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Internet-Delivered, Family-Based Treatment for Early-Onset OCD: A Preliminary Case Series

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Abstract

Given the burdens of early-onset obsessive-compulsive disorder (OCD), limitations in the broad availability and accessibility of evidence-based care for affected youth present serious public health concerns. The growing potential for technological innovations to transform care for the most traditionally remote and underserved families holds enormous promise. This article presents the rationale, key considerations, and a preliminary case series for a promising behavioral telehealth innovation in the evidence-based treatment of early-onset OCD. We developed an Internet-based format for the delivery of family-based treatment for early-onset OCD directly to families in their homes, regardless of their geographic proximity to a mental health facility. Videoteleconferencing (VTC) methods were used to deliver real-time cognitive-behavioral therapy centering on exposure and response prevention to affected families. Participants in the preliminary case series included 5 children between the ages of 4 and 8 (M_{Age} = 6.5) who received the Internet-delivered treatment format. All youth completed a full treatment course, all showed OCD symptom improvements and global severity improvements from pre- to posttreatment, all showed at least partial diagnostic response, and 60% no longer met diagnostic criteria for OCD at posttreatment. No participants got worse, and all mothers characterized the quality of services received as “excellent.” The present work adds to a growing literature supporting the potential of VTC and related computer technology for meaningfully expanding the reach of supported treatments for OCD and lays the foundation for subsequent controlled evaluations to evaluate matters of efficacy and engagement relative to standard in-office evidence-based care.

Early-onset obsessive-compulsive disorder (OCD; i.e., onset <age 9) has been observed (Garcia et al., 2009; Hollingsworth, Tanguay, Grossman, & Pabst, 1980; Swedo, Rapoport,

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Leonard, Lenane, & Cheslow, 1989), and earlier onset has been associated with a more complex and intractable course in adulthood than later onset (de Mathis et al., 2008). Earlier onset symptoms exhibit considerable stability, are associated with profound disability, and confer sizable risk for later life psychopathology and impairments (Comer & Olfson, 2010; Kessler et al., 2005; Riddle, 1998; Storch et al., 2011). Accordingly, effective intervention for early-onset OCD is critical, and in recent years advances in intervention science have identified family-based CBT methods for redressing the problems of early-onset OCD (Freeman et al., 2012; Freeman et al., 2007; Freeman et al., 2008; Freeman et al., 2003).

Unfortunately, gaps persist between supported treatment in experimental settings and services available in the community (Sandler et al., 2005; Silverman, Kurtines, & Hoagwood, 2004; Southam-Gerow, Ringeisen, & Sherrill, 2006; Weisz, Sandler, Durlak, & Anton, 2005, 2006). Although the inadequate availability of supported care is due, in part, to the fact that there has only *recently* been an empirical focus on early-onset OCD (Freeman et al., 2007; Freeman et al., 2008; Freeman et al., 2003; Ginsburg, Burstein, Becker, & Drake, 2011), several obstacles to effective care remain, including inadequate numbers of trained professionals, poor quality of available services for OCD, long wait lists at underfunded and overburdened facilities, and cost and transportation issues.

Technological innovations may offer transformative solutions to overcoming traditional barriers to effective care for early-onset OCD. Videoteleconferencing (VTC) methods may overcome geographical obstacles to care by extending the availability of expert services and addressing regional workforce shortages in care (see Banitt Duncan, Velasquez, & Nelson, in press; Flaum, 2013; Kazdin & Blase, 2011). Families in rural or other underserved regions can participate in real-time treatment conducted by experts, regardless of their geographic proximity to an expert facility. VTC methods also offer more resource-efficient care than in-office care (American Academy of Child and Adolescent Psychiatry Work Group on Quality Issues, 2008; McCrone et al., 2004). Treating families in natural settings, such as homes, can overcome issues of transportation, space, and convenience that traditionally hinder treatment accessibility. Moreover, harnessing technology to deliver interventions directly to families in their natural settings may extend the ecological validity of treatments, as services can be delivered in the very context in which many child symptoms occur. Technology-based innovations for delivering supported services are already being routinely incorporated successfully into care in large health care systems and for various child patient populations (Myers, Valentine, & Melzer, 2007; Nelson, Barnard, & Cain, 2003; Savin, Garry, Zuccaro, & Novins, 2006).

A real-time, Internet-based interactive VTC format may be a particularly promising vehicle for delivery of family-based cognitive behavioral therapy (CBT) for early-onset OCD, given that a VTC CBT format has already demonstrated initial success in reducing OCD and related disorders in older populations (Andersson et al., 2012; Herbst et al., 2012; Himle et al., 2006), and other conditions such as behavior problems in preschool-aged youth (Comer et al., 2013). Family-based CBT centering on E/RP (Freeman & Garcia, 2009) has already demonstrated considerable support as an efficacious in-clinic treatment (Freeman et al., 2012; Freeman et al., 2007; Freeman et al., 2008). A live, interactive, and web-based approach to family-based CBT offers the potential to considerably broaden the scope of care

by extending the accessibility and ecological validity of evidence-based care for early-onset OCD. A VTC format can offer a comparable quantity of therapist contact to standard family-based CBT. Using VTC, therapists can deliver treatment content with the same speed and facility afforded in traditional in-clinic care regardless of a family's geographic proximity to an expert OCD facility (see also Nelson et al., in press). Treating families in their natural settings can also afford real-time observation and feedback in many of the very settings in which child OCD symptoms are problematic.

The present study evaluated outcomes from an initial pilot series of early-onset OCD cases treated with Internet-delivered family-based CBT. VTC was used to remotely deliver Freeman and Garcia's (2009) CBT for early-onset OCD directly to families in their home. We hypothesized that VTC-treated children would complete full courses of treatment and would show improvements in symptomatology and impairment, and that mothers would rate the quality of services received favorably.

METHOD

Participants

Participants in this preliminary trial included a series of five young children (three male) between the ages of 4 and 8 (M_{age} = 6.5, *SD* = 0.9), and their parents. Participating families sought treatment for their child's OCD symptoms at the Center for Anxiety and Related Disorders of Boston University, in the Early Childhood Interventions Program. All children met diagnostic criteria for a principal diagnosis of OCD; comorbid diagnoses included generalized anxiety disorder (four of five cases), specific phobia (two of five), social anxiety disorder (one of five), and separation anxiety disorder (one of five). In 80% of cases, both parents participated in treatment. One family reported earning a household income of $75,000, placing them in the 67th percentile of U.S. household incomes; the other four families reported earning roughly $100,000, placing them in the 79th percentile of U.S. household incomes. All families lived within 45 miles of Boston, Massachusetts.

Eligibility criteria—Inclusion criteria were as follows: (1) child is between 4 and 8 years of age (inclusive); (2) child meets diagnostic criteria for a principal diagnosis of OCD at least 3 months in duration; (3) child and participating parents are English speaking, as the treatment to be administered was provided in English; and (4) family home was equipped with a computing device (e.g., desktop PC, laptop, tablet) with at least 128 MB RAM, 200 MB of hard disk space, and a 16-bit color display adapter. Criteria for exclusion were as follows: (a) child has emotional or behavioral problem(s) more impairing than OCD; (b) child is receiving medication or other psychotherapy to manage behavioral or emotional difficulties; (c) child meets criteria for PANDAS or PANS; (d) history of severe physical or mental impairments (e.g., intellectual disability, deafness, blindness, PDD) in child or participating caretaker(s); and (e) child is a ward of the state.

Measures

Diagnostic outcomes—The Anxiety Disorders Interview Schedule for Children and Parents for *DSM–IV* (ADIS-IV-C/P; Silverman & Albano, 1996) is a semistructured

diagnostic interview that assesses child psychopathology in accordance with *DSM–IV* criteria. In the present sample, we administered the ADIS-P (parent version) to collect parent reports for all children; the ADIS-C (child version) was also administered for participating youth ages 7 and 8. For 7- and 8-year-olds, parent and child diagnostic profiles were integrated using the "or" rule (see Comer & Kendall, 2004). Diagnosticians assigned diagnoses as per *DSM-IV* criteria and clinician severity ratings (CSRs) on the basis of interview data and clinical judgment. CSRs range from 0 to 8; CSR of 4 or higher denotes child meets full diagnostic criteria. The anxiety disorders section of the ADIS-IV-C/P has demonstrated strong concurrent validity (Wood, Piacentini, Bergman, McCracken, & Barrios, 2002) and good reliability (Silverman & Ollendick, 2005; Silverman, Saavedra, & Pina, 2001). The ADIS-P has been used successfully in age ranges comparable to the present sample (Comer et al., 2012; Kennedy, Rapee, & Edwards, 2009). As in these studies, some items were slightly modified for developmental compatibility with younger age ranges and impairment was judged with developmental sensitivity to normative early childhood functioning.

Global functioning, impairment, and severity—The Children's Global Assessment Scale (CGAS; Shaffer et al., 1983) is a widely used measure of overall child disturbance, providing a clinician-rated index of functioning. Scores range from 0 to 100, with lower scores indicating greater functional impairments. The CGAS has been used successfully to assess preschool functional impairment (e.g., Comer et al., 2012; Lavigne et al., 1996). The Clinical Global Impression-Severity and Improvement Scales (CGI-S and I) is the most widely used clinician-rated measure of treatment-related changes in functioning (Guy & Bonato, 1970). The CGI-S score rates illness severity on a 7-point scale, ranging from 1 (*normal*) to 7 (*among the most severely ill patients*). The CGI-I rates clinical improvement on a 7-point scale, ranging from 1 (*very much improved*) to 7 (*very much worse*).

OCD symptoms—The Children's Yale-Brown Obsessive-Compulsive Scale (CY-BOCS; Scahill et al., 1997) is a 10-item semistructured, clinician-rated interview merging data from clinical observation and diagnostic interviewing. In age ranges comparable to the present sample, the CY-BOCS has demonstrated strong convergent validity and sensitivity to treatment-related change (Freeman, Flessner, & Garcia, 2011). For the present purposes, the CY-BOCS Total Score was used.

Treatment satisfaction—At posttreatment, parents were given the first item from the Client Satisfaction Questionnaire–8 (Larsen, Attkisson, Hargreaves, & Nguyen, 1979), which asks "How would you rate the quality of the services you received?" Response options are *poor* (1), *fair* (2), *good* (3), or *excellent* (4).

Treatment

Family-Based CBT for Early Childhood OCD (Freeman & Garcia, 2009) is a 14-week program drawing on supported CBT approaches used with older children (March & Mulle, 1998; Piacentini, Bergman, Jacobs, McCracken, & Kretchman, 2002). The program contains E/RP modifications specifically tailored for developmental compatibility with affected children ages 4 to 8, with careful attention to the restricted cognitive and socioemotional

capacities characteristic of early childhood, and an awareness of young children's primary dependence on the family system (see Freeman et al., 2003, for a full description of developmental modifications made). Throughout treatment, parents are included in structured ways to address issues of family functioning and parenting: (1) parents are trained as coaches for their children and play key roles in shaping treatment and ensuring out-of-session adherence and motivation; (2) treatment addresses parental accommodation of child symptoms; and (3) treatment has an "exposure" function for parents as well, as they are asked to tolerate their own distress while assisting their children with difficult exposure exercises and homework tasks. Parents learn to use differential attention, modeling, and scaffolding techniques to manage child symptoms. Child treatment components include helping children use a feelings thermometer to rate their anxiety and learning to externalize their symptoms by "bossing back" OCD. Therapists work with the family as a whole to create a fear and avoidance hierarchy that in turn serves as a roadmap for sequencing graduated E/RP tasks in which children confront increasingly feared situations without avoidance or engagement in rituals. Contingency management is used to reward children's brave behavior and treatment engagement. Treatment ends with a focus on relapse prevention.

Internet-delivered considerations—Technological, ethical, and administrative considerations for the use of VTC to deliver psychological treatments are considered in full elsewhere (American Telemedicine Association, 2009; Nelson, Davis, & Velasquez, 2013; Spargo, Karr, & Turvey, 2013). Study decisions related to technology and administration were made in accordance with the American Telemedicine Association's current practice guidelines for VTC-based telemental health (American Telemedicine Association, 2009). Specific hardware and equipment used for the present work are summarized in Table 1. Most modern VTC formats allowing two or more parties to communicate in real-time via the simultaneous two-way transmission of audio and video signals afford real-time and lifelike detail and motion sufficiently sophisticated to enable quality treatment. Although highest quality and security are offered by T1 and T3 line connections, such line connections are considerably expensive, limiting their feasibility for connecting a therapist to individual families in their homes. Accordingly, our work relies on easy-to-use web conferencing appliances, which can still be compliant with existing standards and practice guidelines for VTC delivery of psychological treatments and are designed for small and large organizations to enable "virtual" meetings (e.g., Webex, GoToMeeting). Such appliances also afford desktop sharing, which can be very useful for sharing handouts, graphs depicting weekly symptom response, and fear hierarchies with treated families. In our work, during appropriate points in treatment, these graphs and handouts are brought up on the therapist's screen, and then the desktop sharing tool is applied to enable the family to see the therapist's screen as he or she explains the material which they are both able to see. Pricing for these programs typically range from $19 to $49 per month, and only the "host" (i.e., the therapist) needs to have an account. When selecting a VTC format, for security purposes—and in consultation with the American Telemedicine Association's practice guidelines for the use of VTC for delivery of psychological treatment (American Telemedicine Association, 2013)—we chose a VTC platform that (a) allows users to host unlisted meetings, (b) uses the Advanced Encryption Standards algorithm, (c) requires users to be invited by the "host"

(i.e., therapist) in order to attend, (d) requires all meeting attendees to log in with an e-mail address and a strong password, (e) requires approval of "Forgot Password" requests, and (f) provides identification of every meeting attendee. We were also sure to use a VTC format using at least a Secure Sockets Layer/Transport Layer Security encryption tunnel for additional security. Finally, we confirmed that the platform does not store or retain any session information on its network after the sessions end to afford compliance with HIPAA regulatory guidelines relating to use, disclosure, and storage of confidential information.

Interactive online activities for delivering treatment content and promoting child engagement—Given how interactive CBT for child OCD is, special considerations are required for Internet-delivered care. When conducting Internet-based treatment with young children, a variety of Internet games were used. We created a series of interactive computer games that children play in session with their parents and therapist to enhance the child's understanding of treatment concepts. These programs allow both the therapist and the patient to simultaneously access and manipulate a working document in real-time during session and also enable families to access the documents outside of session to reinforce treatment skills and practice between sessions. We used the Google Drawing function of Google Documents, which is available at no cost, to create our working document interactive games.

The activities and games used in our Internet-based program include both adaptations of in-clinic treatment activities from Family-Based CBT for Early Childhood OCD (Freeman & Garcia, 2009) and new games created specifically for the purpose of Internet-based sessions. One activity adapted from Freeman and Garcia (2009) is *Draw an OCD Worry Monster*, which aims to help children externalize OCD. In standard care, the therapist and the family collaborate in the clinic to draw a picture of OCD using paper and markers. Given that a collaborative paper and marker project is not possible over VTC, we developed a format using the Google Drawing function of Google Documents that supplies children with an image bank of varying monster body parts which they can then click and drag, with parental assistance as necessary, to create an image of their OCD (see Figure 1). Therapists are also able to simultaneously click and drag body parts from the image bank to the OCD monster, and throughout this task families are able to continue to verbally communicate with their therapist. Engaging children in this interactive activity in real time affords the therapist valuable insight into the child's ability to externalize OCD, and we have found it appears to promote engagement, rapport, and overall alliance.

Another "click and drag" interactive game we developed, *Bravery Building* (Figure 2), teaches the importance of exposure and approach behavior to ultimately reduce anxiety in a fun and developmentally engaging manner. In Bravery Building, children are shown cartoon characters confronted with anxiety-provoking situations and asked how the character should respond in order to build bravery. When children choose to have the character engage in an exposure by selecting the appropriate image, they are reinforced by the presentation of a smiley face on the screen.

Other online activities include the construction of a "click and drag" feelings thermometer using emotional cartoon faces rank ordered from happiest to saddest, which families use

throughout treatment to rate the severity of OCD symptoms. The completion of this activity during Internet-based sessions enables the therapist to assess and enhance the child's understanding of relative emotional states and produces a personalized treatment tool over which the child may have a greater sense of ownership.

Finally, families also participate in an interactive exposure hierarchy building activity, Bravery Mission (Figure 3). This task engages families and therapists in collaboratively generating and ranking the difficulty of exposure tasks that are then placed on the bravery ladder (i.e., exposure hierarchy). During VTC sessions, both the therapist and family can make and view changes to the document through desktop sharing, offering a clear and concise means of communicating about and tracking the difficulty of exposure tasks. Further, this activity offers children concrete evidence of their treatment progress as exposure tasks decrease in difficulty following practice and are consequently moved down the ladder.

Procedure

All procedures were approved by the Boston University Charles River Campus Institutional Review Board. Participating families were recruited from the natural flow of families seeking treatment for child anxiety at the Boston University Early Childhood Interventions Program. Potential participants were screened by telephone to review initial study eligibility. For those treatment-seeking families meeting initial screening criteria, an Independent Evaluator (IE) conducted a baseline assessment (Baseline) during which time the ADIS was administered and CGAS, CGI, and CY-BOCS scores were generated. IEs were advanced doctoral students in clinical psychology specializing in child disorders. IEs were blind to all treatment-related data across the study (e.g., therapist impressions; treatment compliance). IEs assigned diagnoses in accordance with the *DSM-IV-TR* (American Psychiatric Association, 2004). Between Baseline and the posttreatment assessment (Posttreatment) participating families completed family-based CBT for early-onset OCD (Freeman & Garcia, 2009) over the Internet via VTC as previously outlined. Therapists included three doctoral students in clinical psychology specializing in child disorders and one clinical psychologist. Therapists completed 1 month of didactic training in family-based CBT for early-onset OCD (Freeman & Garcia, 2009), including a 1-day intensive training with the treatment codevelopers, followed by treatment of several in-clinic early OCD cases with the standard treatment protocol with weekly supervision from a licensed clinical psychologist. The codevelopers of the family-based CBT protocol for early-onset OCD reviewed randomly selected treatment clips and provided feedback on therapist performance to the therapists' supervisor.

To standardize care in our grant-funded work (which requires families to already have a personal computer for study eligibility), we provided families with a temporary equipment kit for the duration of their participation that cost less than $200 (see Table 1). At the conclusion of a family's treatment participation, they were expected to return the equipment kit, which was then loaned to the next treated family in our program. Depending on patient flow, we are typically able to operate with the purchase of seven equipment kits at a time (~ $1,400) with the need to purchase the equivalent of one additional equipment kit each year

due to either the occasional malfunctioning component or unreturned equipment. In the event of equipment loss or failure, a replacement piece was to be immediately mailed to the family's home. Families would be dropped from the study if there were more than two pieces of lost or damaged equipment, although no families in the present study lost or damaged their equipment.

Consistent with emerging guidelines for the ethical use of VTC (see Nelson et al., 2013), prior to participation families were socialized to the risks and benefits of Internet-delivered treatment—including consideration of the state of empirical evidence on VTC-based treatment and consensus guidelines for care. Study staff outlined the roles and expectations of the staff and of the participating families. Prior to obtaining informed consent, study staff reviewed with families that—as with all Internet-based communications—there is the potential for breach of confidentiality in VTC-delivered treatment, either from interception of confidential information or from accessing the Internet over a public network. We acknowledged the limited ability for staff to provide direct crisis management during unanticipated emergencies due to geographic distance, and families provided the name of a local emergency contact (e.g., a friend, family member, physician) in such an event. Families were also informed that, in the event of an unforeseen clinical emergency, staff might have to contact local emergency dispatchers.

In accordance with practice guidelines for VTC-delivered mental health care (American Telemedicine Association, 2013), at the beginning of sessions, all individuals present were announced and for corroboration cameras were used to pan the full room. Participants were told to avoid using last names in sessions and to refrain from using personal information (names, birthdays) when creating access IDs. Consistent with guidance from Spargo and colleagues (2013), back-up procedures were put into place to contact families in the event of a dropped or otherwise disrupted VTC session (i.e., contact by cellular phone, texting, and e-mail to confirm safety and coordinate steps to reestablish a connection). To limit distractions in the home during session, parents were asked to place cellular phones on vibrate mode and to unplug landlines or direct them straight to voice mail. We encouraged parents with multiple young children to arrange childcare for siblings during sessions, and we have encouraged families to place "Do Not Disturb" signs on their front doors during sessions to indicate they are unavailable.

Treatment and assessments were provided to families free of cost, and study-related technical support was provided throughout participation. Families participated in 12 sessions across 14 weeks of treatment, equivalent to the standard dose of treatment provided in the standard protocol. After treatment, IEs conducted Posttreatment ADIS interviews and generated CY-BOCS, CGAS, and CGI scores.

Analysis

Participant responder status was determined across five dimensions: diagnostic response, symptom response, functional response, global severity response, and treatment responder status. Diagnostic response was assessed via improvements in OCD CSRs as assessed by the ADIS. Full diagnostic responders were those children who met diagnostic criteria for OCD at Baseline (CSR $\geq$ 4), but not at Posttreatment (CSR $\leq$ 3). Partial diagnostic responders

were those children who met diagnostic criteria for OCD at Baseline (CSR ≥ 4) and still met diagnostic criteria for OCD at Posttreatment (CSR ≥ 4) but did show CSR improvement from Baseline to Posttreatment (i.e., CSR improvement ≥ 1). Symptom response was assessed via reductions from Baseline to Posttreatment in CY-BOCS Score. Functional response was determined for each participant via increased CGAS scores from Baseline to Posttreatment. Global severity response was determined via reductions in CGI-S scores. In the context of this pilot feasibility work, we broadly considered treatment responders were those who scored 3 or lower on the CGI-I (3 = minimally improved, 2 = much improved, 1 = very much improved) at Posttreatment.

RESULTS

Data and Participant Flow

In addition to the five children who participated, two additional children were evaluated for participation but were not assigned a primary diagnosis of OCD (both assigned generalized anxiety disorder). No families were excluded for not meeting the technological requirement for participation. No families dropped out of treatment prematurely. There were no missing data in this case series.

Diagnostic and Symptom Outcomes

Table 2 presents OCD CSRs and CY-BOCS scores, by participant, at Baseline and Posttreatment. Whereas all five participating youth met diagnostic criteria for OCD at Baseline (*M* Baseline CSR = 5.8), only two met diagnostic criteria for OCD at Posttreatment (*M* Posttreatment CSR = 4.00). At least partial diagnostic response was found in 100% of participating youth; full diagnostic response was found in 60% of youth who no longer met diagnostic criteria for OCD at posttreatment. All youth showed OCD symptom improvements from Baseline to Posttreatment as demonstrated by improvements in CY-BOCS scores. Effect sizes for within-subjects CSR and CY-BOCS changes were both large in magnitude (d_{CSR} = 5.88; $d_{CY\text{-}BOCS}$ = 2.54)

Functional Outcomes and Global Response

Figure 4 presents CGI-S scores, by participant, at Baseline and Posttreatment. At Baseline, all participants presented as at least *Markedly ill* (i.e., CGI-S ≥ 5; *M* = 5.2, *SD* = 0.4). All participants showed CGI-S improvements from Baseline to Posttreatment (*M* change = 1.6, *SD* = 0.6). The mean Posttreatment CGI-S score was 3.6, which characterizes the sample at Post-treatment as falling between *Mildly ill* and *Moderately ill* (Guy & Bonato, 1970).

Figure 5 presents CGAS scores, by participant, at Baseline and Posttreatment. At Baseline, children presented with a mean CGAS score of 51.8, which falls just above the category “Moderate degree of interference in functioning in most social areas or severe impairment of functioning in one area .. .” (Shaffer et al., 1983). Children’s global functioning improved for all participants, with a mean improvement of 9.2 CGAS points. The mean Posttreatment CGAS score was 58.6, which falls just below the category “Some difficulty in a single area but generally functioning well .. .” (Shaffer et al., 1983). The effect size for within-subjects CGAS change was large in magnitude (d_{CGAS} = 2.87).

Table 1 also presents Posttreatment CGI-I statuses, by participant. All participants were deemed treatment responders (i.e., CGI-I ≤ 3). One child was *very much improved* (CGI-I = 1), two children were much improved (CGI-I = 2), and two were *minimally improved* (CGI-I = 3). No participants got worse (CGI-I ≥ 5), and no participants showed *no change* (CGI-I = 4).

Treatment Satisfaction

No families dropped out of treatment prematurely. At Posttreatment, all mothers rated the quality of services received as *Excellent* on the Client Satisfaction Questionnaire–8.

DISCUSSION

The present findings are promising as they provide preliminary support for the feasibility and utility of delivering family-based CBT for early childhood OCD to affected families over the Internet using VTC. All treated youth completed a full treatment course, all showed symptom and global severity improvements, and 60% no longer met diagnostic criteria for OCD at posttreatment. Although 40% of youth did not exhibit *full* diagnostic response, 80% of youth did show at least *partial* diagnostic response, meaning they showed diagnostic improvements in OCD CSR although not necessarily full diagnostic remission. All participants were deemed treatment responders (i.e., CGI-I ≤ 3), with one child classified as *very much improved*, two children classified as *much improved*, and two classified as *minimally improved*. No participants got worse, and all mothers characterized the quality of services they received as *Excellent*. These findings add to a growing body of literature supporting the promising role of VTC formats for broadening the delivery of CBT for OCD and related disorders across the lifespan (Andersson et al., 2012; Herbst et al., 2012; Himle et al., 2006; Himle et al., 2012; Storch et al., 2011).

In the present small open case series, 60% of youth were deemed either *very much improved* or *much improved*. Although the present data were drawn from a small nonrandomized series of cases, similar rates of clinical response were found in a randomized clinical trial (RCT) examining traditional in-clinic family-based CBT for early childhood OCD (Freeman et al., 2008). Specifically, Freeman and colleagues found that 50% of young children with OCD randomized to family-based CBT (and 69% of treatment completers) were *very much improved* or *much improved* following treatment, whereas only 40% of youth in relaxation training showed such response. Moreover, the large within-subjects CY-BOCS treatment effect we found among Internet-treated families is comparable in magnitude to the large within-subjects CY-BOCS treatment effect Freeman and colleagues (2008) found among families receiving in-clinic CBT (i.e., within-subjects $d_{\text{CY-BOCS}} = 1.82$ in Freeman et al., 2008). The present preliminary findings have collectively laid the groundwork for an RCT currently underway formally evaluating the potential of Internet-delivered family-based CBT relative to standard in-clinic family-based CBT for early-onset OCD. Our expectation is that treatment effects associated with Internet-delivered CBT will be comparable in magnitude to treatment effects associated with in-clinic CBT, supporting the role of Internet-delivered treatment in the mental health care of children dwelling in rural and other remote regions suffering from early-onset OCD. It is important to note that in the unexpected event

that our RCT finds Internet-delivered methods to be significantly inferior to standard in-clinic care, given profound problems of treatment accessibility as a field, we will then need to consider what level of inferiority is still acceptable and preferable to no treatment availability at all. Moreover, there may also be an important role for the use of VTC for expanding the reach of evidence-based identification and evaluation of early-onset OCD.

Much has been written about the role of technology in dissemination efforts targeting the training and/or retraining of practitioners (Beidas, Koerner, Weingardt, & Kendall, 2011; Comer & Barlow, in press; Jones et al., 2013; Kendall, Khanna, Edson, Cummings, & Harris, 2011). In response to evidence-based care shortages across practice settings, considerable attention and large financial commitments have focused in recent years on broad dissemination and implementation efforts designed to improve the quality of front-line psychological services delivered by a variety of generalist practitioners. The blossoming science of dissemination and implementation has already had an appreciable impact on mental health care services, although given the tremendous diversity of mental health problems, broad dissemination and implementation efforts alone may not be sufficient to adequately address the profound prevalence and burden of child disorders. Notably, the time and expenses associated with quality dissemination and implementation may preclude large-scale competency training in the treatment of low base-rate disorders, such as OCD, in order to prioritize the most common conditions affecting general child populations. In addition, dissemination science reveals that treatment innovations that are too complex do not get routinely incorporated (or incorporated with fidelity) into everyday practice (Rogers, 2003). The broad diversity of educational backgrounds across the mental health workforce (Ellis et al., 2009) underscores the importance of complexity considerations when allocating resources for dissemination efforts. As such, specialized treatment methods, such as E/RP, may not readily lend themselves to broad dissemination and implementation efforts. Accordingly, “putting all of our eggs in the dissemination basket” and in the broad training of a quality generalist mental health workforce (see Comer & Barlow, in press) may fail to ensure effective and available care for (a) children requiring treatment for disorders so uncommon they are not worth the considerable investment necessary for quality dissemination and implementation, and (b) children who would benefit from interventions that are too complex for effective broad dissemination (see Comer & Barlow, in press). With continued empirical support clarifying the utility of Internet-based applications for the delivery of evidence-based pediatric OCD treatment, VTC-delivered E/RP may prove to be a transformative solution for broadly delivering expert services that may not readily lend themselves to traditional dissemination methods. Indeed, VTC may be used to bypass local generalist mental health care workforces altogether and to deliver expert care for low base-rate disorders with more specialized methods to affected youth in need. This may be a particularly important development for improving the availability and quality of care for youth dwelling in rural regions, which are traditionally characterized by poor access to expert services (see Flaum, 2013). As technology expands the field’s ability to reach larger numbers of increasingly diverse patient populations (e.g., American Indians, Alaska Natives, rural Appalachia inhabitants), there will be a critical need to ensure culturally appropriate care into VTC services (see Brooks, Spargo, Yellowlees, O’Neill, & Shore, 2013).

In the present open pilot work, all families received the VTC treatment format, and so it was not possible to evaluate the extent to which VTC may have affected the dose of exposures or families' alliance with the therapist. We are currently evaluating our web-based format relative to standard in-clinic family-based CBT for early OCD in an RCT to evaluate matters of relative efficacy and engagement. Formal comparisons such as these are necessary to examine the extent to which potential Internet- and home-specific barriers to treatment delivery—and the fact that Internet-delivered care does not afford opportunities to execute E/RP with a therapist model "side by side"—may interfere with treatment response. Early observations from our research comparing VTC- and clinic-based CBT for early OCD do reveal some apparent distinctions that may offer meaningful information for those considering VTC methods (see also Table 3). We have observed that when using the interactive online activities (games) for teaching core treatment content and for alliance building, children have been highly engaged while working with the therapist and appear excited to participate. In addition, we have observed that conducting exposures in the home setting may have incremental benefits beyond in-clinic exposures. Consistent with previous empirical work supporting the role of home-based CBT for OCD (Rosqvist et al., 2001), in-session home-based exposure tasks allow therapists to coach families in their natural settings, to identify exposures that will directly translate to home-work tasks, and to observe the completion of such natural setting exposures while identifying compulsions or accommodations that might not be displayed in the clinic setting. For example, in the VTC treatment of one child who would engage in compulsive checking of his parents' locations while at home, during an exposure task in which he was to remain in his room alone while his parents walked around the house and yard, the child was observed on camera leaving his room to borrow a toy from his sibling and opening a window, both of which enabled him to gauge his parents' location. It would not be possible to observe such context-specific behavior in the clinic. Observation of such avoidance in session yielded productive conversations in treatment that meaningfully refined the child's exposure goals in homework and subsequent sessions.

Early observations from this line of research have also revealed unique challenges when conducting VTC-based CBT for early OCD. For example, we have found that disruptive child behaviors are more interfering to exposures conducted over the Internet relative to clinic-based exposures. When disruptive child behaviors occur during in-clinic exposures, therapists will model the use of parent tools and then coach parents through the use of these tools. For example, the therapist would use differential attention for a child who is yelling and stomping when told it is time for an exposure by actively ignoring tantrum behavior while praising small kernels of appropriate behavior and engagement in session activities (e.g., using words to talk about feelings, keeping one's body calm when talking about or talking back to OCD). When conducting VTC-based sessions, therapists cannot provide such proximal modeling and their communication is mediated through computer speakers. Further, when a child is exhibiting tantrum behaviors, it can be particularly hard for parents to adequately attend to the computer. Moreover, if exposures are to be conducted in a room that is not visible from the family's webcam, the therapist may be prevented from providing live coaching. However, limitations in therapists' ability to provide live coaching of parent skills during high-stress and off-camera exposures can potentially be mitigated through use

of Bluetooth-based technology and wireless VTC tools. In other work (Comer et al., 2013), we have developed a VTC-based parent management program in which therapists provide live, unobtrusive, bug-in-the-ear coaching for parents struggling to manage children's disruptive behaviors through Bluetooth wireless ear-piece receivers as families move around the room and interact. For more disruptive children presenting for OCD treatment, such discreet home-based bug-in-the-ear parent management techniques may offer useful complements to CBT centering on E/RP. In addition, portable video conferencing devices, such as tablets and smartphones, could be used to transport the therapist to new locations in the home, facilitating clinically supervised exposure participation throughout the home.

Regrettably, many families most in need of services may not have a personal computer, webcam, and/or broadband connectivity. As such, present disparities in Internet access and technological literacy may interfere with Internet-based treatment accessibility for some, as one fourth of households in the United States do not currently have Internet access (United States Census Bureau, 2012). Of importance, the families examined in the present study were all in the 67th or 79th percentile of U.S. household incomes, and as such the present work may not generalize to families of more limited financial means or families dwelling in more remote communities. However, demographic groups with the poorest current access to and ease with personal computers and the Internet—for example, low-income and rural-dwelling families—are currently showing the most rapid growth in the adoption of household Internet (Horrigan, 2009). Recent trends and large federal and state investments in the expansion of broadband Internet to underserved regions suggest that in the coming years, broadband Internet access may soon show household ubiquity regardless of a family's income or geography. As we approach broadband Internet access for all, regardless of geography, proof-of-concept efforts are essential to evaluate the merits of Internet-delivered treatments. Moreover, given the cost savings associated with Internet-delivered mental health care (McCrone et al., 2004; Newman, 2000), some providers routinely providing services via VTC, and third-party payers, may find it feasible and cost-efficient to purchase and loan temporary equipment for treated families, which can be rotated out to new families in need when a given treatment course ends.

It is important to note that VTC innovations and opportunities for conducting psychological treatments over the Internet are advancing at a more rapid pace than the development of relevant legal, regulatory, and ethical standards (see Van Allen & Roberts, 2011). Accordingly, we must be cautious against conducting VTC-based treatment in the absence of guidance from the broader professional community, particularly given the unique security, privacy, and liability concerns associated with such care. Fortunately, a guiding dialogue has begun to unfold about the management of threats to confidentiality—addressing key issues such as encryption and privacy protection (American Telemedicine Association, 2009; Banitt Duncan et al., in press; Kramer, Mishkind, Luxton, & Shore, 2013; Schwartz & Lonborg, 2011; Yuen, Goetter, Herbert, & Forman, 2012). However, there is still much to be clarified, and in the interim participating families must be clearly informed prior to consenting to VTC services that there is no current consensus on the role of VTC in mental health care. Continued development of standards relevant to the delivery of psychological treatment using information and communication technologies is critical. In

particular, there has been limited dialogue on the proper use of VTC for providing services to families in clinically unsupervised settings, such as personal homes.

In recent years the proportion of very young children being prescribed psychotropic medications in outpatient care has been steadily increasing (Olfson, Blanco, Liu, Moreno, & Laje, 2006; Olfson, Crystal, Huang, & Gerhard, 2010; Olfson, Marcus, Weissman, & Jensen, 2002). Recent trends, particularly in the off-label prescribing of psychotropic medications for early child anxiety disorders and OCD, may be due, in part, to the serious limitations in the availability of supported psychological treatment. Expert consensus treatment algorithms recommend nonpharmacologic interventions as the first-line treatment for pediatric anxiety disorders presenting in the preschool years (Gleason et al., 2007), but limitations in the accessibility of psychological treatments places heavy clinical demands on the pharmacologic dimensions of children's mental health care. The present work adds to a growing body of literature supporting the potential of VTC and related computer technology for meaningfully expanding the reach of evidence-based psychological treatments and improving upon the public health impact of advances in psychological intervention sciences.

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FIGURE 1.
Screen capture of the *Create an OCD Worry Monster* interactive online activity. (Figure appears in color online.)

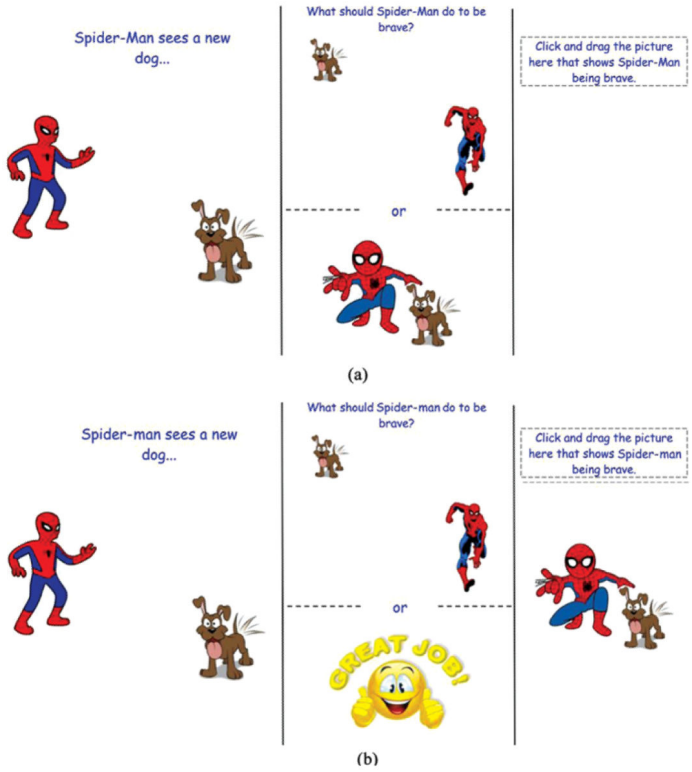

FIGURE 2.

Screen capture from *Bravery Mission*—an interactive online game that teaches children the importance of exposures for ultimately reducing anxiety in a fun and developmentally engaging manner game. (Figure appears in color online.)

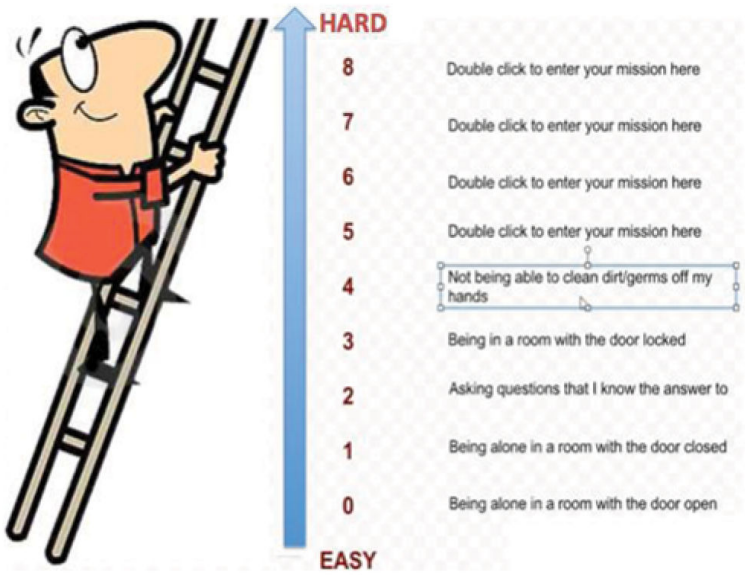

FIGURE 3.

Screen capture of *Bravery Mission*—an interactive desktop sharing tool that allows the therapist and family to collaboratively build a fear and avoidance hierarchy. (Figure appears in color online.)

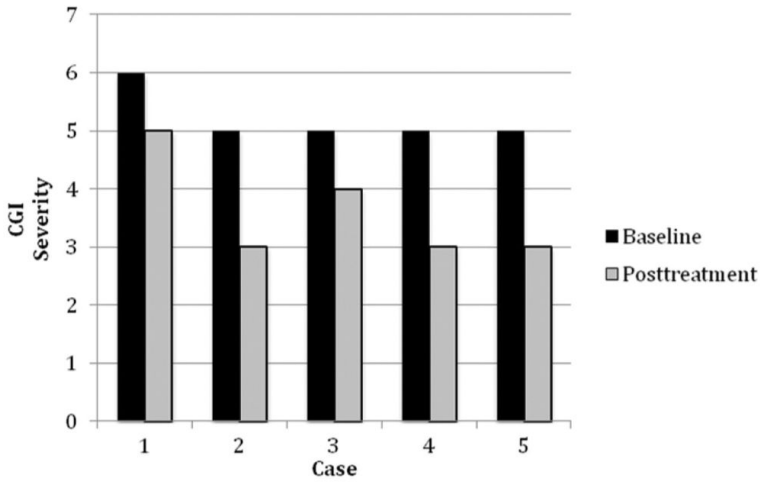

FIGURE 4.

Global severity response, by case. *Note*: CGI = Clinical Global Impression Scale; CGI-Severity 1 = normal, not at all ill; CGI-Severity 2 = borderline mentally ill; CGI-Severity 3 = mildly ill; CGI-Severity 4 = moderately ill; CGI-Severity 5 = markedly ill; CGI Severity 6 = severely ill; CGI-Severity 7 = extremely ill.

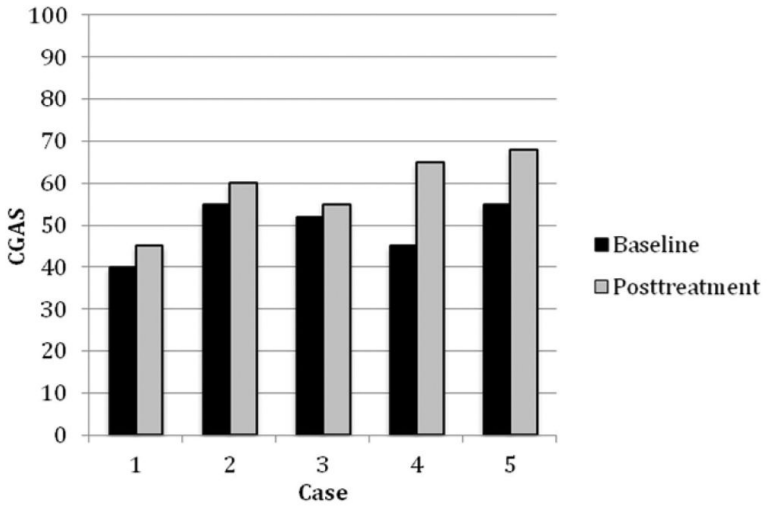

FIGURE 5.

Global functioning response, by case. *Note*: CGAS = Children's Global Assessment Scale. See Shaffer et al. (1983) for CGAS anchors.

TABLE 1

Specific Technologies Used in the Present Work

Technology Used	Notes
Computing Device in Therapist's Office (Desktop PC, Laptop Computer, or Tablet)	Computing device had to have at least 128MB RAM, 200MB of hard disk space, and a 16-bit color display adapter, which is fairly standard for all computers being sold currently
Computing Device in Treated Family's Home	Computing device had to have at least 128MB RAM, 200MB of hard disk space, and a 16-bit color display adapter, which is fairly standard for all computers being sold currently
Multiport USB Hub	~$20.00
Webcam at Both Sites	Logitech HD Pro Webcam C920[a] provided to participating families; ~$99.00
Microphone at Both Sites	MXL AC404 USB Conference Microphone[a] provided to participating families; ~$80.00
Speakers at Both Sites	Speakers built into computing devices sufficed
Broadband or Wi-Fi Internet Connectivity at Both Sites	Only broadband Internet or Wi-Fi connections afford the quality of real-time, fluid, and discernable communication required for treatment. Attempts to conduct treatment using low-bandwidth or dial-up methods are problematic on several fronts: (a) audio-visual communications do not synchronize, (b) picture resolution during movement is poor, (c) distracting strobe-effect due to low frames-per-second of transmitted visual data, (d) at times sound is indiscernible, (e) delayed communications preclude precise real-time interactions, and (f) frequently dropped or disrupted connections. For families with a home computer but not household broadband or Wi-Fi connectivity, we loaned them a temporary mobile Wi-Fi hotspot; <$50.00/month

[a] Specific products used in the present study are not essential, and many families already own comparable equipment components.

TABLE 2

Demographic and Diagnostic Information, and Treatment Response, by Case

Case	Age	Gender	Race	OCD CSR		CY-BOCS Total		CGI Improvement
				Pre	Post	Pre	Post	
1	8	Female	AA	8	6	26	23	3 (Minimally Improved)
2	6	Male	CA	6	3	21	15	2 (Much Improved)
3	6	Male	CA	6	5	30	24	3 (Minimally Improved)
4	8	Male	CA	5	3	17	15	2 (Much Improved)
5	7	Female	CA	6	3	27	10	1 (Very Much Improved)

Note: OCD = obsessive-compulsive disorder; CSR = Clinical Severity Rating (from the Anxiety Disorders Interview Schedule for Children and Parents); CY-BOCS = Children's Yale-Brown Obsessive Compulsive Scale; CGI = Clinical Global Impression; CA = Caucasian; AA = African American.

TABLE 3

Clinic-Based versus Internet-Delivered Family-Based CBT for Early Childhood OCD

Treatment-Related Considerations	Clinic-Based Treatment	Internet-Based Treatment
Participants	Parents and children	Parents and children
Treatment Components Covered	Child tools: identifying OCD, feelings thermometer, bossing back, exposures tasks	Child tools: identifying OCD, feelings thermometer, bossing back, exposures tasks
	Parent tools: Modeling, differential attention, and scaffolding	Parent tools: Modeling, differential attention, and scaffolding
How Child Tools Are Taught	Child treatment components are taught through the use of pre-printed work sheets, drawing, and demonstrations with toys. Therapists can enhance child engagement through the use of teaching activities that include more active play and large-scale drawings.	Interactive online activities (games) are used to teach children core treatment components (e.g., see Figures 1–3). In between sessions, families can also access these activities for practice and skill consolidation. Therapist may have to rely more heavily on parental assistance to explain child tools when children have difficulty attending to computer screens.
How Parent Tools Are Taught	Parent tools are taught to parents alone, first in parent-only sessions, then in parent-only portions of joint parent–child sessions. During parent-only sessions childcare is arranged, while it is typically provided by the clinic during joint sessions. Once the child rejoins the session to participate in exposures, the therapist can model the use of differential attention, modeling, and scaffolding to enhance child engagement in exposures and coach the parents in these skills. Children may be more willing to participate in clinic-based exposures with the therapist present than in home-based exposures. Avoidance behaviors displayed at home may be more intense than avoidance behaviors displayed in the clinic.	Parent tools are taught to parents alone, first in parent-only sessions, then in parent-only portions of joint sessions. During parent-only sessions, therapist may encourage families to pursue childcare. During joint sessions, children play separately in another part of the home. The therapist's ability to model and coach parents in use of parent tools is limited when children rejoin the session. However, when the child does rejoin sessions, therapists can witness naturalistic home-based family patterns, which may in turn enhance the quality of therapist feedback.
How Exposures Are Conducted	Exposure tasks are conducted during session with the therapist present in the clinic and during arranged outings. Exposure tasks requiring materials from the child's home require preplanning and coordination. Some household materials may be too big to transport to session (e.g., a chest of drawers involved in a dressing ritual), and thus cannot be used in clinic-based exposures. Between-session exposures are conducted without therapist assistance.	Therapists guide families through exposures in home setting, potentially yielding greater ecological validity and generalizability of in-session exposures. Therapists can easily facilitate exposure tasks in session that require specific materials from the child's home. Therapists cannot provide proximal modeling for children or parents. Disruptive child behavior can be more problematic than in clinic-based exposure therapy. Some home-based exposure tasks may need to be conducted in rooms that are not visible from a family's desktop computer, requiring additional wireless technology (or alternatively it becomes an "out-of-session" exposure during which time the therapist is unable to provide live intervention. Between-session exposures are conducted without therapist assistance.
Potential Therapist Burdens	Family-friendly clinic space (no office-based technology or technological literacy required)	Requires office-based technology and technological literacy. May require availability of IT support.
Potential Participant Burdens	Transportation/parking	No transportation/parking considerations
	Treatment costs/copay	Several insurance providers will not, at present, cover home-based care
	Child care (siblings, and for target child during parent-only sessions)	Child care may be easier to arrange
	Potential sigma of attending a mental health clinic (No requirements for home-based technology or technological literacy)	Treatment in own home may reduce stigma of care Requires home-based technology and technological literacy
Treatment Access	Professional workforce shortages and geographic disparities in evidence-based care substantially limit the broad availability of CBT for early childhood OCD	Internet-based methods can vastly extend the accessibility of expert care for early childhood OCD

Note: CBT = cognitive behavioral therapy; OCD = obsessive-compulsive disorder; IT = information technology.