological assessments were administered to 27 participants via VC and in-person. Results are similar for both modalities, although VC sessions were 7 minutes longer than face-to-face sessions on average. Participants endorsed high satisfaction with audio and visual quality, and VC overall (Kirkwood, Peck, & Bennie, 2000). Results of VC- and in-person delivery of neuropsychological assessments have also been found to be similar and satisfactory for older adults (Hildebrand, Chow, Williams, Nelson, & Waas, 2004), children and adults with early psychosis (Stain et al., 2011), and adults with intellectual disabilities (Temple, Drummond, Valiquette, & Jozsvai, 2010). An examination of neuropsychological tests delivered over VC and in-person to 32 normal volunteers, yielded high reliability for many measures, but significantly higher scores for attention and memory measures administered via VC (Jacobsen, Sprenger, Andersson, & Krogstad, 2003).

Videoconferencing as a Solution to Lack of Access to Behavior Therapy for Chronic Tic Disorders

Recently, traditional VC has been applied to CTDs. CBIT has been adapted for delivery via VC in order to aid dissemination of the treatment to underserved areas. In an initial pilot test of VC equipment in three children with TS, all showed significant reductions in tic severity following VC delivery of CBIT. Additionally the patients and their families rated the delivery method as acceptable and the therapeutic alliance strong (Himle et al., 2010).

Most recently, VC and face-to-face delivery of CBIT were compared in a RCT of 20 children with CTDs. Results showed significant pre to post reductions in clinician-rated tic severity in both groups, with mean reductions of 33% and 27% for VC and in-person groups, respectively. No significant differences in mean reductions were found between groups. Significant reductions in clinician-rated severity were also noted in both VC (28.2%) and in-person (16.6%) groups from pre to follow-up. The respective rates of treatment responders, as measured by a clinician-rated global impression (improvement) scale, were 80% and 75% in the VC and in-person groups, with no significant differences between groups. There were significant reductions in parent-reported tic severity in both VC (50%) and in-person (49%) delivery, with no significant differences between groups (Himle et al., 2012). Benchmarking results against findings in the original CBIT study showing 31% decreases in tic severity (Piacentini et al., 2010), reductions in tic severity are similar (33%) when using VC format. Additionally, both treatment modalities were rated as highly acceptable to parents and children, with no significant differences between groups. There were also no significant differences in parent and child-reported therapeutic alliance between groups (Himle et al., 2012).

Limitations of Traditional Videoconferencing

Despite its growing popularity, traditional VC does have limitations. Treatment may be restricted to the locations where the equipment was installed, and it may not be easily moved. Patients may also need to travel a distance to use the equipment, as it is typically housed at third-party clinics or universities; and clinicians may also need to travel off-site to use the equipment. Another limitation is that the technology often requires the support of specially trained personnel, who may not be easily accessible or

readily available (Hilty et al., 2002). There may be increased set up time associated with the logistics of arranging for personnel at other sites to turn the equipment on and off, and show participants into the room. New clinics often experience difficulty establishing working relationships with staff from off-site clinics, and solving recurring technological problems (Simpson, Bell, Knox, & Mitchell, 2005). Additionally, equipment and connection costs have historically been expensive to purchase and maintain (Wade, Karnon, Elshaug, & Hiller, 2010).

Web-based Videoconferencing as an Alternative to Traditional Videoconferencing

A newer alternative to traditional VC delivery is the use of Voice over Internet Protocol (VoIP) telephony or web-based VC. This technology allows users to connect over the internet through software using wired or wireless broadband connections. Wired connections require that devices be connected through cables to the internet, whereas wireless connections allow users to access the internet without the device being physically connected. Broadband generally refers to high speed internet, as it runs 10-30 times fasters than dial-up access (Hausman, Sidak, & Singer, 2001). It is commonly used to provide internet access in residential settings, but has also been adopted by some businesses where it is compatible. Subsumed under broadband are digital subscriber lines (DSL) and cable. DSL is an upgrade of ISDN, as it also transfers voice and data through telephone lines, but uses ones that are already installed. Unlike ISDN, DSL is considered to be continuously connected to the internet, and therefore does not require dial-up. Cable access is also considered continuously connected, and provides internet through the use of modem and cable wiring, originally created to transmit television signals (James, 2010; Savage & Waldman, 2005; Spencer, 2012).

VoIP software systems are divided into three main categories: those designed with a specific purpose in mind, such as performing psychotherapy (e.g., Breakthrough.com, and CaliforniaLiveVisit.com; Hoffman, 2011), high end software, including Adobe Acrobat Connect Professional, AT&T Connect, and Cisco WebEx Meeting Center, used for professional or educational purposes that require paid subscriptions and may be paired with expensive traditional VC equipment (Suduc, Bîzoi, & Filip, 2009), and free software, such as Skype©, Google Talk©, MSN Messenger Live©, ooVoo©, and FaceTime©, designed for general communication and often used for entertainment or business purposes (Fell & Kim, 2012). Free software has been integral in making VC available to the general public, as approximately 77% of U.S. households already possess a computer, and 68% use broadband internet, according to 2010 U.S. census data (Economics and Statistics Administration & National Telecommunications and Information Administration, 2011). VoIP software allows users to view and speak to one another using inexpensive web cameras with built in microphones, with the addition of headsets and/or external microphones if needed. Skype© is the most popular of several web-based VC software applications available on the internet and is easier to install and use than other systems (Garfinkel, 2005). Skype© is a peer-to-peer VoIP system, developed by Skype Technologies S.A., and now owned by Microsoft Corporation, providing free video calling, voice calling, instant messaging, and file sharing services between Skype© users (Skype Technologies, S. A., 2013).

Delivering CBIT via web-based VC has several potential advantages over traditional VC delivery. First, it benefits patients, as services may be received from the comfort of their own home computers, reducing the cost of gas mileage, and potentially

decreasing time missed from work and school to attend appointments. Additionally, many families already own web cameras and use video chat services. According to a survey of 610 Americans, 44% used video chat services. Of those who used web-based VC, 82% of them used Skype©, with FaceTime© and Google Talk© coming in second (25%) and third (20%), respectively. In regard to reasons for use, the majority (61.24%) of individuals reported using web-based VC to communicate with friends and loved ones who live far away, however a fraction of participants (3.49%) reported that they use services to communicate with a healthcare practitioner. Although this is a small percentage, approximately 75% of users reported an interest in accessing medical services via web-based VC if available, with approximately 68% of those expressing an interest in receiving counseling/therapy sessions (TokBox, 2012). Second, ISDN lines, often used in traditional VC are more expensive to purchase, harder to install, slower than broadband internet, which is considered high speed, and more suitable for desktop VC occurring in home settings (James, 2010; Spencer, 2012). Also, a web camera and access to free VoIP software is a cheaper alternative for clinics and hospitals than dedicated VC equipment, or PC hardware add-ons, or videophones, which may be costly.

Third, web-based VC benefits the clinician, as services may be provided to the client from the convenience of an office desktop or laptop computer. Clinicians may be able to work from home or be otherwise freed from the constraints posed by the physical stability of traditional VC equipment. Web-based VC also aids scheduling, as patients will no longer need to factor travel time into their appointments. Fourth, web-based VC software applications function satisfactorily at slower broadband speeds, unlike VC systems, which may not support usable audio and video connections at lower speeds

(Garfinkel, 2005). Lastly, the biggest advantage is that VoIP allows experts in a particular treatment or field to deliver a specific intervention directly. Although VC delivery provides access to treatment for those who live far away from knowledgeable treatment providers, patients may still need to drive to the nearest clinic that houses the equipment for treatment. Additionally, there is evidence to suggest that session attendance increases with home-based VC (King et al., 2009).

Psychological Interventions Delivered via Web-based Videoconferencing.

Research evaluating psychological interventions delivered via web-based VC is a limited, but fast emerging area, with several studies being published within the past few years. In a pilot open case series of Skype©-delivered CBT for insomnia and depression in five older adults (Lichstein, Scogin, Thomas, DiNapoli, Dillon, & McFadden, 2013) results were promising. Clinically meaningful improvements on all sleep indices were found at post-assessment, with maintenance or improvement of gains observed at follow-up. Additionally, a decrease from moderate depressive symptoms to normal was shown at the post-assessment, followed by a slight increase to mild symptoms at the follow-up. The therapeutic alliance was high and similar to that found in other trials. Feasibility data was limited, as only two participants provided information; however, findings showed the two patients found the treatment procedures to be clear, and helpful. They liked using the computer and felt comfortable with it, but still expressed a preference for in-person treatment. Dislikes were technological difficulties with the computer or Skype©, audio and visual delays, and challenges with interpretation of body language. Session attendance was perfect for all five participants. Homework adherence was mixed with three participants having 100% homework completion, one having 67% completion, and

one with 0%. Adherence was lower for procedures patients who perceived it as challenging or unbeneficial (Lichstein et al., 2013).

In an open trial of Skype©-delivered Acceptance-based CBT for 26 adults with Social Phobia, researchers found significant decreases in social anxiety, and significant increases in social skills from pre-treatment to 3-month follow-up. Significant increases in acceptance, defusion, and psychological flexibility, and psychosocial functioning were also found. The working alliance significantly increased throughout treatment. In regard to patient satisfaction with the therapist, 86% reported being 'completely satisfied', and 14% reported being 'mostly satisfied'. With respect to patient satisfaction with treatment, 47.6% reported being 'completely satisfied', 47.6% reported being 'mostly satisfied', and 4.8% provided 'neutral' ratings. In regard to usability, 95% of participants and 100% of therapists were completely or mostly satisfied with treatment procedures. Anecdotal information revealed patients found the ability to receive treatment at home or elsewhere convenient, and felt it was mostly easy to communicate with some connection difficulties. Also, with respect to exposures, for some they were perceived as less anxiety provoking, but still helpful. Earlier treatment sessions were associated with a greater number of technological difficulties than later sessions. Overall, sound problems occurred in 30% of sessions and visual problems occurred in 27% of sessions. In 2% of sessions, telephone calls were made instead due to sound difficulties. Those using wireless internet connections experienced greater technological difficulties than those without (Yuen et al., 2013).

In a randomized waitlist-controlled trial of Skype©-delivered ERP for 31 children with OCD, significantly lower scores on a measure of OCD symptoms, and higher scores

on a measure of global severity were found in the treatment group compared to waitlist. Specifically, mean reductions in OCD symptoms were 56.1% in the ERP group, and 12.9% in the waitlist group. Thirteen of the 16 children (81%) in the ERP group were labeled treatment responders relative to only two of the 15 children (13%) in the waitlist group. There were also significant reductions in child and parent-reported OCD-related impairment and family accommodation relative to waitlist. Parents reported high satisfaction with treatment at post. Gains were generally maintained through 3-month follow-up for those in the ERP group. Therapists reported feeling that forming a therapeutic relationship over VC was difficult with certain clients, especially those with more oppositional traits. However, no therapeutic alliance measures were used. Also, therapists felt it was harder to read nonverbal cues when evaluating the child's anxiety, forcing them to rely on parent report. However, they also felt that conducting sessions in the home enhanced generalizability of gains. One weakness is that all participants were required to drive to the study location for pre- and post-treatment assessments. With over 74% of participants living over 90 miles away, this may have increased therapy burden for some (Storch et al., 2011).

Recently, a randomized waitlist comparison of web-based videoconferencing (using eGetgoing) and in-person substance abuse counseling in 85 participants in an opioid treatment program (King, Brooner, Peirce, Kolodner, & Kidorf, 2014) was performed. Testing revealed low rates of drug-positive urine across treatment sessions in both groups with no significant differences. Patient satisfaction and the therapeutic alliance were high with no significant differences between groups. No significant differences were found between groups in session attendance; however, approximately

50% of those receiving counseling via web-based videoconferencing also received at least one face-to-face session due to technological difficulties with internet scheduling. Anecdotal information revealed participants in the videoconferencing group generally appreciated the convenience and novelty of treatment, with some complaints about technological problems (King et al., 2014).

In another recent trial, Skype©, telephone, and in-person delivery of problem-solving therapy were compared for depressed low-income homebound older adults. Clinician-rated depression was significantly lower at post-assessment for those receiving Skype© and in-person delivered treatment, relative to those receiving telephone support. Ratings were not significantly different between Skype© and in-person. Treatment acceptance was high, with slightly higher ratings in those receiving Skype© compared to those receiving in-person treatment (Choi et al., 2014). With respect to acceptance of videoconferencing, anecdotal information revealed older adults thought sessions were convenient, and attributed high satisfaction with their ability to see their therapist via video as opposed to telephone sessions. Many found the treatment exciting and novel. Some expressed frustration due to technological difficulties, and one disliked the lack of privacy in her home from prying family members (Choi, Wilson, Sirrianni, Marinucci, & Hegel, in press). The aforementioned studies provide good preliminary evidence for the effectiveness, acceptability, and feasibility of psychological interventions delivered via web-based VC.

Clinician Views of Web-based Videoconferencing. Research on clinicians' perspectives on videoconferencing is limited; however, one recent study assessed nonacademic licensed psychologists' and current and future academic psychologists'

views on telemental health, with an emphasis on web-camera based VC (Perle et al., 2013). Results showed 67.4% of survey takers felt computer-based interventions of all types were effective for treating psychological disorders, with 76.3% believing computer-based interventions are more effective for certain disorders. With respect to web-based VC interventions, psychologists were most accepting of their use for anxiety and unipolar depressive disorders, followed by trauma, substance abuse, and gender identity disorders, and lastly, bipolar disorder, schizoaffective disorder, and schizophrenia. Respondents were most approving of web-based delivery of CBT therapy over other therapies. Although generally accepting, 62% of respondents cited concerns regarding web-based VC, including little research support, privacy and confidentiality concerns, apprehension regarding potential crises, billing and licensure issues, a lack of ethics coverage, and a lack of telehealth education services (Perle et al., 2013).

Ethical Issues in Web-based Videoconferencing. One of the major ethical issues in web-based VC pertains to the maintenance of patient confidentiality. Although research on client perceptions of the safety of web-based VC is rather limited, concerns regarding network security and privacy have been endorsed by patients receiving traditional VC services (Myers, Valentine, Morganthaler, & Melzer, 2006). One concern is that web-based VC communication software is at risk for being intercepted by eavesdroppers, or allowing user information to be shared with third parties. A risk analysis of the top ten VoIP VC sites based on written policies was performed using a HIPAA compliance checklist (Watzlaf, Moeini, & Firouzan, 2010). Results showed that 60% of the sites indicated they do not listen into VC calls unless maintenance is needed, 70% claimed they do not record VC sessions, 90% reported that personal information or

session content would be provided to legal authorities upon request, 70% allowed transfer of information to third parties in foreign countries, 50% shared VC information with third parties the companies may buy or sell from, and 90% contain links to other websites that may have different privacy policies. Fifty percent of the systems used encryption, but only 30% stated their encryption blocked third party eavesdropping (Watzlaf, Moeini, Matusow, & Firouzan, 2011).

A separate study assessed the privacy, and security of the three most popular free VoIP websites, according to the perceptions of four healthcare workers who were asked to explore policy information and layout of the systems using a checklist (Watzlaf et al., 2010). On average, the raters had low confidence in the privacy of default settings, pictures taken using the systems, the prevention of access to personal information by third party websites, and foreign countries, and the accessibility of personal information by authorized users only. Additionally, the raters had low to moderate confidence in the encryption levels, and that no one would listen in on VC sessions. They were moderately confident that blocked users could not see their video sessions, and felt moderately secure with their VC options for making calls. Overall, the raters were moderately confident in the privacy and security of the VoIP system for use in a therapy session with a client (Watzlaf, & Ondich, 2012).

Unfortunately, but understandably, the two aforementioned studies do not match findings regarding security and privacy to specific VoIP systems. However, practice guidelines to address issues in the delivery of therapy via VoIP are beginning to emerge, and they recommend using the HIPAA checklist to check the compliance of VoIP systems of interest, forming a legal and health professionals team to assess the

appropriateness of VoIP systems of interest, remaining up to date on privacy regulations, educating and training therapists on privacy and security related issues, developing a thorough informed consent explaining the web-based VC procedures, having a procedure in place for handling any incidents that may occur, following the appropriate protections to ensure information security, including using special passwords for VC, making sure the computer has virus protection, and confirming the patient's identity (Watzlaf et al., 2010).

Ensuring that web-based VC systems are compliant with the privacy and security rules of government legislation, including the Health Insurance Portability and Accountability Act (HIPAA, 1996), and the Health Information Technology for Economic and Clinical Health Act (HITECH, 2009) is also an issue. HIPAA mandates that patients may control the use of their protected health information in electronic, paper, and oral formats, and that protections should be in place to ensure the confidentiality of electronic protected health information (Dwyer, Weaver, & Hughes, 2004). The HITECH act was developed to improve the healthcare system's use of health information technology. The privacy and security rules of the HITECH act were formed to enhance those set forth by HIPAA. It clarifies and expands upon rules governing patient control over their private information, protections against breaches of confidentiality, and penalties for failing to follow the rules (Stark, 2010).

Many VoIP sites have not made an official statement regarding their HIPAA compliance. For example, one of the most popular of the free VoIP systems, Skype©, refuses to declare they are HIPAA compliant or sign a business associate agreement with HIPAA, which is a prerequisite for official HIPAA compliance to be granted. Hence,

Skype© presently does not make public, information regarding security breaches or findings from audits (HIPAA Compliance IT, 2011). Despite these issues, recent research has shown that Skype© uses 256-bit encryption to secure audio and video transmission, which offers high security (higher than the industry standard of 128-bit encryption, which offers medium level security). In 2003, the U.S. National Security Agency determined that out of three AES key lengths (128-bit, 192-bit, and 256-bit) the 256-bit key length is strong enough to protect classified information at the top security level (Medien et al., 2010). This is also higher than that (AES 128-bit encryption) used in the trials of VC delivered behavior therapy for tics (Himle et al., 2010; 2012).

Another controversial ethical issue in web-based VC pertains to whether the psychotherapist is able to assist clients in the event of an emergency situation. Specifically, the proper protocol to follow with a client experiencing suicidal ideation or intent is a major concern. In general, guidelines suggest the therapist should address this by specifying that messages sent in an emergency may not be received, and listing alternatives, including a direct phone number for the therapist, an answering service or local health care provider. Therapists should be sure to obtain the telephone number of the local health care provider and release of information to directly contact the provider in an emergency situation (Fitzgerald, Hunter, Hadjistavropoulos, & Koocher, 2010; Hsiung, 2001). Recent research has shown that suicidality can be managed successfully in home-based telehealth (Gros, Veronee, Strachan, Rugiero, & Acierno, 2011).

An overarching issue is informed consent, as patients should be warned of all potential benefits and disadvantages of receiving treatment via web-based VC. Clients should certainly be informed of the limits of confidentiality and privacy, and the protocol

to follow in the event of an emergency; however, according to ethical guidelines for internet-based mental health services, communication procedures and problems, and provisions regarding the therapist's privacy should be mentioned (Hsiung, 2001).

Legal and Administrative Issues in Web-based Videoconferencing. There are legal and administrative issues to consider when delivering psychological treatments via web-based VC, including licensure, insurance reimbursement, and liability. First, in many states treating an out-of-state client via VC is prohibited, or may require special, temporary approval from the licensing board of the patient's state (DeAngelis, 2012). In these instances, web-based VC addresses the barrier to treatment access of travel distance only for those residing within the state. This is problematic, especially for specialists who live in cities close to state borders, as it limits the number of patients they can help. As of March 2010, 41 states permitted VC to consumers in their state from across state lines; however, it is unclear to what extent these laws extend to web-based VC. In all states, fines and/or imprisonment may be incurred for failure to follow these laws (American Psychological Association, 2010). In states where out-of-state treatment is allowed, determining which state's legal system should govern services is a challenge (Fitzgerald et al., 2010).

An additional barrier to the growth of web-based VC for mental health services is a lack of insurance reimbursement. Presently, 26 states either offer reimbursement for VC services through select insurance companies, or have passed laws mandating insurance reimbursement for VC (AMD Global Telemedicine Inc., 2012). However, many insurance companies restrict the forms of VC they will reimburse, possibly excluding web-based VC, particularly Skype©. Additionally, in most of the states offering coverage,

reimbursement is typically reserved for services provided by psychiatrists and clinical psychologists, except for in Utah, where other mental health providers may receive reimbursement (McGinty, Saeed, Simmons, Yildirim, 2006). Presently, this may result in web-based VC being a less practical option for treatment providers, and a less attractive option for their patients, as they may need to pay out of pocket (Hilty, Cobb, Neufeld, Bourgeois, & Yellowlees, 2008). Nevertheless, use of web-based VC is growing among psychotherapists, and it is expected that insurance reimbursement will expand accordingly over time. Another issue pertaining to insurance is the liability of the clinician in the event of an incident. Clinicians practicing web-based VC will need to ensure that therapy via this modality is covered by their liability insurance provider, as companies offering flexible coverage are limited. Coverage for web-based VC delivered to those outside of state boundaries should be confirmed in the event it is needed (Fitzgerald et al., 2010).

Technological Issues in Web-based Videoconferencing. There are several technological issues that can influence the sound and visual quality of VoIP services. VoIP may be used over the public internet or a private or semi-private network, such as one used to connect computers in an office building. If used over the public internet, the quality of the connection will be poorer than through a private network (TalkPath LLC, 2012). Bandwidth also affects performance quality, especially for those receiving internet through a cable service provider. Cable service is associated with constant bandwidth fluctuations within a specified range, depending on the number of users within a given region (De Cicco, Mascolo, & Palmisano, 2011; Meer, 2012). Several features of the computer, including the operating system, processor speed, RAM (random access

memory), and hard drive disk space available can influence how well VoIP runs (Ramirez, 2011). Wireless internet networks can exacerbate technological and security issues associated with using VoIP over wired networks (Cardenete-Suriol, Mangues-Bafalluy, Masó, & Gorricho, 2007; Mehta & Udani, 2001; Yuen et al., 2013). It is also possible that network failures may interrupt video calls, by ending them, or preventing them from being made (Hsiung, 2001).

Social Issues and Treatment Adherence in Web-based Videoconferencing.

All of these technological factors impact the sounds and images associated with transmission. This can affect therapist-client communication and session scheduling (Hsiung, 2001). Intuitively, both sounds and images are important in the treatment of tics, as constant assessment of vocalizations and sudden movements is necessary to effectively implement behavior therapy. Although no studies have assessed Skype©-delivered behavior therapy for TS, the modality was used to conduct a booster session with a client with tics. The therapist noted that the sound was good, but the video quality was subpar, making observation of tics challenging (Flancbaum, Rockmore, & Franklin, 2011). However, sound and video quality of VC sessions conducted using Skype© have been found to be satisfactory in other disciplines in which sound or video is essential, including listening and speech therapy for children with hearing loss (Constantinescu, 2012), occupational therapy for stroke rehabilitation (Hermann et al., 2010), and speech therapy for stuttering (Carey, O'Brian, Onslow, Packman, & Menzies, 2012). Additionally, the use of headsets and/or external microphones may enhance sound quality.

A separate issue is that the clinician's viewing range may be restricted, as the patients' lower extremities may be hidden due to the web camera set-up. This may make it difficult to perform certain treatment components like awareness training, which requires the therapist to identify tics in session, or competing response training, in which the clinician monitors whether the patient is performing the incompatible movement correctly. One concern of patients receiving treatment delivered via VC is inexperience with technology (Alverson et al., 2004; Shore, Savin, Novins, & Manson, 2006). Specifically, research suggests prior technology experience and comfort with audiovisual equipment is associated with better treatment outcomes (i.e., symptom improvement, fewer missed appointments), and comfort significantly increases from pre- to post-treatment in web-based VC (Carey, Wade, & Wolfe, 2008). Additionally, computer and internet specifications (i.e., processor speed, RAM, hard drive disk space, internet connection type and speed, etc.) may influence the frequency of technological difficulties with VoIP, and in turn, satisfaction with the modality (Kazemitabar, Ahmed, Said, & Habsullah, 2010; Ramirez, 2011).

Purpose of the Current Research

The main objective of the study was to evaluate the preliminary efficacy, acceptability, and feasibility of CBIT delivered via VoIP. VoIP-delivered treatment was compared to a waitlist control in a randomized-controlled trial with 20 participants.

Primary Hypotheses

Hypothesis 1: Significantly greater reductions in clinician-rated tic severity (Yale Global Tic Severity Scale; YGTSS) would be found in CBIT-VoIP relative to waitlist-control.

Hypothesis 2: Significantly greater reductions in clinician-rated global severity (Clinical Global Impression-Severity scale; CGI-S) would be found in CBIT-VoIP relative to waitlist.

Secondary Hypotheses

Hypothesis 3: A significantly higher proportion of treatment responders, indicated by a CGI-S score of 1 (Very Much Improved) or 2 (Much Improved) would be found in CBIT-VoIP relative to waitlist.

Hypothesis 4: Significantly greater reductions in parent-reported tic severity (Parent Tic Questionnaire; PTQ) would be found in CBIT-VoIP relative to waitlist.

Hypothesis 5: Parent-reported tic severity (PTQ) would decrease significantly across sessions among those in CBIT-VoIP.

Hypothesis 6: Significantly greater reductions in family dysfunction (Brief FAM-III) would be found in CBIT-VoIP relative to waitlist.

Hypothesis 7: Treatment satisfaction, VC satisfaction, and the therapeutic alliance would be high.

Hypothesis 8: CBIT-VoIP would be feasible to implement (with high usability and adherence), but would pose some technological challenges with respect to audio and visual quality.

As an exploratory aim, the current study investigated potential correlates of treatment outcome, including treatment expectations, computer usage, comfort with VC, satisfaction, therapeutic alliance, adherence, and technological difficulties.

Exploratory Hypotheses

Hypothesis 9: Significant positive relationships would be found between patient, parent, and therapist treatment expectations and clinical outcomes (YGTSS, PTQ, CGI-S).

Hypothesis 10: Significant positive relationships would be found between treatment acceptability and satisfaction, VC satisfaction, the therapeutic relationship, and decreases in tic severity.

Hypothesis 11: Significant pre-post increases in parent and child comfort with VC would be found.

Hypothesis 12: Significant positive relationships would be found between general (Computer Usage Questionnaire total scores) and specific (computer abilities, perceptions of computers as appealing/helpful, hours spent using a computer) computer usage variables, acceptability, satisfaction, and the therapeutic relationship.

Hypothesis 13: Significant positive relationships would be found between both general and specific computer usage variables and adherence with homework and in-session activities.

Hypothesis 14: Among the treatment group, VC satisfaction would be higher and the percentage of technological difficulties would be lower in those with cable internet relative to DSL, separate web-cameras relative to built-in, and desktops relative to laptops.

Hypothesis 15: Higher quality hardware characteristics and specifications (i.e., computer age, processor speed, RAM, and percentage of hard drive disk space) would be associated with higher VC satisfaction and a lower frequency of technological difficulties in treatment sessions.

Method

Participants

After obtaining verbal consent, a brief phone screening was conducted with 35 families in order to assess whether their child appeared to meet inclusion/exclusion criteria. Inclusion criteria included (a) resided in the state of Wisconsin (b) aged 8-17, (c) met DSM-IV diagnostic criteria for CTD (CMVT or TS), d) clinical global Impressions – Severity Score > 3 (moderately ill or worse), (e) YGTSS Total Score $\geq$ 14 and < 30 OR Total Score $\geq$ 10 and < 20 if CTD with motor tics only, (f) unmedicated or on stable medication treatment for tics, OCD, ADHD, anxiety, and/or depressive disorder for at least 6 weeks, with no planned changes for duration of study participation, and (g) fluent English speaker. Exclusion criteria included (a) Total Tic Score > 30 on the YGTSS; for any score exceeding 30 on the YGTSS, the research team determined the appropriateness of the patient's participation in the study, taking into account the patient's global functioning, (b) T-Score < 37 on the Wechsler Abbreviated Scale of Intelligence – Vocabulary subtest (c) DSM-IV substance abuse or dependence or Conduct Disorder within the past 3 months, (d) Lifetime DSM-IV diagnosis of PDD, Mania, or Psychotic Disorder, (e) Any serious psychiatric, psychosocial, or neurological condition (i.e., OCD, ADHD, MDD, anxiety, severe aggression, family discord, suicidality) requiring immediate treatment other than that provided in the current study (i.e., medication, school intervention, family therapy), (f) previous treatment with HRT for tics (four or more sessions), (g) lack of a functional, and accessible home computer, and high speed (i.e., cable/DSL) internet connection, and (h) refusal to sign a release of information form for the child's local primary care physician, mental health professional, or neurologist.

Of the 35 families phone screened, four were ineligible due to residing out of state (N = 1), presence of an exclusionary diagnosis (N = 2), and receipt of previous HRT (N = 1). Six appeared eligible but did not participate. Of these six, two declined due to a preference for in-person treatment (N = 1), and a decrease in tic severity (N = 1). Three of the six were lost to contact, and one experienced technological difficulties with their internet connection. See Figure 1 for a CONSORT flow diagram (Schulz, Altman, Moher, for the CONSORT group, 2010).

Interested participants who appeared to meet study criteria (N = 25) were invited to be screened. Of the 25 who were screened, 4 were ineligible [i.e., tic severity below criterion (N = 3), and exclusionary diagnosis of PDD (N = 1)], and 1 was presumed eligible but declined. Following screening, 20 participants were enrolled. See Figure 2 and Table 1 for a map and summary of the cities in which enrolled participants resided.

Design

This was a randomized waitlist-controlled trial. Patients were randomized to one of two groups using Random Allocation Software, Version 1.0 (Saghaei, 2004) to achieve balance across treatment and waitlist control groups with respect to medication status, and gender. Patients and their parents were informed of their group assignment via phone following completion of the baseline assessment. Patients were considered randomized after that point. Patients who dropped out prior to randomization were not included in data analysis. The IE was blinded to assignment. To maintain the blind, assessment and treatment staff were separated, and children and parents were instructed to avoid disclosing treatment assignment to the independent evaluator.

Materials

Due to its populatrity among consumers and usability, Skype©, a peer-to-peer VoIP system, providing free video and voice calling, instant message, and file sharing between users, was used to deliver treatment (Garfinkel, 2005; Skype Technologies S. A., 2013). Treatment was delivered from a private clinic room, using a Dell© Optiplex GX 980 desktop computer with a 21.5 in. screen, Logitech© c270 web camera, and a high speed (54.0 megabytes per second) wireless local area network internet connection available through the university. The Skype© picture-in-picture feature was used in all sessions so therapists and IEs could monitor their body positioning. Participants used a home computer, high speed internet connection, and a web camera to connect with the therapist. An inexpensive Logitech© c110 web camera was loaned to five families who did not previously have one. See the Results section and Tables 2 and 3 for details about equipment used in the study.

Measures

See Table 4 for a summary of assessment measures administered for treatment and waitlist groups, and the time points of completion.

Demographics Form. A parent-report measure will be used to collect demographic information, treatment history, current medication status, and medical/psychiatric history (pharmacological and behavioral).

The Mini International Neuropsychiatric Interview – Kid (MINI-Kid). The MINI-Kid (Sheehan et al., 2010) is a brief structured diagnostic clinician interview designed to assess for 24 psychiatric disorders in addition to suicidality in youth ages 6 to 17. It takes approximately 30 minutes to administer and informants may be the parent and

child together or an adolescent alone. It has high interrater and test-retest reliability, and convergent validity ranging from good to excellent (Sheehan et al., 2010). This will be administered during the screening assessment.

Wechsler Abbreviated Scale of Intelligence (WASI*).* The WASI (Wechsler, 1999) is a measure of intellectual functioning for individuals ages 6 to 89 years. It has good validity (Canivez, Konold, Collins, & Wilson, 2009; Saklofske, Caravan, & Schwartz, 2000), good interrater and test-retest reliability (Wechsler, 1999), and high internal consistency (Axelrod, 2002). The vocabulary subtest will be used in the current study.

Yale Global Tic Severity Scale (YGTSS). The YGTSS (Leckman et al., 1989) produces separate severity ratings for motor and vocal tics, impairment produced by the tics, and an overall tic severity score. The YGTSS has demonstrated acceptable psychometric properties. The scale has good internal consistency, good inter-rater reliability, and acceptable convergent and divergent validity (Leckman et al., 1989).

Clinical Global Impression-Severity (CGI-S) and Improvement (CGI-I) Scales. The CGI-S and CGI-I are clinician-rated scales that have been used in many clinical trials for over 25 years (Guy, 1976), and several studies with TS patients (Scahill et al., 2001). The CGI-I asks the clinicians to rate patient improvement compared to baseline. Scores of Much (2) or Very Much (1) Improved indicate positive treatment response. The CGI is sensitive to change and has good concurrent validity (Berk et al., 2008; Leon et al., 1993).

Parent Tic Questionnaire (PTQ). The PTQ (Chang, Himle, Tucker, Woods, & Piacentini, 2009) assesses tic severity in children and yields motor, vocal, and total tic

severity scores based on a) the number of tics endorsed, b) frequency (1-4) and c) intensity (1-4) ratings of individual tics. The measure yields tic severity scores for each tic, motor tics, vocal tics, and all tics. The PTQ has test-retest reliability in the good to excellent range, and internal consistency and convergent validity in the superior range (Chang et al., 2009).

Child Behavior Checklist (CBCL/6-18). This 113-item parent-report measure assesses comorbid behavior problems and social functioning (Achenbach & Rescorla, 2001). It consists of 8 subscales, including Anxiety/depression, Withdrawal, Somatic Complaints, Aggression, Delinquent Behavior, Attention Problems, Thought Problems, and Social Problems grouped into two larger scales, Internalizing Problems and Externalizing Problems, that when summed yield a total score. Items are rated on a scale of 0 to 2, from least true to very or often true (Achenbach & Rescorla, 2001). The CBCL 6-18 has good internal consistency (α = .71 to .89), and convergent validity, and adequate divergent validity (Nakamura, Ebesutani, Bernstein, & Chorpita, 2009).

Conners Parent Rating Scale-Revised-Short Version (CPRS-R-S). This 27-item parent-report measure designed to assess symptoms of attention-deficit hyperactivity disorder. Scores are compared to normative data to provide an overall index of ADHD symptoms (Conners, 1997). The measure has good psychometric properties including test-retest reliability alpha coefficients over .85, and test-retest reliability correlations ranging from .62 to .85 (Treuting & Hinshaw, 2001).

Family Assessment Measure III-Brief Form (FAM III-Brief). This 14-item measure assesses general family functioning (Skinner, Steinhauer, & Santa-Barbara, 1995). It consists of three scales: the general scale, assessing overall family functioning,

the dyadic relationship scale, examining how the informant views his/her relationship with a family member, and the self-rating scale, allowing the informant to rate his or her own functioning within the family. It can be completed by the child and parent separately or together. All versions of the FAM yield high internal consistency, good test-retest reliability, and have shown good discriminant and construct validity, and clinical utility (Skinner, Steinhauer, & Sitarenios, 2000).

Adverse Event Review. At baseline and post, the IE will assess health complaints, recent illness or injury, need for medical consultation since the previous assessment, and use of any medication. At each session the therapist will rate the severity of any reported complaints, and whether the adverse event is study related.

Videoconferencing Equipment Interview. This is a 12-item interview assessing several features relevant to VoIP, including internet connection type, web camera type, use of a headset or external microphone, type and age of the home computer, computer operating system, processor type and speed, RAM, and free hard drive disk space. It will be administered by the IE.

Computer Usage Questionnaire. The Computer Usage Questionnaire is an 18-item measure with separate parent and child versions, assessing computer usage in the past week (Schroeders & Wilhelm, 2011). It consists of two subscales: Program Usage, assessing the frequency with which certain computer programs are used, and Activity Performance, measuring the frequency with which certain computer activities are performed. Three independent questions, regarding hours spent using a computer, computer abilities, and perceptions of the appeal and helpfulness of computers were included from a Prior Computer Use measure used in Carey et al. (2008).

Videoconferencing Equipment Comfort Rating Scale. This 10-item measure, adapted from Carey and colleagues (2008) study has both multiple choice and open-ended questions, and assesses comfort with VC used in the study, (i.e., Skype, web camera).

Barriers to Tx./ Tx. Utilization. This scale assesses history of treatment utilization for tic disorders, and perceived barriers to accessing behavior therapy for tic disorders.

Treatment Acceptability Questionnaire. The baseline version of the questionnaire assesses how comfortable parents are with the idea of using videoconferencing, and under what circumstances. The post-assessment version was modified from a measure by Hunsley (1992). It assesses how acceptable the parent found videoconference-delivered CBIT to be for their child.

Treatment Expectancy. This 3-item, 5-point scale assesses the therapist's and participant's expectations about gaining control over tics, having fewer problems with tics, and life improving through treatment.

Children's Perception of Therapeutic Relationship (CPTR). This 10-item, 5-point scale measures a child's perceptions of the quality of the therapeutic relationship (Kendall, 1994; Kendall & Sugarman, 1997). Item 3: "How difficult was it for you and your family to travel here?" was modified to "How difficult was it for you and your family to attend sessions?" Item 5: "How much did you like the rooms where you met with your therapist?" was split into two items: "How much did you like the room in your home, you received treatment from?" and "How much did you like the rooms your

therapist treated you from?" For statistical analyses, these two item ratings were later averaged to create one item in order to remain consistent with the original scale range.

Client Satisfaction Questionnaire (CSQ). This 8-item measure (Larsen, Attkisson, Hargreaves, & Nguyen, 1979) assesses client satisfaction of health services and programs. The CSQ has high internal consistency (Cox, Brown, Peterson, & Rowe, 1982; Larsen et al., 1979; Roberts & Attkisson, 1983), and excellent concurrent validity (Nguyen, Attkisson, & Stegner, 1983; Larsen et al., 1979). Individual items are rated on a scale of 1 to 4, with total scores ranging from 8 (low satisfaction) to 32 (high satisfaction).

Videoconferencing Satisfaction Questionnaire. This 14-item questionnaire assesses patient satisfaction with the VC treatment modality, including aspects such as audio and visual quality, comfort, acceptance, satisfaction, and the ability of VC to meet patient's needs. It was created from a Telemedicine Satisfaction Questionnaire (Yip, Chang, Chan, & Mackenzie, 2003).

Usability Form. This assesses client and therapist perceptions of how well treatment procedures were understood over VoIP.

Session Summary Sheets. Session summary sheets are therapist-completed forms filled out following each session. They assess data pertinent to treatment (e.g., attendance, duration, therapeutic relationship, session topics, client participation, and client homework completion), and any technological difficulties.

IE Session Quality Form. This form assesses the type and severity of technological difficulties during VoIP and how they were addressed. Questions were adapted from those included in Yuen et al. (2013).

Therapist Adherence Scales. The therapist adherence scales, used in the CBIT trial (Piacentini et al., 2010) were used by off-site expert and study team member to view and score 20% of treatment session recordings to assess treatment fidelity.

Procedure

Recruitment. Participants were recruited over the course of a 9-month period, via written solicitations to physicians, psychiatrists, and neurologists across the state of Wisconsin, and newspaper advertisements posted in several major cities within the state. Interested families were instructed to call the University of Wisconsin-Milwaukee (UWM) Tic Disorders Specialty Clinic for study information. Families seeking standard services from the Tic Disorders Specialty Clinic were also invited to participate.

Testing. Participants who appeared eligible following the phone screen, underwent a 2-day screening process. During the process a study staff person drove to the family's home to obtain initial paperwork, including informed assent (for children ages 8-12) and consent (for children ages 12 and older), using UWM Institutional Review Board (IRB)-approved forms. Additionally, UWM Psychology Clinic paperwork (i.e., informed consent to treatment, Acknowledgement of Receipt of Privacy Practices, permission to use email, clinic background form, and releases of information for a local health professional) was completed. Parents and children were also asked to complete forms regarding demographics and treatment and medical history, tic and other symptoms, general behavior, and family functioning. For a list of specific self-report measures used at screening, see Table 4. Following completion of forms, a Logitech© c110 web camera was installed for families who did not own a web camera. Participants received on-site technical support for Skype© downloading and set-up along with written instructions.

Participants also received a handout featuring guidelines on maintaining privacy, the limits of confidentiality, and the possibility of miscommunication during home VC sessions. During the home visit, participants received assistance with downloading and set-up of the Skype© program, and the equipment was tested to ensure the sound and video feed was functioning. A web camera was also installed at this time for families who did not previously own one. Then eligibility was confirmed during a separate screening assessment occurring within a week period.

The screening was performed by the IE via Skype© using a Logitech© c270 web camera from inside a private room in the UWM Tic Disorders Specialty Clinic. The IE initiated the video call to connect with the parent and child in their home. This assessment (see Table 4) took approximately 1 hour 30 minutes to 2 hours for the parent and child to complete, and involved a structured diagnostic interview, a clinician-rated tic severity measure, and a brief vocabulary task (to rule out learning problems). Following completion of testing, the IE reviewed and clarified the results of the assessment with the parent, and answered any remaining questions the parent had about study participation via the phone.

Children deemed eligible for participation received a 1-hour baseline assessment, approximately 7 to 10 days later via Skype©, during which the IE asked more questions about the child's tic severity and other symptoms he/she had, and recorded information about the family's computer equipment. Additionally parents and children were asked to complete and submit internet-based self-report forms via a link sent to a designated parent's email address, allowing users to return to their saved answers (Qualtrics Labs, Inc. software, 2011). Specifically, parents completed questionnaires regarding tic

symptoms in the past week, acceptability of the VC modality, and prior barriers to receiving behavior therapy for tics. Children completed questions about treatment expectations. Both parents and children completed questionnaires regarding computer usage, and comfort with VC.

Parts of the evaluation (interviews and internet questionnaires) were repeated at the end of treatment, during a post-assessment, scheduled by the study coordinator, lasting approximately 1 hour. Participants were paid $25.00 for completion of the baseline assessment and $75.00 for completion of the post-assessment in the form of a check mailed to the designated parent approximately 5 weeks following study completion.

Training of Study Personnel. Study therapists were four upper level clinical psychology doctoral students and one full time therapist all working in the UWM clinic. Therapists were provided with the CBIT manual (Woods et al., 2008) and background readings on the behavioral treatment of tic disorders. They were trained by a faculty supervisor using the protocol from the CBIT trial (Piacentini et al., 2010). Then therapists were required to pass (at 90%) a knowledge test on the treatment protocol. They also received weekly supervision from Dr. Woods.

The IE received training from an expert and off-site study consultant, prior to conducting assessments. Training on the YGTSS and CGIs involved having the IE view several videotaped ratings of the YGTSS and read vignettes for the CGIs. The IE then rated four tapings of the YGTSS and scored four CGI vignettes. Passing was considered scoring within 15% of the gold standard rating on the YGTSS, and within 1 point of the gold standard on the CGI. Twenty percent of the IE assessments were randomly selected

for review and co-rating. If the IE rating fell below criterion (15% of the gold standard on the YGTSS), the IE was required to re-watch training tapes to re-establish criterion. The IE was not allowed to conduct assessments until achieving this level of agreement. IE supervision was provided by Dr. Woods.

Study Conditions. Participants were randomly assigned to one of the following two conditions: 1) CBIT-VoIP or 2) waitlist-control.

For those who were assigned to receive immediate CBIT-VoIP, treatment began within 2 weeks of the child being randomized. Treatment was administered according to the protocol described in the treatment manual (Woods et al., 2008). Treatment was delivered directly into the parent and child's home via a web camera by a therapist from inside a private room in the Tic Disorders Specialty Clinic. The parent was asked to be present for sessions, sometimes with their child or sometimes alone with the therapist, according to protocol. The treatment consisted of two 1.5 hours sessions and six 1 hour sessions over the course of an 8-week period. In CBIT-VoIP the child: 1) learns to become more aware of any sensations, or urges that might trigger his or her tics, and 2) learns some other behavior (something other than the tic) to do every time he/she feels the urge to tic. The child also learns relaxation techniques to reduce stress and make it easier for him/her to resist his or her tics. The parent and other interested family members learn more about childhood tics and methods for helping the child manage his/her symptoms. At the beginning of each treatment session, the parent and child spend approximately 10 minutes discussing with the therapist any problematic issues he/she is having. At the end of each treatment session the child is assigned some tasks to practice before their next session. Also, the parent spends approximately 10 minutes completing a

weekly tic-severity questionnaire about their child's symptoms. Participants received a final assessment no later than 2 weeks following the last treatment session to determine how well treatment worked.

Children randomized to the waitlist-control group did not receive treatment during the 8-week period. Instead they were placed on a waitlist to receive videoconference-delivered treatment following the end of the study period. Participants in this group met with the IE for a pre-assessment, occurring 7 to 10 days after the screen, and a final assessment occurring 8 to 10 weeks after the pre-assessment.

Session Recording. Sound and video of assessment and treatment sessions was digitally recorded using Evaer© video recorder (Evaer Technology, 2013) for Skype©. The recordings will be destroyed no later than 2 years after the study has ended. All recordings were labeled with a study ID number and session number in order to maintain confidentiality. Recordings were securely stored on a password-protected computer at UWM. Copies of randomly select digital recordings of treatment and assessment sessions were uploaded to a free internet storage program, and shared with an off-site study consultant, who viewed and scored them for quality assurance purposes.

Results

Baseline Characteristics. Participants in the trial (see Table 5) ranged in age from 8 to 16 (M = 12.16, SD = 2.34). The sample was 65% male and 35% female. The ethnicity of the sample was 100% Hispanic, and the racial make-up was 95% Caucasian and 5% biracial. Seventeen participants (85%) met criteria for TS and 3 (15%) met criteria for Chronic Motor Tic Disorder. Several participants had additional diagnoses, with 20% meeting criteria for ADHD combined type, and 5% meeting criteria for

Oppositional Defiant Disorder (ODD), Obsessive-compulsive Disorder, Social Phobia, Separation Anxiety Disorder, and Specific Phobia, respectively. With regard to medication, 35% of the sample was taking medications for tics. Independent samples t-tests were performed to determine if there were any significant differences between groups on key baseline characteristics. There were no significant between-group differences in mean age [t (18) = -.31, p = .76, two-tailed], WASI-Vocabulary T-scores [t (18) = -.21, p = .84, two-tailed], YGTSS total scores [t (18) = -1.10, p = .29, two-tailed], or CGI-S scores [t (18) = -.12, p = .91, two-tailed]. Chi-square tests for independence (with Yates Continuity Correction) were used to detect any significant differences between groups in the proportion of participants with specific baseline characteristics. The test indicated no significant difference between groups in the proportion of males and females, χ^2 (1, n = 20) = .08, p = .77, *phi* = -.17, the percentage of Caucasian participants, χ^2 (1, n = 20) = .00, p = 1.00, *phi* = -.19, the proportion of participants on tic meds, χ^2 (1, n = 20) = .00, p = 1.00, *phi* = -.04, the proportion of participants diagnosed with TS, χ^2 (1, n = 20) = .80, p = .37, *phi* = -.34, or the percentage of participants diagnosed with ADHD, χ^2 (1, n = 20) = .00, p = 1.00, *phi* = -.10. Additionally, no significant differences were found between groups among these variables without the Yates Continuity Correction.

Of the 20 participants enrolled in the trial, 12 were randomized to receive immediate treatment, and 8 were randomized to the waitlist condition (see Figure 1). Ten participants in the immediate treatment group (83.3%) received all 8 treatment sessions, and 1 participant (8.3%) completed treatment in 7 sessions. One participant (assigned to

the CBIT-VoIP group) withdrew from the study after the first session due to a loss of interest in receiving treatment for tics, yielding an attrition rate of 5%.

Home Computer Equipment. With regard to participants' computer equipment at baseline (see Tables 2 and 3), 16 (80%) used a cable internet connection, and 4 (20%) had a DSL connection. All had wireless internet connections. Thirteen (65%) had built-in web cameras and 7 (35%) needed a separate web camera. Of those who needed a separate camera, 4 (57.1%) did not own one and elected to use the Logitech© c110 provided. However, a total of five web cameras were loaned, as one was used by a participant who was not eligible for the study following screening. Only one family used additional equipment (a microphone). In regard to computers, 13 (65%) families used laptops and 7 (35%) used desktops. Family computers were located in the computer room (N = 4; 20%), living room (N = 4; 20%), dining room (N = 4, 20%), kitchen (N = 3; 15%), bedroom (N = 3; 15%), and basement (N = 1; 5%). The average computer age was 26.4 months old (*SD* = 21.7) with a range of 1 week to 7 years. The majority of computers (18) were PCs, and 2 were Macintosh computers. Of the Macintosh computers, one ran version 10.6 ("snow leopard") operating system and the other ran version 10.7 ("lion"). Among the PCs, 5 ran Windows 8 operating system, 11 ran Windows 7, 1 ran Windows Vista, and 1 ran Windows XP.

Barriers to Treatment Utilization. At baseline, participants were asked about barriers to treatment utilization. Of the 20 participants, 25% had received prior behavioral treatment (not including HRT) for tics, and 75% had not. Of those who had not received behavioral treatment, 33.3% listed barriers that could be addressed by VoIP (i.e., lack of

service providers in the area, lack of knowledge about where to go to receive services, and a lack of time for weekly therapy).

Acceptability of the Videoconferencing Modality. Participants were also asked about their comfort with and acceptability of using telehealth and telepsychiatry for treatment in various settings. The mean rating for telehealth acceptance was 20.18 (*SD* = 3.81; subscale range = 6-30), and the mean telepsychiatry acceptance rating was 29.00 (*SD* = 4.25). Of the 11 participants who elected to respond to a question regarding concerns about receiving treatment via telepsychiatry, 81.8% reported a concern that it would not be as effective as in-person treatment, 9.1% reported the technology may be too sophisticated, and 9.1% endorsed concerns of what others might think.

Primary Outcomes. Results were analyzed using SPSS 21.0. To address missing data due to attrition, intention to treat – last observation carried forward (ITT-LOCF) analyses were performed for pre-post data. Missing values within scales were substituted using the scale or subscale item means. All other missing data were addressed using pairwise deletions. Mixed analyses of variance (ANOVAs) were performed to determine whether there were significantly greater decreases in YGTSS total scores from baseline to post-treatment among participants in CBIT-VoIP relative to waitlist. Significance was determined using one-tailed p-values instead of two-tailed based on our directional hypotheses. Effects sizes were estimated using partial eta squared, with benchmarks by Cohen (1988) to define small, medium, and large effects, set at .01, .06, and .14, respectively. For the YGTSS total scores, a significant main effect was found for time, F (1, 18) = 8.16, $p < .01$, partial $\eta^2 = .31$. The main effect comparing CBIT-VoIP and waitlist groups was not significant, F (1, 18) = .11, $p = .37$, partial $\eta^2 = .01$. A significant

interaction between group and time was found, F (1, 18) = 3.05, $p < .05$, partial $\eta^2 = .15$. Paired samples t-tests were conducted on pre-post YGTSS total scores for both groups (see Figure 3). Effect sizes were estimated using Cohen's *d* with small, medium, and large effects set at .2, .5, and .8, respectively (Cohen, 1988). In CBIT-VoIP there was a statistically significant decrease in YGTSS total scores from baseline (M = 25.75, SD = 8.51) to post-assessment (M = 18.50, SD = 7.75), t (11) = 3.11, $p < .01$, d = .90. The mean decrease in YGTSS total scores was 7.25 with a 95% confidence interval ranging from 2.12 to 12.38. See Figure 4 for individual participants' pre-post scores. In the waitlist group no statistically significant decrease was found in YGTSS total scores from baseline (M = 22.00, SD = 5.71) to post-assessment (M = 20.25, SD = 6.21), t (7) = 1.11, p = .15, d = .39. See Figure 5 for individual participants' pre-post scores. See Tables 6 and 7 for individual participants' baseline characteristics and pre-post scores. The mean decrease in total scores was 1.75, with a 95% confidence interval ranging from 1.98 to 5.48. For a summary of pre- and post-intervention means and standard deviations for clinical outcome variables see Table 8.

For the YGTSS motor scores, a significant main effect was found for time, Wilks' Lambda = .62, F (1, 18) = 10.9, $p < .01$, partial $\eta^2 = .38$. No significant main effect between groups was found, F (1, 18) = .26, p = .31, partial $\eta^2 = .31$. There was a significant interaction between group and time, Wilks' Lambda = .81, F (1, 18) = 4.18, $p < .05$, partial $\eta^2 = .19$. In the CBIT-VoIP group there was a statistically significant decrease in YGTSS motor scores from baseline (M = 16.33, SD = 3.31) to post-assessment (M = 12.08, SD = 3.48), t (11) = 3.70, $p < .01$, d = 1.07. The mean decrease was 4.25, with a 95% confidence interval ranging from 1.72 to 6.78. In the waitlist group,

no statistically significant reduction in motor scores was found from baseline (M = 14.13, SD = 1.96) to post-assessment (M = 13.13, SD = 2.90), t (7) = 1.13, p = .15, d = .42. The mean decrease was 1.00, with a 95% confidence interval ranging from -1.10 to 3.10.

For the YGTSS vocal subscale no significant main effect was found for time Wilks' Lambda = .88, F (1, 18) = .91, p = .07, partial η^2 = .12, or the comparison between groups, F (1, 18) = .03, p = .43, partial η^2 = .002. Additionally, no significant interaction between time and group was found, Wilks' Lambda = .95, F (1, 18) = .88, p = .18, partial η^2 = .05. In the CBIT-VoIP group there was a statistically significant decrease in YGTSS vocal scores from baseline (M = 9.42, SD = 6.13) to post-assessment (M = 6.42, SD = 5.89), t (11) = 1.98, p < .05, d = .57. There was a mean decrease of 3.00, with a 95% confidence interval ranging from -3.40 to 6.34. No statistically significant reduction in vocal scores from baseline (M = 7.88, SD = 5.33) to post-assessment (M = 7.13, SD = 4.79), t (7) = .42, p = .33, d = .15, was found among those in the waitlist group. The mean decrease was .75, with a confidence interval ranging from -3.46 to 4.96.

For YGTSS impairment scores, a significant main effect was found for time, Wilks' Lambda = .62, F (1, 18) = 11.04, p < .01, partial η^2 = .38. No significant main effect was found for the between group comparison, F (1, 18) = 1.71, p = .11, partial η^2 = .09. No significant interaction between time and group was found, Wilks' Lambda = .88, F (1, 18) = 2.45, p = .07, partial η^2 = .12 (See Figure 6). Scores among the CBIT-VoIP group significantly decreased from baseline (M = 31.25, SD = 9.16) to post-assessment (M = 20.83, SD = 8.08), t (11) = 3.26, p < .01, d = .94. The mean decrease was 10.42, and the 95% confidence interval ranged from 3.39 to 17.45. No statistically significant decrease in YGTSS impairment scores was found among the waitlist group from baseline

(*M* = 31.75, *SD* = 6.27) to post-assessment (*M* = 28.00, *SD* = 7.11), *t* (7) = 1.87, *p* = .05, *d* = .67. The mean decrease was 3.75, with a confidence interval ranging from -.97 to 8.47.

For the CGI-S scores, a significant main effect was found for time, Wilks' Lambda = .75, *F* (1, 18) = 5.97, *p* < .05, partial η^2 = .25. No significant main effect was found for the between group comparison, *F* (1, 18) = .27, *p* = .31, partial η^2 = .02. No significant interaction between time and group was found, Wilks' Lambda = .94, *F* (1, 18) = 1.23, *p* = .14, partial η^2 = .06. In the CBIT-VoIP group, there was a statistically significant decrease in CGI-S scores from baseline (*M* = 4.42, *SD* = .79) to post-assessment (*M* = 3.75, *SD* = .97), *t* (11) = 2.60, *p* < .05, *d* = .77 (see Figure 7). The mean CGI-S decrease was .67, with a 95% confidence interval ranging from .10 to 1.23. In the waitlist group, no statistically significant decrease in CGI-S scores was found from baseline (*M* = 4.38, *SD* = .74) to post-assessment (*M* = 4.13, *SD* = .64), *t* (7) = 1.00, *p* = .18, *d* = .36. The mean decrease was .25, with a 95% confidence interval ranging from -.34 to .84.

Secondary Outcomes. The CGI-I was used to assess treatment response at the post-assessment. Those receiving a score of 1 (very much improved) or 2 (much improved) on the measure were denoted as treatment responders. It was expected that there would be a higher proportion of treatment responders in the treatment group relative to the waitlist group. A Chi-square test for independence was performed to determine if there was a significant difference in the proportion of treatment responders in CBIT-VoIP and waitlist. One-tailed p-values were used due to our directional hypotheses. Results indicated a significantly higher proportion of proportion of treatment responders in CBIT-VoIP (33.3%) relative to waitlist (0%), χ^2 (1, *n* = 20) = .33, *p* < .05, *phi* = .41.

Mixed between-within ANOVAs were also performed to assess differences in PTQ score (parent-reported tic severity) reduction between groups. For PTQ total scores, a significant main effect for time Wilks' Lambda = .52, F (1, 17) = 15.96, $p < .001$, partial $\eta^2 = .49$. No significant main effect between groups was found, F (1, 17) = .12, p = .37, partial $\eta^2 = .01$. However, results yielded a significant interaction between time and group Wilks' Lambda = .75, F (1, 17) = 5.60, $p < .05$, partial $\eta^2 = .25$ (See Figure 8). In the CBIT-VoIP group, there was a statistically significant decrease in PTQ total scores from baseline (M = 40.17, SD = 19.94) to post-assessment (M = 21.75, SD = 20.07), t (11) = 4.76, $p < .001$, d = 1.38. The mean decrease was 18.42, with a 95% confidence interval ranging from 9.91 to 26.93. In the waitlist group, no statistically significant decrease in PTQ total scores was found from baseline (M = 36.57, SD = 17.37) to post-assessment (M = 31.86, SD = 24.03), t (6) = 1.31, p = .12, d = .68. The mean decrease was 4.17, with a 95% confidence interval ranging from -4.12 to 13.55.

It was also expected that PTQ total scores would decline across sessions among participants in the treatment group. Due to partial missing session data in four participants, Multilevel modeling (MLM) was performed, using SPSS 21.0, as an alternative to a repeated-measures ANOVA. This statistical method was used to determine the pattern of change in PTQ total scores across 8 treatment sessions among those in the treatment group, and whether those changes were significant. First, the PTQ session total scores were nested within individuals in order to assess reductions in parent-reported tic severity as a function of two separate growth curve predictors (Time: a linear trend), and Time^2 (a quadratic trend), which were entered one at a time as fixed effects. The variance in random slope and random intercept was also examined using an

autoregressive covariance structure, which assumes that scores will be less correlated over time. Results indicated the linear growth curve was significant, F (1, 10.60) = 28.11, $p < .001$ (see Figure 9), indicating the linear trend significantly describes the trend in PTQ scores over time. Following the addition of the quadratic growth curve to the model, results showed the trend was not significant, F (1, 56.81) = .83, $p = .37$, indicating the quadratic growth curve does not significantly describe the pattern of data over time. In regard to the covariance parameters within the model, variance of the random intercept was significant, $(u_{0i}) = 522.25$, $\chi^2(1) = 2.25$, $p < .05$ suggesting that PTQ scores at week 1 varied significantly across participants. Variance of the random slope was not significant, $(u_{1i}) = 2.08$, $\chi^2(1) = 1.43$, $p = .15$, suggesting that the slope of the relationship between time and parent-reported tic severity was not significantly varied across people. Finally, the covariance between the slope and intercept was significant, cov $(u_{0i}, u_{1i}) = -.69$, $\chi^2(1) = -3.15$, $p < .01$, implying an inverse relationship between the intercept and the slope.

Between group differences in Brief FAM III total score reductions from screening to post-assessment were evaluated using a mixed between-within ANOVA. Results yielded a significant main effect for time, Wilks' Lambda = .84, F (1, 17) = 3.30, $p < .05$, partial $\eta^2 = .16$. No significant main effect was found for the between group comparison, F (1, 17) = .33, $p = .29$, partial $\eta^2 = .02$. No significant interaction between group and time was found, Wilks' Lambda = 1.00, F (1, 17) = .06, $p = .40$, partial $\eta^2 = .004$. In the CBIT-VoIP group, there was no statistically significant decrease in Brief FAM III total scores from screening (M = 10.75, SD = 4.52) to post-assessment (M = 12.58, SD = 5.88), t (11) = -1.18, $p = .13$, $d = -.59$. The mean change in Brief FAM III total scores was -1.83, with a 95% confidence interval ranging from -5.25 to 1.58. In the waitlist group,

there was no statistically significant reduction in Brief FAM III total scores from screening (*M* = 11.71, *SD* = 5.19) to post-assessment (*M* = 14.24, *SD* = 5.18), *t* (6) = -1.61, *p* = .08, *d* = -.61. The mean change in Brief FAM III total scores was -2.42, with a 95% confidence interval ranging from -6.12 to 1.27.

Treatment Acceptability. Treatment acceptability, as measured by the parent-report TAQ, was high (*M* = 39.27, *SD* = 3.85; scale range = 6-42). Parent (*M* = 29.64, *SD* = 3.01; scale range = 8-32) and patient (*M* = 29.64, *SD* = 3.07) ratings on the Client Satisfaction Questionnaire were also high. VC satisfaction was also high, with mean parent and patient ratings of 67.18 (*SD* = 3.63; scale range = 14-70), and 65.27 (*SD* = 5.76). Parent (*M* = 4.73, *SD* = .47) and patient (*M* = 4.27, *SD* = .79) ratings on a separate privacy item were also high (item range = 1-5). The therapeutic alliance, as measured by the CPTR questionnaire was moderately strong (*M* = 37.45, *SD* = 7.61; scale range = 5-50).

Treatment Usability. With regard to treatment usability, the mean parent rating for the treatment group was high at 67.82 (*SD* = 4.87; scale range = 0-72). When asked overall how easy or difficult it was to understand the treatment over VoIP on a 0 (impossible) to 4 (easy) likert scale, 90.1% (N = 10) marked ‘4’ and 9.1% (N = 1) marked ‘3’. The average rating for this item was 3.91 (*SD* = .30). Upon being asked if it would be easier to perform the treatment face-to-face with a therapist on a 0 (Easier face-to-face) to 4 (Videoconferencing was easier) likert scale, the findings were mixed, with 27.3% (N = 3) endorsing scores of ‘1’ and ‘3’, 36.4% (N = 4) endorsing a score of ‘2’, and 9.1% (N = 1) reporting a score of ‘4’. The average rating for the item was 2.18 (*SD* = .98). When asked how much they liked the VoIP treatment overall, on a scale of 0 (Very

much disliked) to 4 (Very much liked), 9.1% of parents (N = 1) endorsed scores of '2' and '3' respectively, and 81.8% reported a score of '4'. The item mean was 3.73. All participants (100%; N = 11) answered 'Yes' when asked: 1) if they would do the treatment again, having now been through it, 2) if they would recommend the treatment to other children with tics, and 3) if they would recommend VoIP delivery of the treatment to other children with tics. With respect to parental concerns during the study, issues reported were homework, a preference for face-to-face treatment, a lack of privacy at home (i.e., noise/interruptions by siblings), fluctuating internet connection quality, session length, and scheduling conflicts. Concerns raised by patients were the small viewing range of the camera, and difficulty remaining seated and focused during sessions.

Therapist usability for the treatment group was also high (*M* = 57.18, *SD* = 2.68; scale range = 0-60). Therapists were also asked if it would be easier to perform the treatment in person relative to over VoIP on a 0 (Easier face-to-face) to 4 (Videoconferencing was easier) scale. In 27.3% (N = 3) of the 11 completed CBIT-VoIP cases, a score of '1' was endorsed; in 45.5% (N = 5) a score of '2' was reported, indicative of perceptions of equivalence between the two modalities; in 9.1% (N = 1) a score of '3' was endorsed; and in 18.2% (N = 2) a score of '4' was indicated. The mean item rating was 2.18 (*SD* = 1.08).

In regard to concerns/difficulties with delivering the treatment via Skype©, several issues emerged. The most prominent theme was difficulty with weekly homework. Therapists had difficulty viewing the homework via Skype©, making it a challenge to determine whether it was being completed properly. In regard to focus, it was reported in

one case that the parent often became distracted and left sessions. In another case, it was reported that the child had difficulty remaining focused, making the therapist feel less in-control relative to performing in-person treatment. Therapists also reported difficulties conducting certain treatment procedures. Awareness training and competing response training posed a challenge in some cases, especially for tics involving body sites outside the viewing range. Additionally, when teaching relaxation techniques, it was difficult for the therapist to see if the patient was performing progressive muscle relaxation and relaxed breathing properly. When asked about concerns/difficulties with questionnaires administered during treatment, therapists reported that parents often forgot to complete the weekly PTQ, leading to several therapist prompts. The emailing of forms right before the session began was cited as a concern by one therapist. In one case a parent, of a child who divided time between two homes, lacked a personal laptop or desktop, which interfered with emailing forms.

Session Adherence. To determine patients' adherence during in-session procedures and homework therapist ratings from session summary sheets were summed and averaged for each patient. These means were averaged to create an overall mean reflecting the whole treatment group. The two items were scored on a 1 (poor) to 7 (good) scale. The mean for homework adherence was 5.87 (*SD* = 1.28; range of means = 2.83-7). The mean for adherence with session activities was 6.29 (*SD* = .75; range of means = 4.86-7).

Technological Difficulties. The percentage of technological difficulties occurring in treatment and IE sessions was calculated to gauge technological feasibility. Of all the treatment sessions that occurred among the treatment group, technological difficulties

occurred in 37.6% (32). Of the 32 sessions in which technological difficulties occurred, 18 (56.3%) were coded as insignificant, 11 (34.4%) were coded as minimal, and 4 (12.5%) were coded as moderate. Of the 32, video quality difficulties occurred in 22 sessions (68.8%), sound quality issues occurred in 17 sessions (53.1%), and video was unable to seen in 2 sessions (6.3%).

In regard to the assessment sessions, technological difficulties occurred during 13 of 23 (56.5%). Of the 13, 2 (15.3%) were coded as insignificant, 10 (76.9%) were coded as minimal, and 1 (7.7%) was coded as major. In 6 of the 13 (46.2%) the video quality was an issue, in 10 (76.9%) sound was a problem, and on one occasion the video feed was unable to be seen by the participant.

Exploratory Outcomes. Pearson product-moment correlations were performed to determine if there were significant relationships between treatment expectations and clinical outcomes (i.e., tic severity, and global severity) at post-treatment at an alpha level of .05. No significant relationships were found between parent-, child-, or therapist-reported treatment expectations and tic or global severity indices ($p > .05$, two-tailed; See Table 9). Pearson product-moment correlations were also performed to assess whether relationships between treatment acceptability, treatment satisfaction, VC satisfaction, the therapeutic alliance, and changes in tic and global severity were significant at an alpha level of .05. A negative correlation was found between child VC satisfaction and changes in YGTSS total scores, $r = -.60$, $p < .05$, two-tailed (See Table 10).

Paired-sample t-tests were conducted to determine if there were significant pre-post increases in parent and child VC comfort among those in the treatment group. No statistically significant increase in child VC comfort was found from baseline ($M = 23.82$,

SD = 2.48) to the post-treatment (*M* = 24.55, *SD* = 3.27), *t* (10) = -1.00, *p* = .34, *d* = -.32 (two-tailed). Additionally, no statistically significant increase in parent VC comfort was found from baseline (*M* = 25.09, *SD* = 3.27) to post-treatment (*M* = 25.64, *SD* = 1.69), *t* (10) = -1.03, *p* = .33, *d* = -.31 (two-tailed).

The relationships between computer usage, acceptability, satisfaction, and the therapeutic relationship were also assessed through the use of Pearson product-moment correlations (see Table 11). A significant positive correlation was found between child VC satisfaction and the child Computer Usage total score ($p < .05$). Relationships between specific computer usage items (independent from the Computer Usage Questionnaire), and measures of satisfaction and the therapeutic alliance were assessed (see Table 12). Child VC satisfaction was significantly and positively correlated with child perceptions of computer appeal/helpfulness ($r = .57$, $p < .05$), and child computer abilities ($r = .58$, $p < .05$).

The Computer Usage Questionnaire was also correlated with measures of treatment adherence (i.e., homework and session adherence) to determine if there were any significant relationships. No significant relationships were found between variables of interest. When examining the relationship between specific computer usage items, and measures of adherence, a significant negative correlation was found between adherence with session activities and parent hours spent using a computer ($r = -.55$, $p < .05$).

Independent samples t-tests were performed to assess whether there were significant differences in VC satisfaction and the percentage of technological difficulties between users of different types of internet connections, web cameras, and computers within the treatment group. Specifically, Cable and DSL internet, built-in and separate

web cameras, and laptops and desktops were compared (see Tables 13-15). No significant differences in VC satisfaction scores were found when compared by internet connection type, web camera type, or computer type. Lastly, to assess the relationship between computer hardware characteristics and specifications, the percentage of technological difficulties, and parent- and child-reported VC satisfaction Pearson-product moment correlations were performed. No significant correlations were found between the variables of interest (see Table 16).

Therapist and Independent Evaluator Adherence. Using therapist adherence scales, 19 (20%) randomly selected treatment sessions were rated for adherence on a 1 to 4 scale, with higher ratings indicating greater adherence to the protocol. The mean adherence rating was 3.26 (*SD* = .73). The YGTSS was also co-rated for 25% of videotaped IE assessment sessions. On average, the percent difference between the IE and Dr. Woods' ratings was 7.86% (*SD* = 7.54%), within the gold standard.

Independent Evaluator Blinding. In order to assess IE blinding, the IE completed a form during the post-assessment, assessing a rating as to which study condition each participant had been enrolled in. Of 19 guesses of condition assignment, the IE was correct 15 times (78.9%). Of the times she was correct, the IE made a 'tentative guess' in 31.6% of cases, was 'almost sure' in 26.3% of cases, and 'completely sure' in 21.1% of cases. In 12 of the 15 cases (80%), the IE rating was inferred from the patient's behavior; in 1 case (6.7%) the IE rating was inferred from study staff; in 2 cases (13.3%) the patient mentioned their group assignment; in 1 case (6.7%) a guess was made.

Adverse Events. Thirty-seven adverse events were reported. Accidental injuries occurred at a rate of 24.3% (N = 9). Medical/surgical procedures and muscle/bone/joint pain/conditions occurred at a rate of 8.1% (N = 3). Headaches, nasal congestion or colds, stomachaches or abdominal discomfort, tiredness/fatigue, interrupted sleep/other sleep problems, allergies NOS, and emotional lability/mood swings each occurred at rates of 5.4% (N = 2). Dizziness/faintness, sore throat, nausea, painful urination, depression, anxiety/nervousness, flu or upper respiratory problem, and sinus condition each occurred at a rate of 2.7% (N =1). Of these events, 29 (78.4%) were rated as mild, and 8 (21.6%) were coded as moderate. None of the adverse events were coded as related to the treatment provided, but 6 (16.2%) were coded as related to the tic disorder.

Discussion

Exploration of Primary Aims

Summary and Interpretation of Primary Aims. The primary aim of the present study was to examine the preliminary efficacy, acceptability, and feasibility of CBIT delivered via VoIP relative to a waitlist-control condition. As postulated in hypothesis 1, significantly greater pre-post reductions in clinician-rated tic severity were found in the treatment group (for total and motor tic severity specifically) relative to the waitlist group. These findings are supported by the results of previous CBIT research. Specifically, benchmarking the mean reduction in clinician-rated total tic severity in the treatment group (7.25) against outcomes in the randomized controlled comparisons of CBIT and PST (mean reduction of 7.6 points; Piacentini et al., 2010), and traditional VC and in-person delivery of CBIT (mean reduction of 6.4 points in the VC group; Himle et al., 2012), results are similar. Reductions in clinician-rated motor tic severity in the

present trial (4.25) are also similar to previous findings (3.9) of the original CBIT trial (Piacentini et al., 2010). No significant differences in pre-post vocal tic severity reduction were found between groups. Additionally, no significant differences in reductions in clinician-rated tic-related impairment were found between groups. These findings are contrary to the original trial. It is unclear why these discrepancies occurred, but it is possible that the timing of the study may have been a factor in tic-related impairment outcomes. For many, the treatment or waitlist period ran through the summer. It is possible that some children in the waitlist group experienced a decrease in tic-related impairment due to being on summer vacation, as they were relieved from school-related demands.

Contrary to expectations detailed in hypothesis 2, reductions in clinician-rated global severity were not significantly greater in the treatment group relative to the waitlist control. However, in contrast with scores in the waitlist control group, global severity significantly decreased from baseline to post-assessment in the CBIT-VoIP group. In the original CBIT trial (Piacentini et al., 2010) greater improvements in global functioning were found in the CBIT group relative to a control treatment, using a separate measure, the Children's Global Assessment Scale, ranging from 0 to 100. The discrepancy in findings may be related to a lack of range in CGI-S scores as the item is rated on a 0 to 7 scale.

Limitations and Proposed Modifications for Primary Aims. A potential limitation of the analyses for the primary aims is the use of one-tailed p-values to judge significance. However, this was deemed appropriate due to the use of a priori, directional hypotheses, the prior research support for CBIT, and the waitlist-control trial design.

Additionally, baseline scores were not controlled for in the analyses. However, despite the appearance of baseline differences for some scores upon visual inspection, independent samples t-tests indicated no significant differences in baseline scores between groups. Another limitation is the use of the CGI-S to assess reductions in clinician-rated global severity, as the scale may not be sensitive enough to detect changes due to its narrow range. In the future a global severity measure with a greater score range should be used.

Exploration of Secondary Aims

Summary and Interpretation of Secondary Aims. The proportion of treatment responders (33%) was found to be significantly greater in the treatment group compared to waitlist (0%), as was expected in hypothesis 3, and found in the original CBIT trial (Piacentini et al., 2010). However, this percentage is considerably lower than that found in the original trial (52.5%) and much lower than the comparison of traditional VC and face-to-face CBIT, which found response rates of 80%, and 75% respectively (Himle et al., 2012). The lower treatment response rate may be attributed to technological difficulties with respect to audio and visual quality, which could have interfered in treatment delivery. Additionally, there may be some aspect of the web-based VC modality that influences treatment adherence for some. Furthermore, an outlier was present in the treatment group, as one participant had a clinician-rated total tic severity score at least two standard deviations above the mean at baseline, which remained high at post-assessment, despite showing a substantial decrease in tic symptoms. In regard to parent-reported tic severity (PTQ total scores), significantly greater pre-post decreases were found in CBIT-VoIP relative to waitlist, as expected in hypothesis 4. The 46%

reduction is consistent with that found in the original CBIT trial (41%) and the traditional VC versus face-to-face comparison, with respective reduction rates of 50% and 49%. Additionally, findings showed that time significantly predicted parent-reported tic severity, with PTQ total scores significantly decreasing in a linear fashion across sessions within the treatment group, supporting hypothesis 5. Publications have not reported on changes in weekly PTQ outcomes at this time. However, this finding is not surprising given previous research showing pre-post declines in PTQ scores (Himle et al., 2012; Piacentini et al., 2010).

With respect to family functioning (Brief FAM-III total scores), no screening- to post-treatment reductions in impairment were found in either group. Instead, slight increases were noted in both groups over time. This is contrary to hypothesis 6, in which higher pre-post reductions were expected in the treatment group relative to the waitlist group. It is unclear why increases were observed, but the lack of a decrease is consistent with previous results. Specifically, in the first CBIT trial (Piacentini et al., 2010) no significant differences in pre-post reductions were found between or within active and control treatment groups. This might be because the measure used is a narrow indicator of psychosocial functioning. Furthermore, as noted in Woods et al., 2011, it is possible that it is difficult to capture decreases in family functioning within the acute treatment period, as changes may not occur until a while after treatment is terminated, and therefore may not be observed until long-term follow-up.

In regard to treatment satisfaction, hypothesis 7 was generally supported, as treatment acceptability/satisfaction, VC satisfaction, and therapeutic alliance ratings were high. Specifically, mean ratings on the Treatment Acceptability Questionnaire (by parent

report) were high (39.27; scale range = 7-42) and are similar to parent-reported treatment acceptability ratings found in the randomized comparison of VC-delivered CBIT (35.5) to in-person delivery (36.7; Himle et al., 2012). Additionally, both parent- and child-reported treatment satisfaction (CSQ) and VC satisfaction scores were high. The therapeutic alliance (CPTR) was relatively strong (37.45; scale range = 5-50). A different alliance scale (the Working Alliance Inventory) was used in Himle et al. (2012) making between-study comparisons difficult; however upon visual inspection of the means (75.7; scale range = 12-84), it seems the alliance was slightly stronger in Himle et al. (2012).

Hypothesis 8 was supported, as the treatment was generally feasible to implement with respect to usability and adherence, but posed some technological challenges. Treatment usability ratings were high, with parents liking the treatment, perceiving it as relatively easy to understand, and remaining neutral with respect to the ease of VC relative to in-person sessions. Treatment usability ratings were also high among therapists. Therapist perceptions regarding the ease of delivering CBIT via VC relative to face-to-face were also neutral, with ratings indicative of perceptions of equality between the two modalities.

Limitations of Secondary Aims. One limitation is that family functioning was measured at screening – not baseline, which may have influenced ratings. Additionally, this was the only measure of psychosocial functioning used, resulting in the exclusion of several other domains. With respect to acceptability, one limitation is the use of a different therapeutic alliance measure than in previous CBIT research (Himle et al., 2012) making comparisons challenging. Also the measure used in the present trial was modified slightly from its original form to be consistent with the VoIP modality, which may have

altered its validity. Furthermore, the measure was administered only to the patients, so there is no parent-report.

In regard to parent perceptions of treatment usability, some dislikes with respect to treatment were homework, session length, internet connection quality, scheduling conflicts, the use of VoIP relative to face-to-face treatment, and disruptions during sessions from other family members. Some concerns raised by patients were the small viewing range of the camera, and difficulty remaining seated and focused during sessions.

With respect to therapist concerns about treatment usability, several were cited. Therapists reported challenges perforyuming certain treatment components. Specifically, during awareness training therapists occasionally had difficulty hearing certain vocal tics, and seeing certain motor tics. During CR training it was sometimes difficult to see if certain competing responses were being performed correctly. This issue was also relevant to the teaching of relaxation procedures, including relaxed breathing and progressive muscle relaxation. Homework was also reported as a challenge. It was read aloud by clients, with the therapist recording notes on paper. Therapists reported a preference for viewing homework as they would in face-to-face treatment sessions in order to check accuracy and keep the original forms for their records. An added difficulty was that homework was often forgotten by clients and their parents. Despite therapist concerns regarding homework and session adherence, quantitative measures of therapist-rated adherence with homework and session activities were relatively good with respective ratings of 5.87 (scale range = 1-7), and 6.29.

An additional item often forgotten was the weekly measure of parent-reported tic severity, which was supposed to be completed on the parent's home computer and emailed to the therapist each week. Therapists needed to provide several reminders in order to get the weekly data, and in some cases resorted to asking parents the questions over VoIP and recording the answers themselves. In one instance a parent, of a patient who divided time between divorced parents' homes, did not possess a personal laptop or desktop and therefore was unable to email forms in the traditional sense, and instead improvised by taking pictures of the measures on her smart phone and sending them.

In regard to the internet surveys, their completion went smoothly with respect to technological issues, as parents each received detailed instructions prior to study onset. However, reminder calls were needed for several participants. In face-to-face treatment settings surveys can be completed during or immediately preceding/following a session. In the present study, there was little control over when participants completed internet surveys, creating more work for the administrator.

Another theme that emerged was parent and client focus and presence during sessions. When patients became distracted or non-responsive during sessions, therapists sometimes felt less control over the situation than in face-to-face treatment. Additionally, despite informing parents at treatment onset that they would need to be present for treatment sessions – age permitting, parental presence was lacking in a few cases. For example, a parent might be present for the first 20 minutes of a session, but then leave after becoming distracted by disruptions in the home. An additional noteworthy observation was that clients sometimes consumed food/snacks during treatment sessions. Although somewhat distracting, this was not, and is not necessarily a major problem

within itself, unless it stands to signify perceptions of a lack of formality in treatment among patients and parents.

Interference due to technological difficulties was cited as a concern by some therapists, as occasional session disruptions occurred, causing both therapists and patients to repeat themselves. Quantitative data supports this finding as technological difficulties were identified in 37.6% of therapy sessions, and 56.5% of assessment sessions. However, they were typically rated insignificant to moderate in terms of severity.

Proposed Modifications for Secondary Aims. With respect to psychosocial functioning, it would be best if any scales used are administered at baseline along with the other measures. Additionally, it would be beneficial to administer a measure of psychosocial functioning assessing several domains (e.g., family, social, school, etc.). With respect to the alliance measures it would be best to find a measure using wording consistent with the VoIP modality, and to administer it to parents in addition to patients.

In regard to treatment modifications for use of CBIT via VoIP, several suggestions follow. In order to improve ease of treatment performance, a more advanced camera may be needed to enhance viewing range and picture quality, and direct parental assistance with treatment procedures may be needed (e.g., awareness training, competing response training, relaxation training, etc.) during sessions, in which the therapist has difficulty viewing or hearing the tics.

To improve therapist homework viewing, a document camera would be helpful; however, they can be costly compared to the inexpensive web cameras purchased for this study. Another option might be to have participants hold the homework up to the web camera for viewing by the therapist. However, the simplest option seems to be having the

parent and child read aloud the homework for the therapist to take notes on, as was done in this trial. Homework nonadherence may be addressed with explicit written and verbal instructions regarding expectations for patient and parent participation in treatment. As many parents forgot to complete the weekly tic outcome measure, it is suggested that weekly parent-/child-report measures are either read aloud to the therapist via VoIP, or replaced by weekly clinician-rated measures. As many parents also needed reminders to complete their baseline and post-assessment forms, assessment sessions may be best conducted if patient reside close enough to the treatment facility. Additionally, self-report forms should be kept to a minimum. Furthermore, a noteworthy observation is that parents who were challenging to reach via the phone (for reminders and scheduling), were actually highly responsive when sent text messages instead. As phone communication was important in the present trial and seems to be essential for performing web-based VC in general, it may be helpful for therapists to have office phones with text messaging capabilities.

Shifting patient and parent focus was also cited as a patient and therapist concern. In order to address shifting patient and parent focus, it will be important to preface future VoIP treatment with very clear expectations for patient and parent attendance and participation with constant reminders. As technological difficulties occurred frequently, and interrupted sessions on occasion, clinicians should seek more advanced VoIP software platforms with higher visual and audio quality for future VoIP treatment.

Exploration of Exploratory Aims

Summary and Interpretation of Exploratory Aims. An exploratory aim of the present study was to examine the relationships between treatment outcomes, treatment

expectations, computer usage, satisfaction, the therapeutic alliance, treatment adherence, and technological difficulties. In hypothesis 9, it was expected that positive relationships would be found between patient, parent, and therapist treatment expectations and tic and global severity. This hypothesis was not supported, as treatment expectancy was not significantly associated with any clinical outcomes. This is understandable, as findings in the general research literature are mixed with respect to this issue (Joyce & Piper, 1998; Vogel, Hansen, Stiles, Gunnar Götestam, 2006). In regard to the relationship between satisfaction and alliance variables and pre-post changes in tic severity, it was expected that positive relationships would be found (hypothesis 10). This was not supported. Higher child VC satisfaction was found to be associated with lower pre-post decreases in clinician-rated total tic severity. It is unclear why negative correlations were found. Considering the small sample size, these findings may be spurious. The lack of a positive relationship is consistent with findings in Himle et al. (2012), in which no significant correlations were found between the therapeutic alliance and clinician-rated tic severity change scores at post-assessment. Positive relationships were found at a 4-month follow-up assessment in that study, however.

With respect to VC comfort, it was expected that it would increase significantly from baseline to the post-assessment among parents and children in the treatment group, as stated in hypothesis 11. Contrary to the hypothesis no significant increases were found in either child or parent VC comfort. Research in this area is highly limited, however in one study comfort with web-based VC technology increased across family problem solving treatment sessions for traumatic brain injury (Carey et al., 2008). However, the treatment in that study was 14 sessions, which provided greater exposure to the VC

technology than in the present trial. In hypothesis 12, it was expected that positive relationships would be found between both general and specific computer usage variables, and measures of acceptability and the therapeutic relationship. General child computer usage, child computer skills, and child perceptions of computers as appealing/helpful at baseline were positively associated with child VC satisfaction, providing partial support for the hypothesis. This makes sense, as familiarity with computer technology may enhance VoIP ease of use, and in turn satisfaction with the modality. No significant relationships were found between prior computer usage variables and general measures of treatment satisfaction or the alliance, as found in previous research (Carey et al., 2008; Hufford, Glueckauf, & Webb, 1999).

In hypothesis 13, it was expected that higher general and specific computer usage variables would be associated with higher adherence with homework and in-session activities. This hypothesis was not supported, as the only significant correlation found was in the opposite direction as predicted. Specifically, lower parent hours spent using a computer at baseline were associated with higher adherence with in-session activities. It is unclear why the results in the present study were obtained but perhaps parents with less computer experience at baseline were more vigilant about making sure treatment ran smoothly, thus being more likely to adhere to treatment.

When mean VC satisfaction scores and percentage of technological difficulties were compared by internet connection (cable vs. DSL), web camera (built-in vs. separate), and computer type (desktop vs. laptop) among those in the treatment group, no significant differences were found between groups. This is contrary to hypothesis 14, in which it was postulated that higher VC satisfaction and a lower percentage of

technological difficulties would be found in those with cable internet, separate web cameras, and desktop computers. There is some research to suggest that type of computer equipment can influence certain outcomes. In a study of web-based videoconferencing for social anxiety, users of wireless internet connections experienced significantly greater technological difficulties than those using wired connections (Yuen et al., 2013). The lack of significant differences found between users of different equipment in the present trial is likely related to the small sample size. Additionally, contrary to hypothesis 15, no significant relationships were found between hardware characteristics (e.g., computer age) and specifications (e.g., RAM, processor speed), VC satisfaction, the percentage of technological difficulties occurring within treatment sessions, and parent- and child-reported VC satisfaction.

Limitations and Proposed Modifications for Exploratory Aims. The major limitation of the exploratory aims is the small sample size, as analyses were run in the treatment group only. For this reason all findings must be interpreted with caution. Additionally, most of the exploratory analyses are correlational. In the future, it would be interesting to perform more advanced statistical analyses.

Summary of Present Research

Strengths. One of the strengths of the trial is the waitlist-control design, which was important as tics fluctuate in severity independently of treatment (Leckman, 2003). An additional strength is the use of a blind independent evaluator, and multiple therapists. Also, a portion of the therapy and assessment sessions were co-rated by an off-site researcher to assess treatment fidelity, with high co-ratings found. Additionally, multiple measures of patient and parent acceptability were assessed (i.e., treatment acceptability,

videoconferencing satisfaction, child-therapist alliance, treatment usability), with positive outcomes. Also, patient adherence regarding treatment sessions and homework completion was tracked by clinicians, with good ratings. In addition, clinician and IE ratings of technological difficulties during VoIP sessions were also tracked to provide additional feasibility data.

Limitations. The study has several limitations. First, the sample size was rather small, limiting the statistical power. Also, participant characteristics differed from other treatment samples in terms of gender and comorbidities. Specifically, a higher proportion of females (35%) was present in this sample than is typical for studies of children with CTDs. It is unclear why this is the case, but one contributing factor may have been the state wide recruitment. Additionally, rates of ADHD and OCD diagnoses were slightly lower than those in other CTD samples. However, an abbreviated diagnostic interview was used in this trial. Additionally, the use of a waitlist-control group instead of an in-person CBIT group makes it difficult to draw definitive conclusions regarding the acceptability of VoIP-delivered CBIT relative to face-to-face sessions beyond anecdotal information. Also, no short- or long-term follow-up assessment was included so maintenance of gains cannot be assessed or compared to previous trials. Additionally, a selection bias may have inflated the acceptability ratings, as many participants who were uninterested in the VoIP delivery method may have excluded themselves from participation. Furthermore, although not necessarily a limitation, it is worth noting that patient adherence and satisfaction may have been influenced by the initial home visit, as it may have functioned to establish initial rapport with families. It would be interesting to

observe outcomes had the participants not ever met a member of the study team in person.

Summary. Results of the present trial show CBIT can be implemented via VoIP with good adherence, along with some modifications, using inexpensive equipment/equipment already owned by families. Despite not ever entering the clinic, and experiencing some technological difficulties in sessions, satisfaction and therapeutic alliance ratings among families were high. Furthermore, with respect to technology it is important to note that no family who underwent phone screening was excluded from the trial for lacking a high speed (i.e., Cable/DSL) internet connection; and only one family who seemed eligible for the study during phone screening was unable to participate in the full 2-day screening process due to technological difficulties with their high speed internet connection. Additionally, the majority of families enrolled, already owned a web camera prior to the study. This highlights the fact that ever increasing numbers of families have computers, internet connections, and web cameras, and the use of web-based VC does not necessarily exclude treatment seeking individuals based on possession of certain technology.

Future Directions. In the future, a randomized-controlled trial with a larger sample size comparing in-person and VoIP-delivery of treatment sessions is needed to better assess differences in clinical outcomes, and satisfaction between modalities; and explore relationships between computer/internet variables and outcomes. Also, in future studies, researchers should find a way to obtain a stable measure of internet speed, which was not obtained in the present study, due to its constant fluctuation. This may be a stronger indicator of technological difficulties and satisfaction than any variables

explored in the present trial. It would also be interesting to group participants by prior computer skill or usage level (i.e., high vs. low) to determine whether clinical and satisfaction outcomes differ between groups. Also, future inclusion of both short- and long-term follow-up assessments is needed to assess the pattern of maintenance of gains. Additionally, as a number of technological difficulties did occur during VoIP sessions, it would be helpful to perform CBIT via newer, advanced VoIP programs to determine if audio and visual quality are improved. Furthermore, it would be interesting to pilot CBIT on personal tablets or smart phones, as VoIP programs can be downloaded as applications on these devices, and several families expressed interest in performing VoIP sessions on their personal tablets at the outset of their participation in the present trial.

References

Achenbach, T. M., & Rescorla, L. A. (2001). *Manual for the ASEBA School-Age Forms & Profiles.* Burlington, VT: University of Vermont, Research Center for Children, Youth, & Families.

Adam, H., & Luborsky, L. (1993). The role of the therapeutic alliance in psychotherapy. *Journal of Consulting and Clinical Psychology, 61,* 561-573.

Alverson, D. C., Shannon, S., Sullivan, E., Prill, A., Effertz, G., Helitzer, D., …Preston, A. (2004). Telehealth in the trenches: Reporting back from the frontlines in rural America. *Telemedicine Journal and e-Health, 10,* S-95-S-109.

AMD Global Telemedicine, Inc. (2012). *Private Payers by State.* Retrieved from http://www.amdtelemedicine.com/telemedicine-resources/PrivatePayersByState.html

American Psychiatric Association. (2000). *Diagnostic and statistical manual of mental disorders* (4th edition, text revision). Washington, DC: Author.

American Psychological Association. (2010). Telehealth 50-state review. Practice Directorate, Legal & Regulatory Affairs. Retrieved from APA Practice Central: http://www.apapracticecentral.org/advocacy/state/telehealth-slides.pdf

Axelrod, B. N. (2002). Validity of the Wechsler Abbreviated Scale of Intelligence and other very short forms of estimating intellectual functioning. *Assessment, 9,* 17-23.

Azrin, N. H. & Nunn, R. G. (1973). Habit Reversal: a method of eliminating nervous habits and tics. *Behaviour Research and Therapy, 11,* 619-628.

Azrin, N. H., Nunn, R. G., Frantz, S. E. (1980). Habit reversal vs. negative practice

treatment of nervous tics. *Behavior Therapy, 11,* 169-178.

Azrin, N. H., & Peterson, A. L. (1990). Treatment of Tourette syndrome by habit reversal: A waiting-list control group comparison. *Behavior Therapy, 21,* 305-318.

Bakke, B., Mitchell, J., Wonderlich, S., & Erickson, R. (2001). Administering Cognitive-Behavioral Therapy for Bulimia Nervosa via telemedicine in rural settings. *International Journal of Eating Disorders, 30,* 454-457.

Barak, A., Hen, L., Boniel-Nissim, & Shapira, N. (2008). A comprehensive review and a meta-analysis of the effectiveness of internet-based psychotherapeutic interventions. *Journal of Technology in Human Services, 26,* 109-160.

Berk, M., Ng, F., Dodd, S., Callaly, T., Campbell, S., Bernardo, M., & Trauer, T. (2008). The validity of the CGI severity and improvement scales as measures of clinical effectiveness suitable for routine clinical use. *Journal of Evaluation of Clinical Practice, 14,* 979-983.

Bird, D.C., Dempsey, P., & Hartley, D. (2001). Addressing mental health workforce needs in underserved rural areas: Accomplishments and challenges. Portland, ME: Maine Rural Health Research Center.

Bose, U., McLaren, P., Riley, A., & Mohammedali, A. (2001). The use of telepsychiatry in the brief counselling of non-psychotic patients from an inner-London general practice. *Journal of Telemedicine and Telecare, 7,* S1 8-10.

Bouchard, S., Paquin, B., Paveur, R., Allard, M., Rivard, V., Fournier, T., …Lapierre, J. (2004). Delivering cognitive behavior therapy for panic disorder with agoraphobia in videoconference. *Telemedicine and e-Health, 10,* 13-25.

Bouchard, S., & Robillard, G. (2000). *Validation of the scale of telepresence in videoconferencing.* Unpublished manuscript, University of Quebec at Hull.

Canivez, G. L., Konold, T. R., Collins, J. M., & Wilson, G. (2009). Construct validity of the Wechsler Abbreviated Scale of Intelligence and Wide Range Intellligence Test: Convergent and structural validity. *School Psychology Quarterly*, *24,* 252-265.

Capner, M. (2000). Videoconferencing in the provision of psychological services at a distance. *Journal of Telemedicine and Telecare, 6,* 311-319.

Cardenete-Suriol, M., Mangues-Bafalluy, J., Maso, A., & Gorricho, M. (2007). Characterization and comparison of Skype behavior in wired and wireless network scenarios. In Proceedings of GLOBECOM ‘07.

Carey, B., O’Brian, S., Onslow, M., Packman, A., & Menzies, R. (2012). Webcam delivery of the camperdown program for adolescents who stutter: A phase I trial. *Language, Speech, and Hearing Services in Schools, 43,* 370-380.

Carey, J. C., Wade, S. L., & Wolfe, C. R. (2008). Lessons learned: The effect of prior technology use on web-based interventions. *CyberPsychology & Behavior, 11*, 188-195.

Chae, Y. M., Park, H. J., Cho, J. G., Hong, G. D., & Cheon, K. (2000). The reliability and acceptability of telemedicine for patients with schizophrenia in Korea. *Journal of Telemedicine and Telecare, 6,* 83-90.

Chang, S., Himle, M. B., Tucker, B. T. P., Woods, D. W., Piacentini, J. (2009). Initial psychometric properties of a brief parent-report instrument for assessing tic

severity in children with Chronic Tic Disorder. *Child & Family Behavior Therapy, 31,* 181-191.

Choi, N. G., Hegel, M. T., Marti, C. M., Marinucci, M. L., Sirrianni, L., & Bruce, M. L. (2014). Telehealth problem-solving therapy for depressed low-income homebound older adults: Acceptance and preliminary efficacy. *American Journal of Geriatric Psychiatry, 22,* 263-271.

Choi, N. G., Wilson, N. L., Sirrianni, L., Marinucci, M. L., & Hegel, M. T. (in press). Acceptance of home-based telehealth problem-solving therapy for depressed, low-income homebound older adults: Qualitative interviews with the participants and aging-service case managers. *The Gerontologist,*

Cohen, J. (1988). *Statistical power analysis for the behavioral sciences (2nd ed).* Hillsdale, NJ: Lawrence Erlbaum Associates.

Conners, C. K. (1997). *Manual for Conners' Rating Scales.* Toronto: Multi-Health Systems Inc.

Conelea, C. A., Woods, D. W., Zinner, S. H., Budman, C., Murphy, T., Scahill, L. D., …Walkup, T. (2011). Exploring the impact of Chronic Tic Disorders on youth : Results from the Tourette Syndrome impact survey. *Child Psychiatry and Human Development, 42,* 219-242.

Constantinescu, G. (2012). Satisfaction with telemedicine for teaching listening and spoken language to children. *Journal of Telemedicine and Telecare, 18,* 267-272.

Cook, C.R., & Blacher, J. (2007). Evidence-based psychosocial treatments for tic disorders. *Clinical Psychology: Science & Practice, 14,* 252-267.

Cooper, C., Robertson, M. M., & Livingston, G. (2003). Psychological morbidity and caregiver burden in parents of children with Tourette's Disorder and psychiatric comorbidity. *Journal of the American Academy of Child and Adolescent Psychiatry, 42,* 1370-1375.

Cowain, T. (2001). Cognitive-behavioural therapy via videoconferencing to a rural area. *Australian and New Zealand Journal of Psychiatry, 35,* 62-64.

Cox, J. B., Brown, T. R., Peterson, P. D., & Rowe, M. M. (1982). A report on a statewide community mental health center outcome study. *Community Mental Health Journal, 18,* 135-150.

Cubo, E., Gabriel y Galán, J. M. T., Villaverde, V. A., Velasco, S. S., Benito, V. D., Macarrón, J. V., … Benito-León, J. B. (2011). Prevalence of tics in schoold children in Central Spain : A population-based study. *Pediatric Neurology, 45,* 100-108.

Cutler, D., Murphy, T., Gilmour, J., & Heyman, I. (2009). The quality of life of young people with Tourette syndrome. *Child: Care, Health, and Development, 35,* 496-504.

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,* 499-503.

DeAngelis, T. (2012). Practicing distance therapy, legally and ethically: Psychology is developing guidelines for practitioners in this rapidly changing area. *Monitor on Psychology, 43,* 52.

De Cicco, L., Mascolo, S., & Palmisano, V. (2011). Skype video congestion control: An experimental investigation. *Computer Networks, 55,* 558-571.

Deckersbach, T., Rauch, S., Buhlman, U., & Wilhelm, S. (2006). Habit reversal versus supportive psychotherapy in Tourette's disorder: A randomized trial and predictors of treatment response. *Behaviour Research & Therapy, 44,* 1079-1090.

Dwyer, S. J., Weaver, A. C., & Hughes, K. K. (2004). Health insurance portability and accountability act. In B. I. Reiner, E. L. Siegel, & S. J. Dwyer (Eds.), *Security Issues in the Digital Medical Enterprise: Scar University Primer 1* (pp. 9-18). Society for Computer Applications in Radiology.

Economics and Statistics Administration & National Telecommunications and Information Administration in the U.S. Department of Commerce. (2011). *Exploring the Digital Nation: Computer and Internet Use at Home.* Retrieved from http://www.esa.doc.gov/sites/default/files/reports/documents/exploringthedigitalnation-computerandinternetuseathome.pdf

Eddy, C. M., Rizzo, R., Gulisano, M., Agodi, A., Barchitta, M., Cali, P., ...Cavanna, A. E. (2011). Quality of life in young people with Tourette syndrome: A controlled study. *Journal of Neurology, 2,* 291-301.

Eisenberg, D., Golberstein, E., & Gollust, S. E. (2007). Help-seeking and access to mental health care in a university student population. *Medical Care, 45,* 594-601.

Elford, R., White, H., Bowering, R., Ghandi, A., Maddiggan, B., & St. John, K. (2000). A randomized, controlled trial of child psychiatric assessments conducted using videoconferencing. *Journal of Telemedicine and Telecare, 6,* 73-82.

Elstner, K., Selai, C. E., Trimble, M. R., & Robertson, M. M. (2001). Quality of life (QOL) of patients with Gilles de la Tourette's syndrome. *Acta Psychiatrica Scandinavica, 103,* 52-59.

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. *The International Journal of Eating Disorders, 44,* 687-691.

Evaer Technology. (2013). Evaer video recorder for Skype. Version 1.3.9.29.

Fell, D. W., & Kim, K. (2012). Developing international collaborations in physical therapy academia: A case example emphasizing education and scholarship. *Journal of Physical Education, 26,* 6-12.

Fitzgerald, T. D., Hunter, P. V., Hadjistavropoulos, T., & Koocher, G. P. (2010). Ethical and legal considerations for internet-based psychotherapy. *Cognitive Behaviour Therapy, 39,* 173-187.

Flancbaum, M., Rockmore, L., & Franklin, M. E. (2011). Intensive behavior therapy for tics: Implications for clinical practice and overcoming barriers to treatment. *Journal of Developmental and Physical Disabilities, 23,* 61-69.

Fox, J. C., Blank, M., Rovnyak, V. G., & Barnett, R. Y. (2001). Barriers to help seeking for mental disorders in a rural impoverished population. *Community Mental Health Journal, 37,* 421-436.

Freeman, R. D., Fast D. K., Burd, L., Kerbeshian, J., Robertson, M. M., & Sandor, P. (2000). An international perspective on Tourette syndrome: Selected findings

from 3,500 individuals in 22 countries. *Developmental Medicine and Child Neurology, 42,* 436-447.

Frueh, B. C., Monnier, J., Grubaugh, A. L., Elhai, J. D., Yim, E., & Knapp, R. G. (2007a). Therapist adherence and competence with manualized cognitive-behavioral therapy for PTSD delivered via videoconferencing technology. *Behavior Modification, 31,* 856-866.

Frueh, B. C., Monnier, J., Yim, E., Grubaugh, A. L., Hammer, M. B., & Knapp, R. G. (2007b). A randomized trial of telepsychiatry for post-traumatic stress disorder. *Journal of Telemedicine and Telecare, 13,* 142-147.

Garfinkel, S. L. (2005). *VoIP and Skype security*. Retrieved February 25, 2011, from http://skypetips.internetvisitation.org/files/VoIP%20and%20Skype.pdf

Germain, V., Marchand, A., Bouchard, S., Drouin, M. S., & Guay, S. (2009). Effectiveness of Cognitive-Behavioral Therapy administered by Videoconference for Postraumatic Stress disorder. *Cogntive Behaviour Therapy, 38,* 42-53.

Germain, V., Marchand, A., Bouchard, S., Guay, S., & Drouin, M. S. (2010). Assessment of the therapeutic alliance in face-to-face or videoconference treatment for posttraumatic stress disorder. *Cyberpsychology, Behavior, and Social Networking, 13,* 29-35.

Goldfield, G. S., & Boachie, A. (2003). Delivery of family therapy in the treatment of anorexia nervosa using telehealth. *Telemedicine Journal and E-health, 9,* 111-114.

Grealish, A., Hunter, A., Glaze, R., & Potter, L. (2005). Telemedicine in a child and adolescent mental health service: Participants' acceptance and utilization. *Journal of Telemedicine and Telecare, 11,* 53-55.

Griffiths, L., Blignault, I., & Yellowlees, P. (2006). Telemedicine as a means of delivering cognitive-behavioural therapy to rural and remote mental health clients. *Journal of Telemedicine and Telecare, 12,* 136-140.

Gros, D. F., Morland, L. A., Greene, C. J., Acierno, A., Strachan, M. Egede, L. E., Tuerk, P. W., ...Frueh, B. C. (2013). Delivery of evidence-based psychotherapy via video telehealth. *Journal of Psychopathology and Behavioral Assessment, 35,* 506-521.

Gros, D. F., Veronee, K., Strachan, M., Ruggiero, K. J., & Acierno, R. (2011). Managing suicidality in home-based telehealth. *Journal of Telemedicine and Telecare, 17,* 332-335.

Gros, D. F., Yoder, M., Tuerk, P. W., Lozano, B. E., & Acierno, R. (2011). Exposure therapy for PTSD delivered to veterans via telehealth: Predictors of treatment completion and outcome and comparison to treatment delivered in person. *Behavior Therapy, 42,* 276-283.

Guy, W. (1976). ECDEU assessment manual for psychopharmacology. Rev. Rockville, Md.: National Institute of Mental Health. (DHEW publication no. (ADM) 76-338).

Hassija, C., & Gray, M. J. (2011). The effectiveness and feasibility of videoconferencing technology to provide evidence-based treatment to rural domestic violence and sexual assault populations. *Telemedicine and e-Health, 17,* 309-315.

Hausman, J. A., Sidak, G., & Singer, H. J. (2001). Cable modems and DSL: Broadband internet access for residential customers. *American Economic Association Papers & Proceedings, 91,* 302-307.

Health Information Technology for Economic and Clinical Health (HITECH) Act, Title XIII, Division A of the American Recovery and Reinvestment Act (ARRA), Pub. L. No. 111-5, §§ 13001-13424, 123 Stat. 115, 228-279 (2009).

Health Insurance Portability and Accountability Act, 45 C. F. R. § 160, 162, 164 (1996) (US).

Hermann, V. H., Herzog, M., Jordan, R., Hofherr, M., Levine, P., & Page, S. J. (2010). Telerehabilitation and electrical stimulation: An occupation-based, client-centered stroke intervention. *64,* 73-81.

Hildebrand, R., Chow, H., Williams, C., Nelson, M., & Wass, P. (2004). Feasibility of neuropsychological tetsing of older adults via videoconference: Implications for assessing the capacity for independent living. *Journal of Telemedicine and Telecare, 10,* 130-134.

Hilty, D. M., Cobb, H. C., Neufeld, J. D., Bourgeois, J. A., & Yellowlees, P. M. (2008). Telepsychiatry reduces geographic physician disparity in rural settings, but is it financially feasible because of reimbursement? *Psychiatric Clinics of North America, 31,* 85-94.

Hilty, D. M., Ferrer, D. C., Burke Parish, M., Johnston, B., Callahan, E. J., & Yellowlees, P. M. (2013). The effectiveness of telemental health: A 2013 review. *Telemedicine & e-Health, 19,* 444-454.

Hilty, D. M., Luo, J. S., Morache, C., Marcelo, D. A., & Nesbitt, T. S. (2002). Telepsychiatry: An overview for psychiatrists. *CNS Drugs, 16,* 527-548.

Hilty, D. M., Marks, S. L., Urness, D., Yellowlees, M.D., & Nesbitt, M. D. (2004). Clinical and educational telepsychiatry applications: A review. *The Canadian Journal of Psychiatry, 49,* 12-23.

Himle, J. A., Fischer, D. J., Muroff, J. R., Van Etten, M. L., Lokers, L. M., Abelson, J. L., et al. (2006). Videoconferencing-based cognitive-behavioral therapy for obsessive-compulsive disorder. *Behavior Research and Therapy, 44,* 1821-1829.

Himle, M. B., Freitag, M., Walther, M., Franklin, S. A., Ely, L., & Woods, D. W. (2012). A randomized pilot trial comparing videoconference versus face-to-face delivery of behavior therapy for childhood tic disorders. *Behaviour Research and Therapy, 50,* 565-570.

Himle, M. B., Olufs, E., Himle, J., Tucker, B. T. P., & Woods, D. W. (2010). Behavior thereapy for tics via videoconference delivery: An initial pilot test in children. *Cogntive and Behavioral Practice, 17,* 329-337.

Himle, M. B., Woods, D. W., Piacentini, J., & Walkup, J. (2006). A brief review of habit reversal training for Tourette syndrome. *Journal of Child Neurology, 21,* 719-725.

HIPAA Compliance IT. (2011). *Skype Security and HIPAA Compliance.* Retrieved September 17, 2012, from http://www.hipaacomplianceit.com/skype-security-and-hipaa-compliance/

Hoffman, J. (2011, September 23). When your therapist is only a click away. *The New York Times.* Retrieved from http://www.nytimes.com

Hsiung, R. C. (2001). Suggested principles of professional ethics for the online provision of mental health services. *Telemedicine and e-Health, 7,* 39-45.

Hufford, B. J., Glueckauf, R. L., & Webb, P. M. (1999). Home-based interactive videoconferencing for adolescents with epilepsy and their families. *Rehabilitation Psychology, 44,* 176-193.

Hunsley, J. (1992). Development of the Treatment Acceptability Questionnaire. *Journal of Psychopathology and Behavioral Assessment, 14,* 55-64.

Jacobsen, S. E., Sprenger, T., Andersson, S., & Krogstad, J. (2003). Neuropsychological assessment and telemedicine: A preliminary study examining the reliability of neuropsychology services performed via telecommunication. *Journal of the International Neuropsychological Society, 9,* 472-478.

James, K. L. (2010). *The Internet: A User's Guide, Second Edition.* New Delhi, India: PHI Learning Private Limited.

Janik, P., Kalbarczyk, A., & Sitek, M. (2007). Clinical analysis of Gilles de la Tourette syndrome in 126 cases. *Neurologia I Neurochirurgia Polska, 41,* 381-387.

Joyce, A. S., & Piper, W. E. (1998). Expectancy, the therapeutic alliance, and treatment outcome in short-term individual psychotherapy. *Journal of Psychotherapy Practice and Research, 7,* 236-248.

Kazdin, A. E., & Kopel, S. A. (1975). On resolving ambiguities of the multiple-baseline design: Problems and recommendations. *Behavior Therapy, 6,* 601-608.

Kazemitabar, H., Ahmed, S., Nisar, K., Said, A. B., & Habsullah, H. B. (2010). A comprehensive review on VoIP over wireless LAN networks. *Computer Science Letters, 2.*

Kendall, P. C. (1994). Treating anxiety disorders in children: Results of a randomized clinical trial. *Journal of Consulting and Clinical Psychology, 62,* 100-110.

Kendall, P. C., & Sugarman, A. (1997). Attrition in the treatment of childhood anxiety disorders. *Journal of Consulting and Clinical Psychology, 65,* 883-888.

Khalifa, N., & von Knorring, A. L. (2003). Prevalence of tic disorders and Tourette syndrome in a Swedish school population. *Developmental Medicine and Child Neurology, 45,* 315-319.

Khalifa, N., & von Knorring, A. L. (2006). Psychopathology in a Swedish population of school children with tic disorders. *Journal of the American Academy of Child & Adolescent Psychiatry, 45,* 1346-1353.

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,* 36-42.

King, V. L., Stoller, K. B., Kidorf, M., Kindbom, K., Hursh, S., Brady, T., & Brooner, R. K. (2009). Assessing the effectiveness of an internet-based videoconferencing platform for delivering intensified substance abuse counseling. *Journal of Substance Abuse Treatment, 36,* 331-338.

Kirkwood, K. T., Peck, D. F., & Bennie, L. (2000). The consistency of neuropsychological assessments performed via telecommunication and face to face. *Journal of Telemedicine and Telecare, 6,* 147-151.

Knight, T., Steeves, T., Day, L., Lowerison, M., Jette, N., Pringsheim, T. (2012). Prevalence of tic disorders: A systematic review and meta-analysis. *Pediatric Neurology, 47,* 77-90.

Kobak, K. A. (2004). A comparison of face-to-face and videoconference administration of the Hamilton Depression Rating Scale. *Journal of Telemedicine and Telecare, 10,* 231-235.

Kobak, K. A., Williams, J, B. W., & Engelhardt, N. (2008). A comparison of face-to-face and remote assessment of inter-rater reliability on the Hamilton Depression Rating Scale via videoconferencing. *Medical Image Analysis, 158,* 99-103.

Kraft, J. T., Dalsgaard, S., Obel, C., Thomsen, P. H., Henriksen, T. B., & Scahill, L. (2012). Prevalence and clinical correlates of tic disorders in a community sample of school-age children. *European Child & Adolescent Psychiatry, 21,* 5-13.

Lakshmanan, G. T. (2008). Placement strategies for internet-scale data stream systems. *IEEE Internet Computing, 12,* 50-60.

Larsen, D. L., Attkisson, C., Hargreaves, W. A., & Nguyen, T. D. (1979). Assessment of client/patient satisfaction: Development of a general scale. *Evaluation and Program Planning, 2,* 197-207.

Lazzari, C., Egan, S. J., & Rees, C. S. (2011). Behavioral activation treatment for depression in older adults delivered via videoconferencing: A pilot study. *Cognitive and Behavioral Practice, 18,* 555-565.

Leckman, J. F. (2002). Tourette's syndrome. *Lancet, 360,* 1577-1586.

Leckman, J. F., Riddle, M. A., Hardin, M. T., Ort, S. I., Swartz, K. L., Stevenson, J., et al. (1989). The Yale Global Tic Severity Scale: Initial testing of a clinician-rated scale of tic severity. *Journal of the American Academy of Child & Adolescent Psychiatry, 28,* 566-573.

Leon, A. C., Shear, M. K., Klerman, G. L., Portera, L., Rosenbaum, J., & Goldenberg, I. (1993). A comparison of symptom determinants of patient and clinician global ratings in patients with panic disorder and depression. *Journal of Clinical Psychopharmacology, 13,* 327-331.

Lemaire, E. D., Boudrias, Y., & Greene, G. (2001). Low-bandwidth, internet-based videoconferencing for physical rehabilitation consultations. *Journal of Telemedicine and Telecare, 7,* 82-89.

Lichstein, K. L., Scogin, F., Thomas, J. DiNapoli, E. A., Dillon, H. R., & McFadden, A. (2013). Telehealth cognitive behavior therapy for co-occurring insomnia and depression symptoms in older adults. *Journal of Clinical Psychology, 69,* 1056-1065.

Manchanda, M., & McLaren, P. (1998). Cognitive Behaviour Therapy via interactive video. *Journal of Telemedicine, 4,* 53-55.

Matsuura, S., Hosaka, T., Yukiyama, T., Ogushi, Y, Okada, Y., Haruki, Y., & Nakamura, M. (2000). Application of telepsychiatry: A preliminary study. *Psychiatry and Clinical Neurosciences, 54,* 55-58.

McGinty, K. L., Saeed, S. A., Simmons, S. C., & Yildirim, Y. (2006). Telepsychiatry and e-mental health services: Potential for improving access to mental health care. *Psychiatry Quarterly, 77,* 335-342.

Medien, Z., Machhout, B., Bouallegue, B., Khriji, L., Baganne, A., & Tourki, R. (2010). Design and hardware implementation of QoSS-AES processor for multimedia applications. *Transactions on Data Privacy, 3,* 43-64.

Meer, A. (2012). DSL compared to Cable speeds. *eHow Tech.* Demand Media, Inc. Retrieved from http://www.ehow.com/about_6625546_dsl-compared-cable-speeds.html

Mehta, P., & Udani, S. (2001). Voice over IP: Sounding good on the internet. *IEEE Potentials,* 36-40.

Miltenberger, R. G., Fuqua, R. W., & McKinley, T. (1985). Habit reversal with muscle tics: Replication and component analysis. *Behavior Therapy, 16,* 39-50.

Mitchell, J. E., Crosby, R. D., Wonderlich, S. A., Crow, S., Lancaster, K., Simonich, H., et al. (2008). A randomized trial comparing the efficacy of cognitive-behavioral therapy for bulimia nervosa delivered via telemedicine versus face-to-face. *Behaviour Research and Therapy, 46,* 581-592.

Mojtabai, R., Olfson, M., Sampson, N. A., Jin, R., Druss, B., Wang, P. S., … Kessler, R. C. (2011). Barriers to mental health treatment: Results from the National Comorbidity Survey Replication. *Psychological Medicine, 41,* 1751-1761.

Morland, L. A., Greene, C. J., Rosen, C. S., Foy, D., Reilly, P., Shore, J., et al. (2010). Telemedicine for anger management therapy in a rural population of combat veterans with posttraumatic stress disorder: A randomized noninferiority trial. *The Journal of Clinical Psychiatry, 71,* 855-863.

Morland, L. A., Pierce, K., & Wong, M. Y. (2004). Telemedicine and coping skills groups for Pacific Island veterans with post-traumatic stress disorder: A pilot study. *Journal of Telemedicine and Telecare, 10,* 286-289.

Myers, K. M., Valentine, J., Morganthaler, R., & Melzer, S. (2006). Telepsychiatry with incarcerated youth. *Journal of Adolescent Health, 38,* 643-648.

Nakamura, B. J., Ebesutani, C., Bernstein, A., & Chorpita, B. F. (2009). A psychometric analysis of the Child Behavior Checklist DSM-Oriented Scales. *Journal of Psychopathology and Behavioral Assessment, 31,* 178-189.

Nelson, E., Barnard, M., & Cain, S. (2003). Treating childhood depression over videoconferencing. *Telemedicine Journal and e-Health, 9,* 49-55.

Nesbitt, T. S., Hiilty, D. M., Kuenneth, T., & Siefkin, A. (2000). Development of a telemedicine program: A review of 1,000 videoconferencing consultations. *Western Journal of Medicine, 173,* 169-174.

Nguyen, T. D., Attkisson, C. C., & Stegner, B. L. (1983). Assessment of patient satisfaction: Development and refinement of a Service Evaluation Questionnaire. *Evaluation and Program Planning, 6,* 299-314.

Oakes, J., Battersby, M. W., Pols, R. G., & Cromarty, P. (2008). Exposure therapy for problem gambling via videoconferencing: A case report. *Journal of Gambling Studies, 24,* 107-118.

Pelletier, M. (2006). Cognitive-Behavioral Therapy efficacy via videoconferencing for social (public speaking) anxiety disorder: Single case design. *Dissertation Abstracts International: Section B: The Sciences and Engineering, 63,* 6103.

Pepin, R., Segal, D. L., & Coolidge, F. L. (2009). Intrinsic and extrinsic barriers to mental health care among community-dwelling younger and older adults. *Aging & Mental Health, 13,* 769-777. *Behaviour Research and Therapy, 30,* 167-174.

Perle, J. G., Langsam, L. C., Randel, A., Lutchman, S., Levine, A. B., Odland, A. P., … Marker, C. D. (2013). Attitudes toward psychological telehealth: Current and

future clinical psychologists' opinion of internet-based interventions. *Journal of Clinical Psychology, 69,* 100-113.

Piacentini, J., Woods, D. W., Scahill, L., Wilhelm, S., Peterson, A. L., Chang, S., et al. (2010). Behavior therapy for children with Tourette Disorder: A randomized controlled trial. *The Journal of the American Medical Association, 303,* 1929-1937.

Porcari, C. E., Amdur, R. L., Koch, E. I., Richard, D. C. S., Favorite, T., Martis, B., et al. (2009). Assessment of post-traumatic stress disorder in veterans by videoconferencing and by face-to-face methods. *Journal of Telemedicine and Telecare, 15,* 89-84.

Qualtrics Labs, Inc. software (2011). Version 21269 of the Qualtrics Research Suite. Provo, UT: Qualtrics Labs, Inc. http://www.qualtrics.com.

Ramirez, M. (2011, April). Communication in "the cloud": Skype, GoogleTalk, and Google Voice. *Technology.* Retrieved from http://digitalcommons.calpoly.edu/cgi/viewcontent.cgi?article=1079&context=lib_fac&sei-redir=1&referer=http%3A%2F%2Fscholar.google.com%2Fscholar%3Fq%3DSkype%2Bquality%2Bheadset%2Bprocessing%2Bspeed%26btnG%3D%26hl%3Den%26as_sdt%3D0%252C50#search=%22Skype%20quality%20headset%20processing%20speed%22

Rees, C. S., & Stone, S. (2005). Therapeutic alliance in face-to-face versus videoconferenced psychotherapy. *Professional Psychology: Research and Practice, 36,* 649-653.

Roberts, R. E., & Attkisson, C. C. (1983). Assessing client satisfaction among Hispanics. *Evaluation and Program Planning, 6,* 401-413.

Robertson, M. M. (2008). The prevalence and epidemiology of Gilles de la Tourette syndrome: Part 1: The epidemiological and prevalence studies. *Journal of Psychosomatic Research, 65,* 461-472.

Rouse, M. (2005). ISDN (Integrated Service Digital Network). *Tech Target, Inc.* Retrieved from http://archenterprisewan.techtarget.com/

Saghaei, M. (2004). Random Allocation Software. Version 1.0. Isfahan, Iran. http://mahmoodsaghaei.tripod.com/Softwares/randalloc.html

Saklofske, D. H., Caravan, G., Schwartz, C. (2000). Concurrent validity of the Wechsler Abbreviated Scale of Intelligence (WASI) with a sample of Canadian children. *Canadian Journal of School Psychology, 16,* 87-94.

Savage, S. J., & Waldman, D. (2005). Broadband internet access, awareness, and use: Analysis of United States household data. *Telecommunications Policy, 29,* 615-633.

Scahill, L., Chappell, P. B., Kim, Y. S., Schultz, R. T., Katsovich, L., Shepherd, E., …Leckman, J. F. (2001). Guanfacine in the treatment of children with tic disorders and ADHD: A placebo-controlled study. *American Journal of Psychiatry, 158,* 1067-1074.

Scahill, L., Erenberg, G., Berlin, C. M. Jr., Budman, C., Coffey, B. J., Jankovic, J., …Tourette Syndrome Association Medical Advisory Board: Practice Committee.

(2006). Contemporary assessment and pharmacotherapy of Tourette syndrome. *NeuroRx, 3,* 192-206.

Scahill, L., Williams, S., Schwab-Stone, M., Applegate, J., & Leckman, J.F. (2009). Disruptive behavior problems in a community sample of children with tic disorders. *Advanced Neurology, 99,* 184–190.

Scharf, J. M., Miller, L. L., Mathews, C. A., & Ben-Shlomo, Y. (2012). Prevalence of Tourette Syndrome and chronic tics in the population-based Avon Longitudinal Study of Parents and Children Cohort. *Journal of the American Academy of Child & Adolescent Psychiatry, 51,* 192-201.

Schroeders, U., & Wilhelm, O. (2011). Computer usage questionnaire: Structure, correlates, and gender differences. *Computers in Human Behavior, 27,* 899-904.

Schulz, K. F., Altman, D. G., Moher, D., for the CONSORT Group. (2010). CONSORT 2010 Statement: Updated guidelines for reporting parallel group randomized trials. *BMJ, 340,* 698-702.

Sheehan, D. V., Sheehan, K. H., Shytle, R. D., Janavs, J., Bannon, Y., Rogers, J. E., … Wilkinson, B. (2010). *Journal of Clinical Psychiatry, 71,* 313-326.

Shepherd, L., Goldstein, D., Whitford, H., Thewes, B., Brummell, V., & Hicks, M. (2006). The utility of videoconferencing to provide innovative delivery of psychological treatment for rural cancer patients: Results of a pilot study. *Journal of Pain and Symptom Management, 32,* 453-461.

Shore, J. H., Savin, D., Novins, D., & Manson, S. M. (2006). Cultural aspects of telepsychiatry. *Journal of Telemedicine and Telecare, 12,* 116-121.

Shore, J. H., Savin, D., Orton, H., Beals, J., & Manson, S. M. (2007). Diagnostic reliability of telepsychiatry in American Indian Veterans. *The American Journal of Psychiatry, 164,* 115-118.

Sibbald, B., & Roland, M. (1998). Understanding controlled trials: Why are randomized controlled trials important? *British Medical Journal, 316,* 201-202.

Simpson, S. (2001). The provision of a telepsychology service to Shetland: Client and therapist satisfaction and the ability to develop a therapeutic alliance. *Journal of Telemedicine & Telecare, 7,* 34-36.

Simpson, S. (2009). Psychotherapy via videoconferencing: A review. *British Journal of Guidance & Counseling, 37,* 271-286.

Simpson, S., Bell, L., Knox, J., & Mitchell, D. (2005). Therapy via videoconferencing: A route to client empowerment? *Clinical Psychology and Psychotherapy, 12,* 156-165.

Simpson, S., Bell, L., Britton, P., Mitchell, D., Morrow, E., Johnston, L., & Brebner, J. (2006). Does video therapy work? A single case series of bulimic disorders. *European Eating Disorders Review, 14,* 226-241.

Simpson, S., Deans, G., & Brebner, E. (2001). The delivery of a tele-psychology service to Shetland. *Clinical Psychology and Psychotherapy, 8,* 130-135.

Skinner, H., Steinhauer, P., & Sitarenios, G. (2000). Family Assessment Measure (FAM) and process model of family functioning. *Journal of Family Therapy, 22,* 190-210.

Skinner, H. A., Steinhauer, P. D., & Santa-Barbara, J. (1995). *FAM-III manual.* Toronto, ON: Multihealth Systems Inc.

Skype Technologies S. A. (2013). *What is Skype?* Retrieved October 5th, 2013, from http://about.skype.com/

Spencer, W. (2012). Differences between ISDN and DSL. [Web log post]. Retrieved from http://www.tech-faq.com/difference-between-isdn-and-dsl.html

Stain, H. J., Payne, K., Thienel, R., Michie, P., Carr, V., & Kelly, B. (2011). The feasibility of videoconferencing for neuropsychological assessments of rural youth experiencing early psychosis. *Journal of Telemedicine and Telecare, 17,* 328-331.

Stamm, B. H. (1998). Clinical applications of telehealth in mental health care. *Professional Psychology: Research and Practice, 29,* 536-542.

Stark, P. (2010). Congressional intent for the HITECH Act. *The American Journal of Managed Care, 16,* SP24-SP28.

Stefanoff, P., Wolanczyk, A., Gawrys, K., Swirszcz, E., Stefanoff, E., Kaminska, M., …Brynska, A. (2008). Prevalence of tic disorders among schoolchildren in Warsaw, Poland.

Storch, E. A., Caporino, N. E., Morgan, J. R., Lewin, A. B., Rojas, A., Brauer, L., …Murphy, T. K. (2011). Preliminary investigation of web-camera delivered cognitive-behavioral therapy for youth with obsessive-compulsive disorder. *Psychiatry Research, 189,* 407-412.

Storch, E. A., Merlo, L. J., Lack, C., Milsom, V. A., Geffken, G. R., Goodman, W. K., & Murphy, T. K. (2007). Quality of life in youth with Tourette's syndrome and chronic tic disorder. *Journal of Clinical Child and Adolescent Psychology, 36,* 217-227.

Suduc, A., Bîzoi, M., & Filip, F. G. (2009). Exploring multimedia web conferencing. *Informatica Economică, 13,* 5-17.

TalkPath LLC. (2012). *Good VoIP vs. Bad VoIP*. Retrieved from the AccuConference website: http://www.accuconference.com/

Task Force on Promotion and Dissemination of Psychological Procedures (1995). Training and dissemination of empirically-validated psychosocial treatments: Report and recommendations. The Clinical Psychologist, 48, 3-23.

Temple, V., Drummond, C., Valiquette, S., & Jozsvai, E. (2010). A comparison of intellectual assessments over video conferencing and in-person for individuals with ID: preliminary data. *Journal of Intellectual Disability Research, 54,* 573-577.

TokBox. (2012). *A video chatterbox nation: A report on live video communications today and tomorrow*. Retrieved from http://www.tokbox.com/blog/wp-content/uploads/2012/06/Video-Chatterbox-Nation-TokBox-May-2012.pdf

Treuting, J. J., & Hinshaw, P. P. (2001). Depression and self-esteem in boys with attention-deficit/hyperactivity disorder: Associations with comorbid aggression and explanatory attributional mechanisms. *Journal of Abnormal Child Psychology, 29,* 23-39.

Tuerk, P. W., Yoder, M., Ruggiero, K. J., Gros, D. F., & Acierno, R. (2010). A pilot study of prolonged exposure therapy for Posttraumatic Stress Disorder delivered via telehealth technology. *Journal of Traumatic Stress, 23,* 116-123.

Vanheusden, K., Mulder, C. L., van der Ende, J., van Lenthe, F. J., Mackenbach, J. P., & Verhulst, F. C. (2008). Young adults face major barriers to seeking help from mental health services. *Patient Education and Counseling,* 97-104.

Vogel, P. A., Hansen, B., Stiles, C., & Gunnar Götestam, K. (2006). Treatment motivation, treatment expectancy, and helping alliance as predictors of outcome in cognitive behavioral treatment. *Journal of Behavior Therapy and Experimental Psychiatry, 37,* 247-255.

Vogel, P. A., Launes, G., Moen, E. M., Solem, S., Hansen, B., Håland, T., & Himle, J. A. (2012). Videoconference- and cell phone-based cognitive-behavioral therapy of obsessive-compulsive disorder: A case series. *Journal of Anxiety Disorders, 26,* 158-164.

Wade, V. A., Karnon, J., Elshaug, A. G., & Hiller, J. E. (2010). A systematic review of economic analyses of telehealth services using real time video communication. *BMC Health Services Research, 10,* 233-245.

Wakefield, B. J., Holman, J. E., Ray, A., Morse, J., & Kienzle, M. G. (2004). Nurse and patient communication via low- and high-bandwidth home telecare systems. *Journal of Telemedicine and Telecare, 10,* 156-159.

Watson, T. S., & Sterling, H. E. (1998). Brief functional analysis and treatment of a vocal tic. *Journal of Applied Behavior Analysis, 31,* 471-474.

Watzlaf, V. J. M., Moeini, S., Firouzan, P. (2010). VOIP for telerehabilitation: A risk analysis for privacy, security, and HIPAA compliance. *International Journal of Telerehabilitation, 2,* 3-13.

Watzlaf, V. J. M., Moeini, S., Matusow, L., & Firouzan, P. (2011). VOIP for telerehabilitation: A risk analysis for privacy, security, and HIPAA compliance: Part II. *International Journal of Telerehabilitation, 3,* 3-10.

Watzlaf, V. R., & Ondich, B. (2012). VoIP for telerehabilitation: A pilot usability study for HIPAA compliance. *International Journal of Telerehabilitation, 4,* 25-32.

Wechsler, D. (1999). *Wechsler Abbreviated Scale of Intelligence (WASI).* London: The Psychological Corporation.

What is My IP Address. (2012). *What is ISDN?* Retrieved from http://whatismyipaddress.com/isdn

Wilhelm, S., Deckersbach, T., Coffey, B.J., Bohne, A., Peterson, A.L., & Baer, L. (2003). Habit reversal versus supportive psychotherapy for Tourette's disorder: A randomized controlled trial. *American Journal of Psychiatry, 160,* 1175-1177.

Wilhelm, S., Peterson, A. L., Piacentini, J., Woods, D. W., Deckersbach, T., Sukhodolsky, D. G.,…Scahill, L. (2012). Randomized trial of behavior therapy for adults with Tourette Syndromre. *Archives of General Psychiatry, 69,* 795-803.

Wood, J. A. V., Miller, T. W., & Hargrove, D. S. (2005). Clinical supervision in rural settings: A telehealth model. *Professional Psychology: Research and Practice, 36,* 173-179.

Woods, D. W. (2001). Habit reversal treatment manual for tic disorders. In D. W. Woods & R. G. Miltenberger (Eds.), *Tic disorders, trichotillomania, and other repetitive behavior disorders: Behavioral approaches to analysis and treatment* (pp. 97-132). Norwell, MA: Kluwer Academic Publishers.

Woods, D. W., Conelea, C. A., & Himle, M. B. (2010). Behavior therapy for Tourette's disorder: Utilization in a community sample and an emerging area of practice for psychologists. *Professional Psychology: Research and Practice, 41,* 518-525.

Woods, D. W., Piacentini, J., Chang, S. W., Deckersbach, T., Ginsburg, G., Peterson, A. L., …Wilhelm, S. (2008). *Managing Tourette Syndrome: A Behavioral Intervention for Children and Adults.* New York, NY: Oxford University Press Inc.

Woods, D. W., Piacentini, J. C., Scahill, L., Peterson, A. L., Wilhelm, S., Chang, S., …Walkup, J. T. (2011). Behavior therapy for tics in children: Acute and long-term effects on psychiatric and psychosocial functioning. *Journal of Child Neurology, 26,* 858-865.

Woods, D.W., Miltenberger, R.G., & Lumley, V.A. (1996). Sequential application of major habit reversal components to treat motor tics in children. *Journal of Applied Behavior Analysis, 29,* 483-493.

Woods, D. W., & Twohig, M. P. (2002). Using habit reversal to treat chronic vocal tic disorder in children. *Behavioral Interventions, 17,* 159-168.

Woods, D. W., Twohig, M. P., Flessner, C. A., & Roloff, T. J. (2003). Treatment of vocal tics in children with Tourette Syndrome: Investigating the efficacy of habit reversal. *Journal of Applied Behavior Analysis, 36,* 109-112.

Yip, M. P., Chang, A. M., Chan, J., & Mackenzie, A. E. (2003). Development of the Telemedicine Satisfaction Questionnaire to evaluate patient satisfaction with telemedicine: A preliminary study. *Journal of Telemedicine and Telecare, 9,* 46-50.

Yoshino, A., Shigemura, J., Kobayashi, Y., Nomura, S., Shishikura, K., Den, R., …Ashida, H. (2001). Telepsychiatry: Assessment of televideo psychiatric interview reliability with present- and next-generation internet infrastructures. *Acta Psychiatrica Scandinavica, 104,* 223-226.

Yuen, E. K., Herbert, J. D., Forman, E. M., Goetter, E. M. Juarascio, A. S., Rabin, S., …Bouchard, S. (2013). Acceptance based behavior therapy for social anxiety disorder through videoconferencing. *Journal of Anxiety Disorders, 27,* 389-397.

Zarate, C. A., Weinstock, L., Cukor, P., Morabito, C., Leahy, L., Burns, C., & Baer, L. (1997). Applicability of telemedicine for assessing patients with schizophrenia: Acceptance and reliability. *The Journal of Clinical Psychiatry, 58,* 22-25.

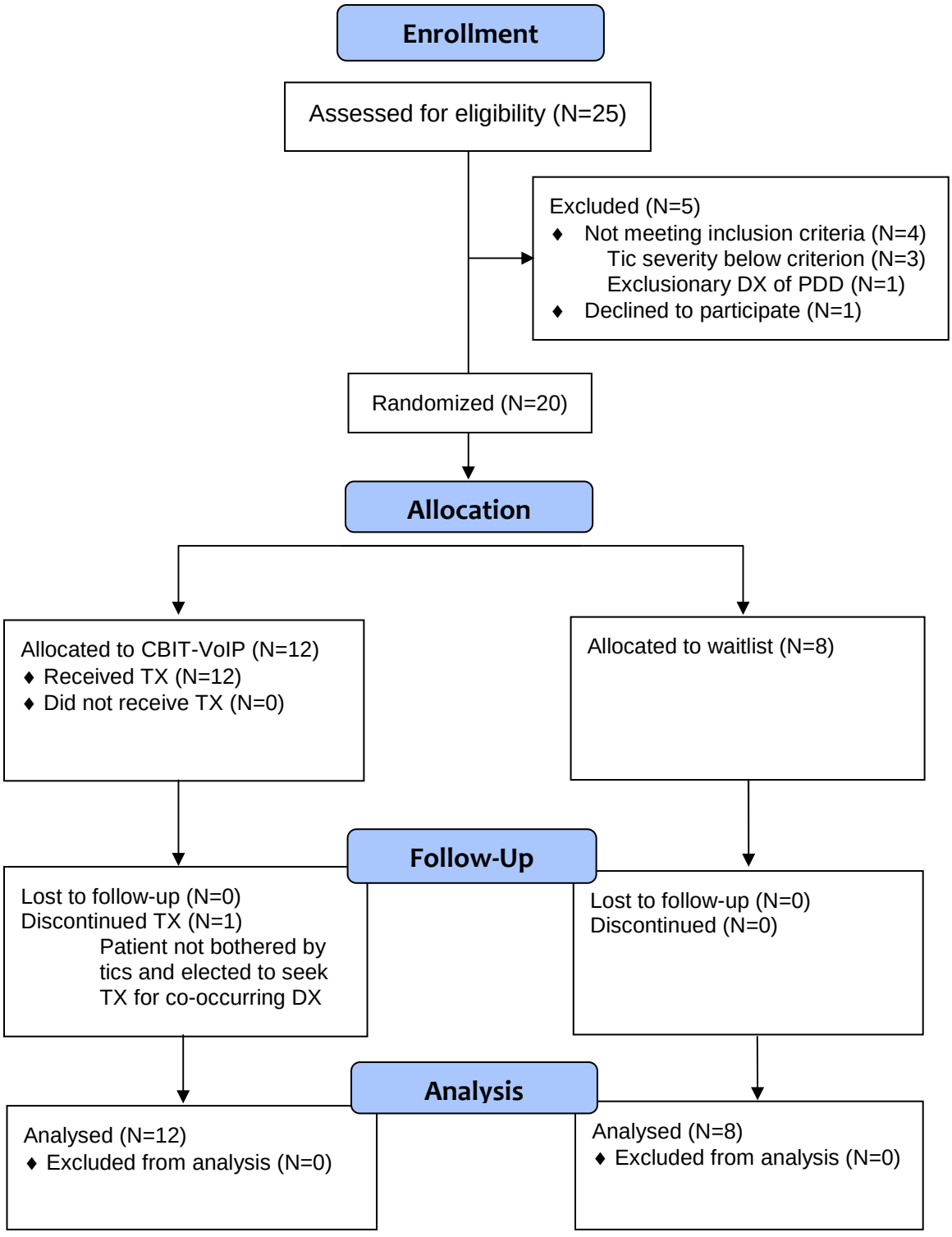

Figure 1. CONSORT diagram of participant flow through the trial. Diagram is based on template from Schulz, Altman, Moher, for the CONSORT group (2010).

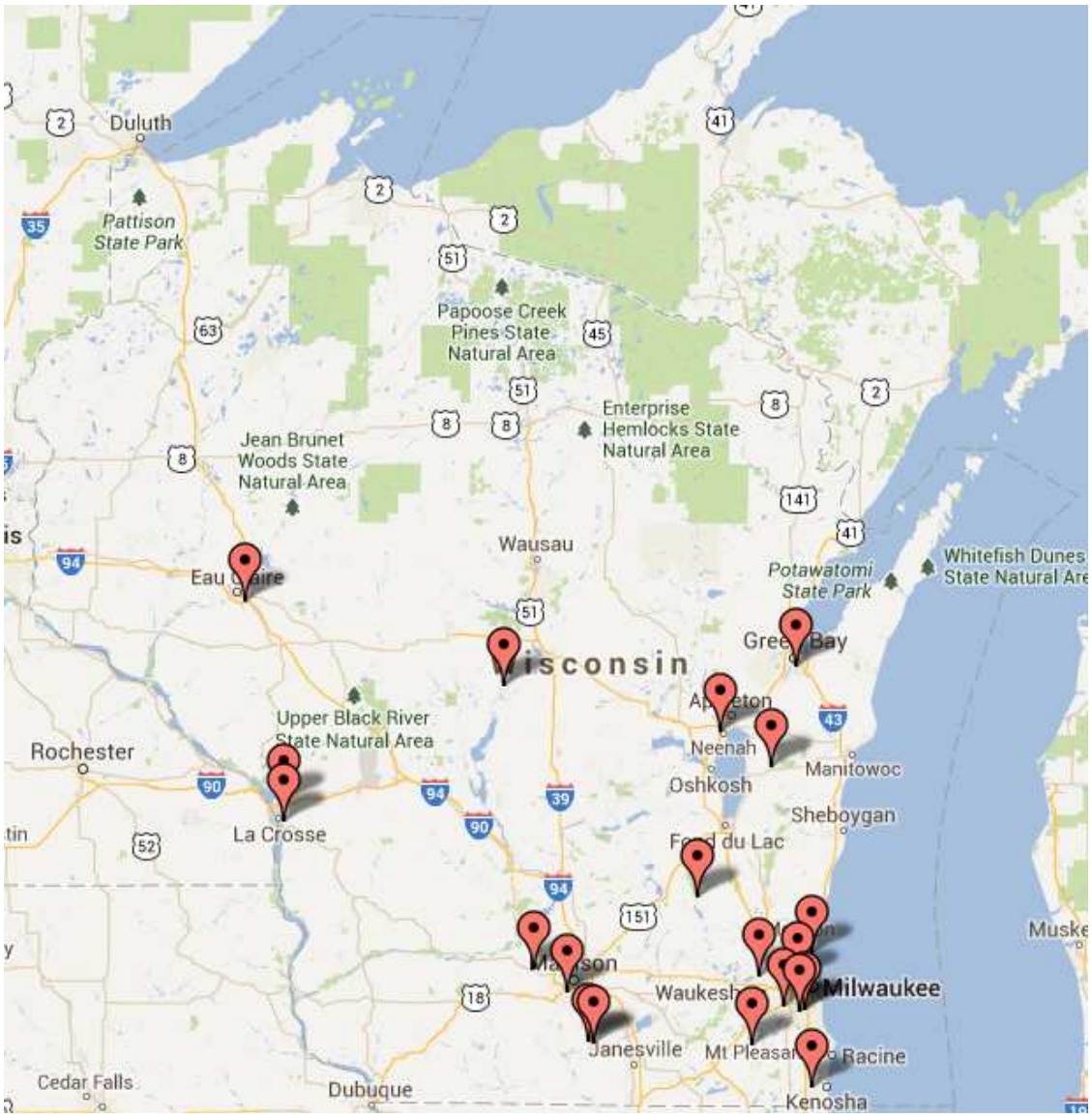

Figure 2. Map of distribution of participants across the State of Wisconsin.

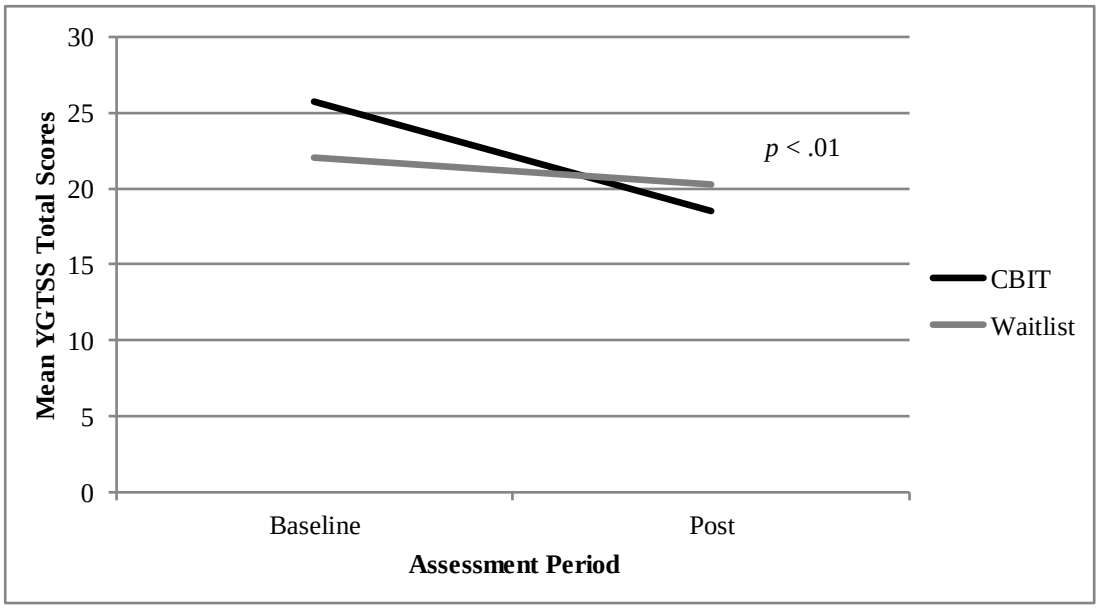

Figure 3. Mean baseline and post-treatment YGTSS total scores by group.

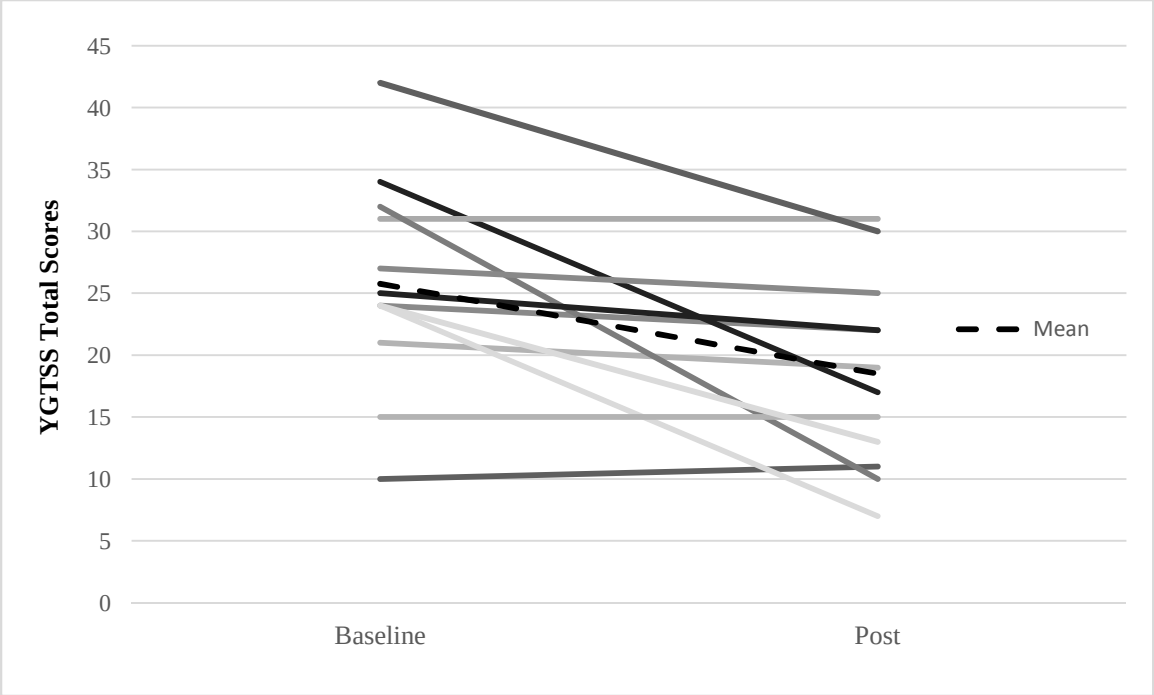

Figure 4. Individual baseline and post-treatment YGTSS total scores in CBIT-VoIP.

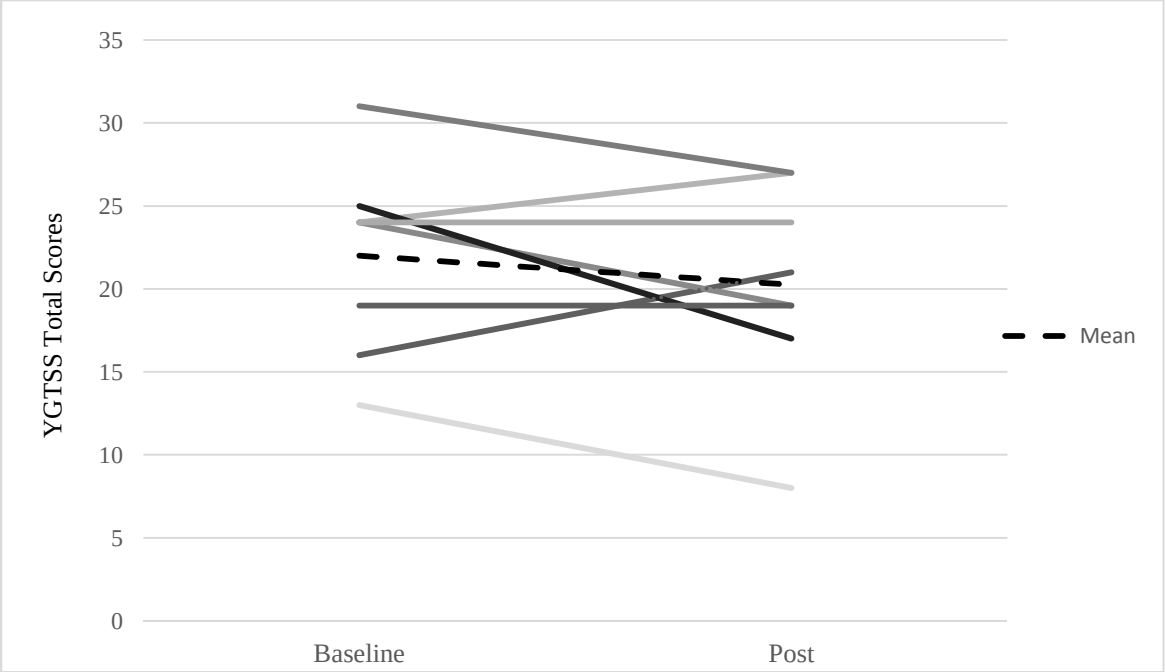

Figure 5. Individual baseline and post-treatment YGTSS total scores in waitlist.

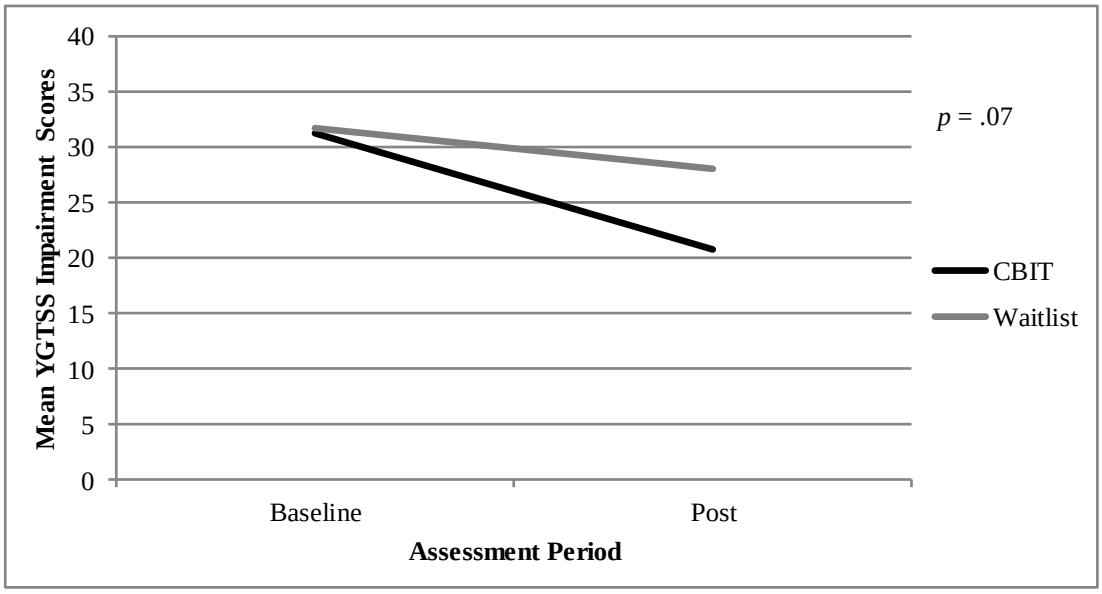

Figure 6. Mean baseline and post-treatment YGTSS impairment scores by group.

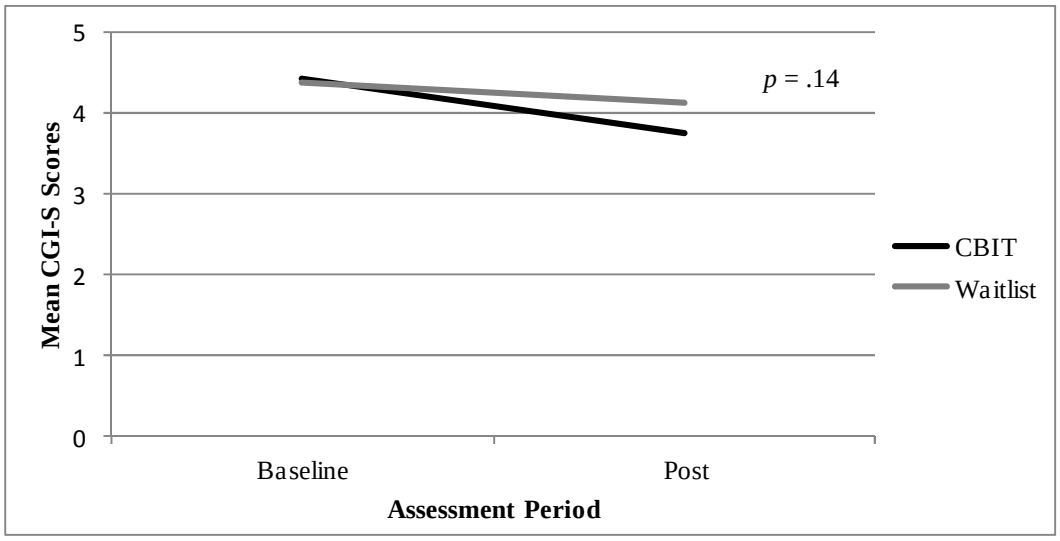

Figure 7. Mean baseline and post-treatment CGI-S scores by group.

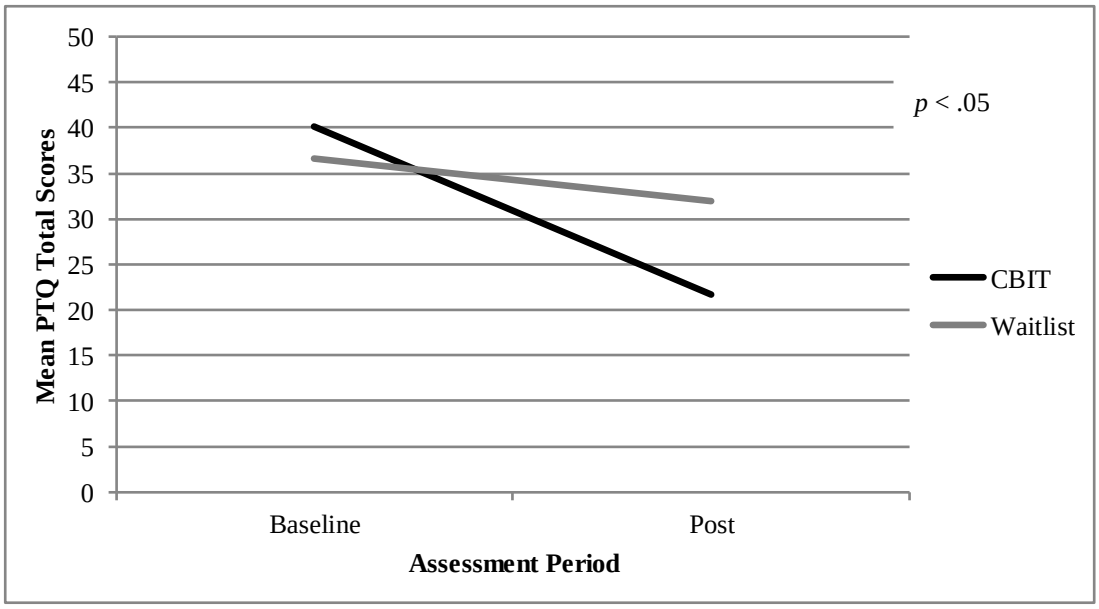

Figure 8. Mean baseline and post-treatment PTQ total scores by group.

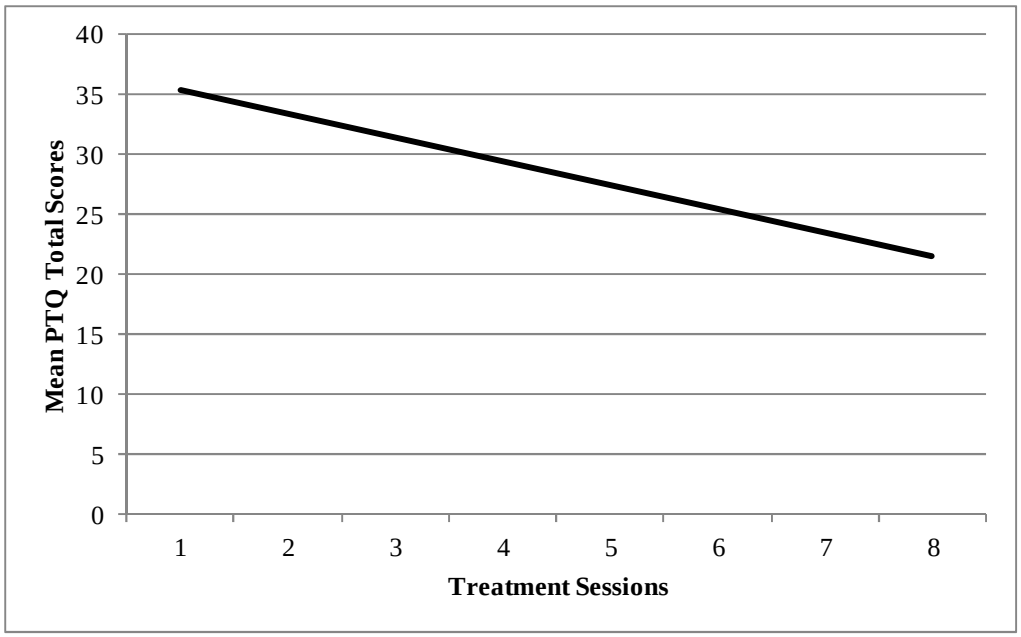

Figure 9. Linear change in mean Parent Tic Questionnaire total scores across sessions in CBIT-VoIP group.

Table 1

Distribution of Enrolled Participants across the State of Wisconsin

City	Approximate Miles	N	Zip Code
Bayside	10.8	1	53217
Chilton	74.7	1	53014
Cross Plains	103	1	53528
East Troy	42.6	1	53120
Eau Claire	247	1	54701
Evansville	107	2	53536
Fitchburg	88.6	1	53711
Green Bay	112	1	54301
Greendale	16	1	53129
Greenfield	14.3	1	53221
Horicon	51.1	1	53032
Kenosha	40.2	1	53142
LaCrosse	216	1	54601
Milwaukee	6.6	1	53210
Neenah	95.5	1	54956
New Berlin	17.8	1	53151
North Wisconsin Rapids	163	1	54495
Onalaska	210	1	54650
Pewaukee	25.2	1	53072

Table 2

Description of Equipment Used by Participants in CBIT-VoIP

	Internet	Web Camera Type	Web Camera Model	Additional Equipment	Computer Type	Computer Location
Clinic	Wi-Fi	Built-in	Logitech c270	No	Desktop	Therapy room
	DSL	Built-in		No	Laptop	Living room
	DSL	Built-in		No	Desktop	Master bedroom
	DSL	Separate	Logitech c110	No	Laptop	Kitchen
	DSL	Built-in		No	Desktop	Basement
	Cable	Built-in		No	Laptop	Dining room
CBIT-VoIP	Cable	Built-in		No	Laptop	Living room
	Cable	Separate	Microsoft HD	No	Desktop	Office/computer room
	Cable	Built-in		No	Laptop	Bedroom
	Cable	Separate	Logitech C110	No	Laptop	Living room
	Cable	Separate	Creative VF0415 Live!	No	Desktop	Office/computer room
	Cable	Built-in		No	Laptop	Bedroom
	Cable	Built-in		No	Laptop	Bedroom

Table 2 (cont.)

Description of Study Equipment used by Participants in CBIT-VoIP (cont.)

	Computer Age	Model	Operating System	Processor Type	Processor Speed	RAM	Free Hard Drive Space
Clinic	1 year	Dell Optiplex 980	Windows XP	Intel Core i5	3.20 GHz	3.49 GB	217 GB free of 232 GB Total GB Capacity
CBIT-VoIP	9 months	Dell Inspiron 15R	Windows 8	Intel Core I3	2.3 GHZ	6 GB	330GB free of 446 Total GB Capacity
	4 months	Dell Alienware Aurora	Windows 8	Intel Core I7	3.6 GHZ	16 GB	370 GB free of 464 Total GB Capacity
	2.5 years	Hewlett Packard HPG62	Windows 7	Intel Pentium Dualcore	2.3 GHZ	4.0 GB	375 GB free of 451 Total GB Capacity
	1 year	Mac OSX version 10.7.5	Mac OSX 10.7.5	Intelcore i5	2.5 GHz	4 GB	387.06 GB free of 500 Total GB Capacity
	5 years	Macbook Pro	Mac OSX 10.6.8	Intelcore 2 duo	2.8 GHz	4 GB	335.23 GB free of 500 Total GB Capacity
	4 months	Dell inspiron n7110	Windows 7	Intel R Core TM I3-2310M CPU	2.1GHz	4 GB	401 GB free of 451 Total GB Capacity
	3.5 years	HP P6620F	Windows 7	Intel AMD Phenom (TM) 2x4 830	2.8GHz	6 GB	646 GB free of 919 Total GB Capacity
	1 year	Dell n5040	Windows 7	Intel core m380	2.53GHz	4 GB	489 GB free of 581 Total GB Capacity
	7 years	Toshiba Satellite L355D	Windows 7	AMD Turion 64	2 GHz	3 GB	103 GB free of 231 Total GB Capacity
	2.5 years	Cyber Power	Windows 7	AMD Athlon 2 x 4 630	2.8 GHz	4 GB	218 GB free of 500 Total GB Capacity
	6 months	Toshiba I 7	Windows 8	Intel R Core I 7 3630	2.4 GHz	8 GB	474 GB free of 585 Total GB Capacity
	3 years	Dell Studio 1737	Windows 7	Intel Core Duo 2	2.1 GHz	4 GB	405 GB free of 465 Total GB Capacity

Note. RAM = Random Access Memory, and refers to original RAM each computer was formatted with, not available RAM, which fluctuates.

Table 3

Description of Equipment Used by Participants in Waitlist

	Internet Connection	Web Camera Type	Web Camera Model	Additional Equipment	Computer type	Computer Location
Waitlist	Cable	Separate	Logitech c110	No	Laptop	Dining room
	Cable	Built-in		No	Desktop	Computer room
	Cable	Built-in		No	Laptop	Kitchen
	Cable	Built-in		No	Laptop	Dining room
	Cable	Built-in		No	Laptop	Kitchen
	Cable	Separate	Logitech C110	No	Desktop	Family room
	Cable	Separate	Gearhead	Yes (microphone)	Desktop	Computer room
	DSL	Built-in		No	Laptop	Dining room

Table 3 (cont.)

Description of Equipment Used by Participants in Waitlist (cont.)

	Computer Age	Computer Model	Operating System	Processor Type	Processor Speed	RAM	Free Hard Drive Space
	1 week	HP AMD	Windows 8	AMD E 300 APU	1.3 GHZ	3.6 GB	229 GB free of 273 Total GB Capacity
	3 years	Dell dual processor	Windows 7	Amdatnion II x2	2.8GHz	6 GB	584 GB free of 698 Total GB Capacity
	1 year	Toshiba P775	Windows 7	Intel R Core TM I52450 MCPU	2.5 GHz	6 GB	623 GB free of 682 Total GB Capacity
Waitlist	3 years	Toshiba Satellite ASOS	Windows XP	Intel Core 2 Duo CPU	2.1 GHz	4 GB	137 GB free of 286 Total GB Capacity
	3.5 years	Gateway MD2419U	Windows 7	AMD Athlon X2/ Dual core/QL/65	2.1GHz	3 GB	124 GB free of 320 Total GB Capacity
	2 years	Asus CM 5570	Windows Vista	Intel Pentium dual core	2.6 GHz	6 GB	109 GB free of 238 Total GB Capacity
	3-4 years	E Machine ET 1331 G	Windows 7	AMD Athelon TM 2 2 250 U	1.60 GHz	4 GB	400 GB free of 499 Total GB Capacity
	6 months	Acer Aspire (m)	Windows 8	Intel Core i5	1.7 GHz	6 GB	387 GB free of 444 Total GB Capacity

Note. RAM = Random Access Memory, and refers to original RAM each computer was formatted with, not available RAM, which fluctuates.

Table 4

Assessment Measures

				Acute Tx.		**Waitlist**	
Measures	Informant	Rater	Screen	Pre	Post	Pre	Post
Background							
Demographics & History	P	P	X				
MINI-Kid-P	P	IE	X				
WASI-Vocabulary	C	IE	X				
Tic Assessments							
YGTSS	PC	IE	X	X	X	X	X
CGI – S	PC	IE	X	X	X	X	X
CGI – I	PC	IE			X		X
PTQ	P	P	X	At Each Ax. & Tx. Session		X	X
Comorbidity							
CPRS-R-S	P	P	X				
CBCL 6-18	P	P	X				
Psychosocial Functioning							
FAM – III-Brief	C	C	X		X		X
Safety/Acceptability/Integrity							
Adverse Event Review	PC	IE		X	X	X	X
	PC	T	At Each Tx. Session				
VC Equipment Interview	PC	IE		X			
Computer Usage	P;C	P;C		X			
VC Comfort	P;C	P;C		X	X		
Barriers to Tx./Tx. Utilization	P	P		X			
Treatment Acceptability	P	P		X	X		
Treatment Expectancy	P;C;T	P;C;T		X			
Perception of Therap Rel	C	C		Session 3			
Satisfaction Questionnaire	P;C	P;C			X		
VC Satisfaction	P;C	P;C			X		
Usability Form-Therapist	T	T			X		
Usability Form-Parent	P	P	At Each Tx. Session				
Session Summary Sheets	T	T	At Each Tx. Session				
IE Session Quality Form	IE	IE		X	X		

Note. C = child, P = Parent, T = Therapist, ; = independent ratings by informants

Table 5

Baseline Characteristics

Characteristic	CBIT-VoIP (N = 12)		Waitlist (N = 8)	
Demographics				
Age (mean, SD)	12.3	2.39	11.96	2.41
WASI-Vocab T-score (mean, SD)	60.0	9.32	59.13	9.42
Male Gender (N, %)	7	58.3%	6	75%
Ethnicity (N, %)				
Non-Hispanic	12	100%	8	100%
Race (N, %)				
Caucasian	11	91.7%	8	100%
Biracial (African-American and Caucasian)	1	8.3%		
On Tic Meds at Entry (N, %)	4	25%	3	37.5%
No medication	8	75%	5	62.5%
Alpha-agonist	3	25%	1	12.5%
Alpha-agonist + Antipsychotic			1	12.5%
2 Alpha-agonists + Antipsychotic	1	8.3%		
Antipsychotic + Anticonvulsant			1	12.5%
Two Parent Family Home (N, %)	10	83.3%	7	87.5%
Highest Parent Education (N, %)				
High School Diploma			1	12.5%
Technical School/Some College	3	25%	1	12.5%
College Graduate	5	41.7%	3	37.5%
Professional Degree	4	33.3%	2	25.0%
Diagnoses (N, %)				
Tourette Syndrome	9	75%	8	100%
Chronic Motor Tic Disorder	3	25%		
Attention-Deficit-Hyperactivity Disorder	2	16.7%	2	25%
Oppositional Defiant Disorder			1	12.5%
Obsessive-compulsive Disorder	1	8.3%		
Generalized Anxiety Disorder			1	12.5%
Social Phobia	1	8.3%		
Separation Anxiety Disorder	1	8.3%		
Specific Phobia	1	8.3%		
Special Education Services During Lifetime (N, %)	3	25%	2	25%
Yale Global Tic Severity Scale (mean, SD)				
Total Score	25.75	8.51	22	5.71
Motor Subscale	16.33	3.31	14.13	2.00
Phonic Subscale	9.42	6.13	7.88	5.33
Impairment Scale	31.25	9.16	31.75	6.27
Clinical Global Impairment – Severity (mean, SD)	4.42	.79	4.38	7.44

Table 6

Individual Characteristics and Pre- and Post-treatment Scores in CBIT-VoIP

Gender	Age	Race	Vocab T-score	Med Status	Diagnosis	YGTSS Total		YGTSS Impairment		CGI-S		CGI-I
						Pre	Post	Pre	Post	Pre	Post	Post
Male	15	Caucasian	56	No	CMTD	10	11	20	15	3	3	3
Male	12	Caucasian	58	No	CMTD	21	19	12	28	4	4	4
Female	10	Caucasian	71	Yes	TS	24	22	33	18	4	4	3
Female	9	Caucasian	61	No	TS, Separation Anxiety Disorder	34	17	35	16	5	3	1
Male	11	Caucasian	63	No	TS	24	7	35	10	4	2	1
Male	10	Mixed	54	Yes	TS, OCD, ADHD-C Social Phobia, Specific Phobia	31	31	38	38	5	5	4
Male	8	Caucasian	76	No	TS	32	10	42	20	5	3	1
Female	16	Caucasian	64	Yes	TS	42	30	35	25	6	5	3
Female	12	Caucasian	62	No	CMTD	15	15	35	28	4	4	3
Female	10	Caucasian	65	No	TS	27	25	40	22	5	5	3
Male	14	Caucasian	42	No	TS	25	22	30	20	4	4	3
Male	14	Caucasian	48	Yes	TS	24	13	20	10	4	3	2

Note. CGI-Severity scale: 1 = normal, not all ill; 2 = borderline mentally ill; 3 = mildly ill; 4 = moderately ill; 5 = markedly ill; 6 = severely ill; 7 = extremely ill CGI-Improvement: 1 = very much improved; 2 = much improved; 3 = minimally improved; 4 = no change; 5 = minimally improved; 6 = much worse; 7 = very much worse.

Table 7

Individual Characteristics and Pre- and Post-treatment Scores in Waitlist

Gender	Age	Race	Vocab T-score	Med Status	Diagnosis	YGTSS Total		YGTSS Impairment		CGI-S		CGI-I
						Pre	Post	Pre	Post	Pre	Post	Post
Male	10	Caucasian	61	No	TS; GAD	16	21	36	30	4	4	5
Male	14	Caucasian	51	No	TS	24	27	25	30	4	5	5
Female	11	Caucasian	53	Yes	TS	24	19	30	20	4	4	3
Male	9	Caucasian	70	Yes	TS; ADHD-C; ODD	25	17	38	40	5	4	5
Female	14	Caucasian	50	No	TS	13	8	35	24	4	3	3
Male	14	Caucasian	54	No	TS	24	24	25	20	4	4	4
Male	12	Caucasian	58	Yes	TS; ADHD-C	31	27	40	35	6	5	3
Male	8	Caucasian	76	No	TS	19	19	25	25	4	4	4

Note. CGI-Severity scale: 1 = normal, not all ill; 2 = borderline mentally ill; 3 = mildly ill; 4 = moderately ill; 5 = markedly ill; 6 = severely ill; 7 = extremely ill
CGI-Improvement: 1 = very much improved; 2 = much improved; 3 = minimally improved; 4 = no change; 5 = minimally improved; 6 = much worse; 7 = very much worse.

Table 8

Pre- and Post-treatment Means, Standard Deviations, and Effect Sizes

	CBIT-VoIP					Waitlist					
	Pre (N = 11)		Post (N = 10)		*d*	Pre (N = 8)		Post (N = 8)		*d*	Partial η^2
Measure	M	SD	M	SD		M	SD	M	SD		
YGTSS											
Total	25.75	8.51	18.50	7.75	.90**	22.00	5.71	20.25	6.21	.39	.15*
Motor	16.33	3.31	12.08	3.48	1.07**	14.13	1.96	13.13	2.90	.42	.19*
Phonic	9.42	6.13	6.42	5.89	.57*	7.88	5.33	7.13	4.79	.15	.18
Impairment	31.25	9.16	20.83	8.08	.94*	31.75	6.27	28.00	7.11	.67	.12
CGI-S	4.42	.79	3.75	.97	.77*	4.38	.74	4.13	.64	.36	.06
PTQ	40.17	19.94	21.75	20.07	1.38***	34.38	17.24	35.33	24.32	.68	.25*
Brief FAM-III	10.75	4.52	12.58	5.88	-.59	11.00	5.21	15.00	5.10	-.61	.004

Note: N = 7 for PTQ and Brief FAM-III scores; *$p < .05$; ** $p < .01$; ***$p < .001$

Table 9

Pearson-product Moment Correlations between Treatment Expectations, and Change in YGTSS, CGI-S and PTQ scores

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
(1) Tx Expectations - Child	___						
(2) Tx. Expectations - Parent	-.07	___					
(3) Tx. Expectations - Therapist	-.36	-.07	___				
(4) YGTSS Total Change	.10	.40	-.58	___			
(5) YGTSS Impairment Change	.07	.10	-.47	.63*	___		
(6) CGI – Severity Change	.07	.32	-.55	.98**	.64*	___	
(7) PTQ Total Change	.34	.20	-.32	-.10	-.12	-.16	___

Note. p-values are two-tailed; *$p < .05$; **$p < .01$

Table 10

Pearson-product Moment Correlations between Treatment Satisfaction, the Therapeutic Relationship, and Clinical Outcomes

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
(1) TAQ - Parent	___									
(2) TX Satisfaction - Parent	.87*	___								
(3) VC Satisfaction - Parent	-.13	-.16	___							
(4) TX Satisfaction - Child	.81**	.69*	.11	___						
(5) VC Satisfaction - Child	.03	.001	.71*	.50	___					
(6) CPTR	.18	.03	.47	.57	.76**	___				
(7) YGTSS Total Change	.14	.22	-.55	-.20	-.60*	-.17	___			
(8) YGTSS Impairment Change	.14	.10	-.17	-.14	-.32	.11	.63*	___		
(9) CGI - Severity Change	.20	.30	-.47	-.18	-.60	-.19	.98**	.64*	___	
(10) PTQ Total Change	-.26	-.12	-.38	-.14	-.08	.01	-.10	-.12	-.16	___

Note. *p*-values are two-tailed; *$p < .05$; **$p < .01$

Table 11

Pearson-product Moment Correlations between Computer Usage, Satisfaction, and the Therapeutic Alliance

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
(1) Comp. Usage-P-Total	___							
(2) Comp. Usage-C-Total	.60*	___						
(3) Parent TAQ	-.43	-.25	___					
(4) TX Satisfaction-P	-.42	-.09	.87**	___				
(5) TX Satisfaction-C	-.08	.21	-.13	-.16	___			
(6) VC Satisfaction-P	-.10	.21	.81**	.69**	.11	___		
(7) VC Satisfaction-C	.01	.61*	.03	.00	.71**	.50	___	
(8) CPTR	.07	.35	.18	.03	.47	.57*	.76**	___

Note. p-values are one-tailed; *$p < .05$; **$p < .01$; P = Parent; C = Child

Table 12

Pearson-product Moment Correlations between Specific Computer Usage Variables, Satisfaction, and the Therapeutic Alliance

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
(1) Comp Hrs Past Wk-P	___											
(2) Comp Appeal/ Helpfulness-P	.01	___										
(3) Comp Abilities-P	.25	.72	___									
(4) Comp. Hrs Past Wk-C	.28	.37	.25	___								
(5) Comp. Appeal Helpfulness-C	.38	.12	.55*	.26	___							
(6) Comp. Abilities-C	.09	.43	.36	.52*	.56*	___						
(7) Parent TAQ	-.37	.07	-.21	-.17	-.39	.07	___					
(8) TX Satisfaction-P	-.37	.08	-.30	-.09	-.40	.15	.87**	___				
(9) VC Satisfaction-P	-.33	.10	.27	.47	.24	.06	-.13	-.16	___			
(10) TX. Satisfaction-C	-.40	.39	.25	.07	.18	.46	.81**	.69**	.12	___		
(11) VC Satisfaction-C	-.47	.28	.36	.50	.57*	.58*	.03	.00	.71**	.50	___	
(12) CPTR	-.48	.13	.42	.04	.41	.35	.18	.03	.47	.57*	.76**	___

Note. p-values are one-tailed; *$p < .05$; **$p < .01$; P = Parent; C = Child

Table 13

Results for Independent samples T-tests and Descriptive Statistics for VC Satisfaction and Percentage of Technological Difficulties by Internet Connection Type

	Cable			DSL					95% CI	
Measure	M	SD	N	M	SD	N	*t(df)*	*p*	LL	UL
VC Satisfaction-Parent	66.43	4.31	7	68.50	1.73	4	.90(9)	.39	-3.12	7.26
VC Satisfaction-Child	65.71	5.47	7	64.50	7.05	4	-.32(9)	.76	-9.78	7.35
% Technological difficulties in TX sessions	26.01	27.26	7	56.25	33.07	4	1.65(9)	.13	-11.35	71.82

Note. p-values are two-tailed

Table 14

Results for Independent samples T-tests and Descriptive Statistics for VC Satisfaction and Percentage of Technological Difficulties by Web Camera Type

	Built-in web camera			Separate web camera					95% CI	
Measure	M	SD	N	M	SD	N	*t(df)*	*P*	LL	UL
VC Satisfaction-Parent	68.83	1.47	6	65.20	4.60	5	-1.84 (9)	.10	-8.10	.83
VC Satisfaction-Child	66.83	6.34	6	63.40	4.98	5	-.98(9)	.35	-11.34	4.48
% Technological difficulties in TX sessions	50.00	32.60	6	21.42	25.14	5	-1.60(9)	.14	-69.01	11.85

Note. p-values are two-tailed

Table 15

Results for Independent samples T-tests and Descriptive Statistics for VC Satisfaction and Percentage of Technological Difficulties by Computer Type

	Laptop			Desktop					95% CI	
Measure	M	SD	N	M	SD	N	*t(df)*	*P*	LL	UL
VC Satisfaction-Parent	68.00	2.38	7	65.75	5.32	4	-.99(9)	.35	-7.40	2.90
VC Satisfaction-Child	67.57	3.95	7	61.25	6.75	4	-1.99(9)	.08	-13.50	.85
% Technological difficulties in TX sessions	32.14	35.25	7	45.52	26.82	4	.65 (9)	.71	-32.96	59.72

Note. p-values are two-tailed

Table 16

Pearson-product Moment Correlations between Computer Hardware Specifications, Percentage of Technological Difficulties in Treatment sessions, and Parent- and Child-reported VC Satisfaction

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
(1) Computer Age (months)	___						
(2) Processor Speed GHz	.02	___					
(3) RAM	-.42	.28	___				
(4) % Free hard drive disk space	-.62*	-.16	.30	___			
(5) % Technological difficulties in TX sessions	-.48	.13	.25	.05	___		
(6) VC Satisfaction-Parent	-.34	.00	.10	.11	.06	___	
(7) VC Satisfaction-Child	.03	.00	.14	-.12	-.11	.71*	___

*Note. p-values are two-tailed; *p* < .05

CURRICULUM VITAE

Emily Ricketts

Place of Birth: Reading, England, United Kingdom

Education

B.S., University of Florida, May 2007
Major: Psychology
Summa Cum Laude

M.S. University of Wisconsin-Milwaukee, May 2011
Major: Clinical Psychology

Dissertation Title: A Randomized Waitlist-Controlled Trial of VoIP-delivered Behavior Therapy for Chronic Tic Disorders

Predoctoral Clinical Internship

Western Psychiatric Institute and Clinic, Pittsburgh, PA
August 2013 – August 2014
WPIC Psychology Internship Program, Child Track
APA Accredited, Academy of Psychological Clinical Science (APCS) member

Grant Experience

National Institutes of Health: National Research Service Award Fellowship to Promote Diversity (F31) "Developing and Testing the Feasibility of Voice over Internet Protocol Delivered Behavior Therapy for Tourette Syndrome: A Model Application ($ 83,299, Funded 12/2011)

Honors and Scholarships

4/13	2012 UWM $1000 Psychology Graduate Research Award
2/12	Trichotillomania Learning Center $300 Travel Award
6/09 – 12/11	UWM Advanced Opportunity Fellowship
8/08 – 5/10	UWM Chancellor's Graduate Student Award Scholarship
6/06	National Science Foundation $3,000 Stipend for University of Miami Summer Research Program
3/06	UF College of Liberal Arts and Sciences High Honors Award
5/05, 12/05	UF Dean's List
5/05	UF President's Honor Roll
5/05	UF Circle K International Distinguished Member Award

Publications

Ricketts, E. J., Bauer, C. C., Van der Fluit, F., Capriotti, M. R., Espil, F. M., Snorrason, I., Ely, L. J., Walther, M. R., & Woods, D. W. (2013). Behavior therapy for stereotypic movement disorder in typically developing children: A clinical case series. *Cognitive and Behavioral Practice, 20,* 544-555.

Specht, M. W., Woods, D. W., Nicotra, C. M., Kelly, L. M., **Ricketts, E. J.,** Conelea, C. A., & Walkup, J. T. (2013). Effects of tic suppression: Ability to suppress, rebound, negative reinforcement and habituation to the premonitory urge. *Behavior Research and Therapy, 51,* 24-30.

Snorrason, I., **Ricketts, E. J.,** Flessner, C. A., Franklin, M. E., Stein, D. J., & Woods, D. W. (2012). Skin picking disorder is associated with other body-focused repetitive behaviors: Findings from an internet study. *Annals of Clinical Psychiatry, 24,* 292-299.

Ricketts, E. J., Brandt, B. C., & Woods, D. W. (2012). The effects of severity and causal explanation on social perceptions of hair loss. *Journal of Obsessive-Compulsive and Related Disorders, 1,* 336-343.

Capriotti, M. R., Brandt B. C., **Ricketts, E. J.,** Espil, F., & Woods, D. W. (2012). Comparing the effects of reinforcement of other behavior and response-cost contingencies on tics in youth with Tourette Syndrome. *Journal of Applied Behavior Analysis, 45,* 251-263.

Fine, K. M., Walther, M. R., Joseph, J. M., Robinson, J., **Ricketts, E. J.,** Bowe, W. E., & Woods, D. W. (2012). Acceptance-enhanced behavior therapy for Trichotillomania in adolescents. *Cognitive and Behavioral Practice, 19,* 463-471.

Keeley, M. L., Geffken, G. R., **Ricketts, E.,** McNamara, J. P., & Storch, E. A. (2011). The therapeutic alliance in the cognitive behavioral treatment of pediatric obsessive-compulsive disorder. *Journal of Anxiety Disorders, 25,* 855-863.

Walther, M. R., **Ricketts, E. J.,** Conelea, C. A., & Woods, D. W. (2010). Recent advances in the understanding and treatment of Trichotillomania. *Journal of Cognitive Psychotherapy, 24,* 46-64.

Kircanski, K., Woods, D. W., Chang, S. W., **Ricketts, E. J.,** & Piacentini, J. C. (2010). Cluster analysis of the Yale Global Tic Severity Scale (YGTSS): Symptom dimensions and clinical correlates in an outpatient youth sample. *Journal of Abnormal Child Psychology, 38,* 777-788.

Duke, D. C., Keeley, M. L., **Ricketts, E. J.,** Geffken, G. R., & Storch, E. A. (2010). The phenomenology of hairpulling in college students. *The Journal of Psychopathology and Behavioral Assessment, 32,* 281-292.

Storch, E. A., Lehmkuhl, H. D., **Ricketts, E.,** Geffken, G. R., Marien, W., & Murphy, T. K. (2010). An open trial of intensive family based cognitive-behavioral therapy in youth with Obsessive-Compulsive Disorder who are medication partial- or non-responders. *Journal of Clinical Child & Adolescent Psychiatry, 39,* 260-268.

Lack, C. W., Storch, E. A., Keeley, M. L., Geffken, G. R., **Ricketts, E.,** Murphy, T. K., & Goodman, W. K. (2009). Quality of life in children and adolescents with obsessive-compulsive disorder: Base rates, parent-child agreement and clinical correlates. *Social Psychiatry and Psychiatric Epidemiology, 44,* 935-942.

Shalev, I., Sulkowski, M. L., Geffken, G. R., **Ricketts, E. J.,** Murphy, T. K., & Storch, E. (2009). Long-term durability of cognitive behavioral therapy gains for pediatric obsessive-compulsive disorder. *Journal of the American Academy of Child and Adolescent Psychiatry, 48,* 766-767.

Storch, E. A., Lehmkuhl, H., Pence, S., Geffken, G. R., **Ricketts, E.,** Storch, J. F., & Murphy, T. K. (2009). Parental experiences of having a child with Obsessive-Compulsive Disorder: Associations with clinical characteristics and caregiver adjustment. *Journal of Child and Family Studies, 18,* 249-258.

Sulkowski, M. L., Storch, E. A., Geffken, G. R., **Ricketts, E.,** Murphy, T. K., & Goodman, W. K. (2008). Concurrent validity of the Yale-Brown Obsessive-Compulsive Scale-Symptom Checklist. *Journal of Clinical Psychology, 64,* 1338-1351.

Gallant, J., Storch, E. A., Merlo, L. J., **Ricketts, E.,** Geffken, G. R., Goodman, W. K., & Murphy, T. K. (2008). Convergent and discriminant validity of the Children's Yale Brown Obsessive-Compulsive Scale Symptom Checklist. *Journal of Anxiety Disorders, 22,* 1369-1376.

Storch, E. A., Merlo, L. J., Lehmkuhl, H., Geffken, G. R., Jacob, M., **Ricketts, E.,** Murphy, T. K., & Goodman, W. K. (2008). Cognitive-behavioral therapy for obsessive-compulsive disorder: Comparison of intensive and weekly approaches. *Journal of Anxiety Disorders, 22,* 1146-1158.

Storch, E. A., Merlo, L. J., Keeley, M. L., Grabill, K., Milsom, V., Geffken, G., **Ricketts, E.,** Murphy, T. K., & Goodman, W. K. (2008). Somatic symptoms in children and adolescents with Obsessive-Compulsive Disorder: Associations with clinical characteristics and cognitive-behavioral therapy response. *Behavioural and Cognitive Psychotherapy, 36,* 283-298.

Chapters

Franklin, M. E., Antinoro, D., **Ricketts, E. J.,** Woods, D. W. (2011). Treatment of tic disorders and trichotillomania. In G. Steketee (Ed.), Handbook of Obsessive Compulsive and Spectrum Disorders. New York, NY: Oxford University Press.

Ricketts, E. J., Woods, D. W., Antinoro, D., & Franklin, M. E. (2011). Phenomenology and epidemiology of tic disorders and trichotillomania. In G. Steketee (Ed.), Handbook of Obsessive Compulsive and Spectrum Disorders. New York, NY: Oxford University Press.

Presentations

National Conferences

Capriotti, M., **Ricketts, E. J.,** Espil, F. M., Lee, H. J, Piacentini, J. C., & Woods, D. W. (2013, November). *Repetitive behaviors across the disorders: A transdiagnostic framework. Assessing environmental consequences of ticcing in youth with Tourette Syndrome.* Symposium presented at the annual meeting of the Association for Behavioral and Cognitive Therapies, Nashville, Tennessee.

Ricketts, E. J., Lipps, T. D., Gilbert, D. L., Wiegand, G. A., Zinner, S. H., Vierhile, A. E., Mink, J. W., Piacentini, J. C., Walkup, J. T., & Woods, D. W. (2013, November). *Next Steps for Comprehensive Behavioral Intervention for Tics. Feasibility of transporting behavior therapy for chronic tic disorders to neurology and primary care clinics.* Symposium presented at the annual meeting of the Association for Behavioral and Cognitive Therapies, Nashville, Tennessee.

Ricketts, E. J., Bauer, C. C., Ran, D., Himle, M. B., & Woods, D. W. (2013, November). *Pilot open case series of Voice over Internet Protocol-delivered behavior therapy for chronic tic disorders.* A poster presented at the annual meeting of the Association for Behavioral and Cognitive Therapies, Nashville, Tennessee.

Specht, M. W., Nicotra, C. M., Kelly, L., Walkup, J. T., **Ricketts, E. J.,** Conelea, C. A., Grados, M., & Ostrander, R. (2013, November). *Updates in the phenomenology of Tourette Disorder: New directions for treatment. Tic suppressibility and the effects of tic suppression in treatment naïve youth with chronic tic disorders.* Symposium presented at the annual meeting of the Association for Behavioral and Cognitive Therapies, Nashville, Tennessee.

Ricketts, E. J., Brandt, Bauer, C. C., Van der Fluit, F., Capriotti, M., Espil, F. M., Snorrason, I., Ely, L. J., Walther, M. R., & Woods, D. W. (2012, November). *Behavior therapy for stereotypic movement disorder in typically developing children: A clinical case series.* A poster presented at the annual meeting of the Association for Behavioral and Cognitive Therapies, National Harbor, Maryland.

Espil, F. M., Capriotti, M. R., **Ricketts, E. J.,** Bauer, C. C., Neal-Barnett, A., & Woods, D. W. (2012, November). *Minority recruitment of individuals with Trichotillomania: Preliminary findings from a large, randomized controlled trial.* A poster presented at the annual meeting of the Association for Behavioral and Cognitive Therapies, National Harbor, Maryland.

Nicotra, C. M., Kelly, L. M., Woods, D. W., **Ricketts, E. J.,** Walkup, J. T., & Specht, M. W. (2012, November). *The relationship between premonitory urge severity ratings and the probability of a tic occurring during tic suppression.* A poster presented at the annual meeting of the Association for Behavioral and Cognitive Therapies, National Harbor, Maryland.

Ricketts, E. J., Brandt, B. C., & Woods, D. W. (2012, May). *The effects of severity and causal explanation on social perceptions of preventative disclosure of hair loss.* A poster presented at the 19th annual Conference on Hair Pulling & Skin Picking Disorder, Chicago, Illinois.

Espil, F. M., Capriotti, M. R., **Ricketts, E. J.,** Conelea, C. A., & Woods, D. W. (2011, November). *Self-Reported Medication Use and Outcome in a Community Sample of Children with Chronic Tic Disorders.* A poster presented at the annual meeting of the Association for Behavioral and Cognitive Therapies, Toronto, Ontario, Canada.

Ricketts, E. J., Brandt, B. C., & Woods, D. W. (2011, November). *The Effects of Severity and Perceived cause of hair loss on the social evaluation of female hair pullers engaging in preventative disclosure of Trichotillomania.* A poster presented at the annual meeting of the Association for Behavioral and Cognitive Therapies, Toronto, Ontario, Canada.

Ricketts, E. J., Snorrason, I., Woods, D. W., Flessner, C. A., & Franklin, M. E. (2011, November). *Body-focused repetitive behaviors in a pathological skin picking sample.* A poster presented at the annual meeting of the Association for Behavioral and Cognitive Therapies, Toronto, Ontario, Canada.

Woods, D. W., Franklin, S. A., Lee, H., **Ricketts, E.,** Aringer, A., & Smith, O. (2011, April). Neurocognitive correlates of hairpulling. In N.J. Keuthen (Chair) Recent research findings in phenomenology and treatment of hair pulling in adults and children. Symposium presented at the Trichotillomania Learning Center (TLC) annual conference, San Francisco, California.

Ricketts, E. J., Roth, K. G., Burkel, R. L., Conelea, C. A., Woods, D. W., & Tourette Syndrome Impact Working Group. (2010, November). *A qualitative content analysis of reasons for disclosure of Tourette Syndrome.* A poster presented at the annual meeting of the Association for Behavioral and Cognitive Therapies, San Francisco, California.

Ricketts, E. J., Franklin, S., Conelea, C. A., Woods, D. W., & TS Impact Working Group. (2010, June). *Examining the relationship between anxiety, mood, and tic severity in an internet sample of children with Tourette Syndrome.* A poster presented at the triennial meeting of the World Congress of Behavioral and Cognitive Therapies, Boston, Massachusetts.

Specht, M., **Ricketts, E. J.,** Rooth, G. T., Tucker, B. T. P., Susaneck, R., Conelea, C. A., & Franz, M. (2009, June). *Tic suppression and the urge habituation hypothesis: A preliminary investigation.* A poster presented at the 5th International Scientific Symposium on Tourette Syndrome, New York, New York.

Wheaton, M. G., Draper, W., Harrington, D., & Singer, T., **Ricketts, E.,** Storch, E. A., & Abramowitz, J. (2008, November). *Hoarding symptoms and the OCI-R: A factor analytic study.* A poster presented at the annual meeting of the Association for Behavioral and

Cognitive Therapies, Orlando, Florida.

Wheaton, M. G., Singer, T., Harrington, D., Draper, W., **Ricketts, E.,** Storch, E. A., & Abramowitz, J. (2008, November). *The relative prevalence of hoarding symptoms in OCD, other anxiety disorders, and controls.* A poster presented at the annual meeting of the Association for Behavioral and Cognitive Therapies, Orlando, Florida.

Nichols, R., Bernardi, K., Duke, D., Keeley, M., **Ricketts, E.,** Geffken, G., & Storch, E. (2008, March). *Hairpulling in college students: Associated rituals and environmental cues.* A poster presented at the annual meeting of the Anxiety Disorders Association of America, Savannah, Georgia.

Paradoa, M., Tavares P., Duke, D., Keeley, M., **Ricketts, E.,** Geffken, G., & Storch, E. (2008, March). *Hairpulling in college students: Associated affective states.* A poster presented at the annual meeting of the Anxiety Disorders Association of America, Savannah, Georgia.

Regional/ Local Conferences
Ricketts, E. J., & Woods, D. W. (2012, April). *Funding opportunities for graduate students and early career psychologists: Applying for an NRSA F31-diversity.* Symposium presented at the annual meeting of the Midwest Regional Conference on Pediatric Psychology, Milwaukee, Wisconsin.

Franklin, S. A., Woods, D. W., Lee, H., **Ricketts, E. J.,** Aringer, A., & Smith, O. (2011, April). Neurocognitive correlates of hairpulling. University of Wisconsin-Milwaukee Association for Graduate Studies in Psychology (AGSIP) Symposium.

Ricketts, E. J., Siegel, R. S., La Greca, A. M. (2006, September). *The relationship between friendship quality and depressive symptoms in youth with AD/HD.* A poster presented at the fifth annual meeting of the North Carolina Alliance to Create Opportunity through Education (NC OPT-ED), Greensboro, North Carolina.

Professional Memberships
11/10 – present Sigma Xi: The Scientific Research Society, Associate Member
9/08 – present Association for Behavioral and Cognitive Therapies, Student Member
6/06 – present American Psychological Association, Student Affiliate