Article

A Pilot Study of Trauma-Focused Cognitive–Behavioral Therapy Delivered via Telehealth Technology

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Abstract

Significant barriers exist in access to evidence-based, trauma-focused treatment among youth from economically disadvantaged backgrounds, those living in rural areas, and belonging to a racial and ethnic minority group, despite the high prevalence rates of trauma exposure among these underserved groups. The present study is proof-of-concept pilot of trauma-focused cognitive–behavioral therapy (TF-CBT) delivered to underserved trauma-exposed youth ($N = 15$) via telehealth technology (i.e., via one-on-one videoconferencing), aimed at addressing barriers in access to TF treatment. This pilot study provides preliminary evidence of the ability to successfully deliver TF-CBT via a telehealth delivery format. Results demonstrated clinically meaningful symptom change posttreatment (large effect sizes for youth-reported ($d = 2.93$) and caregiver-reported ($d = 1.38$) reduction in posttraumatic stress disorder symptoms), with no treatment attrition (0% dropout). These findings are promising in showing treatment effects that are comparable with TF-CBT delivered in an in-person, office-based setting and an important first step in determining how to best address the mental health needs of trauma-exposed youth with barriers in access to care.

Keywords

child PTSD/trauma, evidence-based treatment, technology

It is estimated that approximately half of all youth will experience at least one type of potentially traumatic event (e.g., physical abuse, sexual abuse, witnessing domestic or community violence, violent or unexpected death of a loved one) before the age of 18 years (Finkelhor, Turner, Shattuck, & Hamby, 2013; Kilpatrick et al., 2003). While the majority of youth return to pretrauma levels of functioning over time (Bonanno & Mancini, 2008), a significant number go on to develop mental health disorders including posttraumatic stress disorder (PTSD), depression, and anxiety (Hanson, Moreland, & Orengo-Aguayo, In Press; Kessler, 2000).

Despite high rates of trauma exposure among youth, a major concern cited in the literature is the vast underutilization of evidence-based mental health treatments, particularly among children and families from underserved communities. This is particularly of concern among trauma-exposed youth from economically disadvantaged backgrounds, living in rural areas, and belonging to a racial and ethnic minority group (e.g., Hispanic and African American; Alegría, Vallas, & Pumariega, 2010; Roberts, Gilman, Breslau, Breslau, & Koenen, 2011). Some barriers in access to mental health services include (1) lack of transportation and means to travel (e.g., gas/parking money) to mental health facilities, (2) lack of insurance, (3) employment barriers (e.g., scheduled work hours, leave restrictions), and (4) limited availability of culturally and linguistically competent services for Spanish-speaking children and families (National Research Council and Institute of Medicine, 2009). Rural communities, in particular, face a disproportionate number of barriers to accessing developmental and behavioral health treatment, including greater poverty and related obstacles (DeLeon, Wakefield, & Hagglund, 2003); fewer community resources, such as access to public transportation (Baffour, Gourdine, Domingo, & Boone, 2009); and relatively fewer child mental health specialists available across large rural areas resulting in extended wait lists. Such barriers faced by youth from marginalized populations—as well as the gaps in availability of linguistically appropriate services—result in poor access to evidence-based mental health treatment for youth from underserved communities.

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Use of Telehealth to Reduce Barriers to Treatment

Telehealth refers to the use of interactive technologies such as videoconferencing via computer and/or tablet to deliver a broad range of health-care services to patients (including mental health treatments) as an alternative to traditional models of delivery (i.e., in-person office-based) in an effort to minimize barriers in access to care and to address health-care disparities (e.g., Kazdin, 2008; Myers & Comer, 2016). Such technology may allow for providers trained in evidence-based trauma treatments to reach youth who might otherwise remain untreated by eliminating logistical barriers such as distance from the clinic, lack of transportation and associated costs, and limited or no providers in rural or economically disadvantaged areas (Yellowlees et al., 2013; Yellowlees, Marks, Hilty, & Shore, 2008). Furthermore, telehealth technology allows for culturally and linguistically competent providers to offer mental health services to youth and families who might not have access to such clinicians in their communities. Additionally, telehealth technology allows clinicians to connect with patients in more comfortable and familiar settings such as schools, day cares, and homes (Gloff, LeNoue, Novins, & Myers, 2015), thus causing less interruption to their day-to-day routines and increasing the probability of treatment attendance and completion (Comer et al., 2014).

Research Supporting Telemental Health

Current evidence suggests that services delivered via telehealth are as effective as office-based treatment in addressing a number of disorders in youth such as attention deficit hyperactivity disorder (ADHD) (Myers, Vander-Stoep, Zhou, McCarty, & Katon, 2015), obsessive-compulsive disorder (OCD) (Comer et al., 2014), disruptive and oppositional behavior (Comer et al., 2015), depression (Nelson, Barnard, & Cain, 2003), and other mental health problems (see Gloff et al., 2015 for a review). Telehealth has also been shown to be acceptable among youth and their parents, with research suggesting that clinicians and patients are able to establish a positive therapeutic alliance that closely approximates face-to-face treatment (Goldstein & Glueck, 2016). Parents, youth, and referring providers report high levels of satisfaction with the care received (Hilty et al., 2016; Myers, Palmer, & Geyer, 2011). Furthermore, this treatment delivery modality is promising as being more cost effective for families, particularly due to circumventing the associated costs with travel and loss of work to attend weekly office-based appointments (Spaulding, Belz, DeLurgio, & Williams, 2010). Nevertheless, several implementation challenges associated with a telehealth treatment modality have been identified in the literature including technological issues (e.g., equipment malfunction, poor Internet connection), sustainability issues (e.g., nonreimbursement from third-party payers, difficulties obtaining buy-in from community agencies), privacy and confidentiality (e.g., finding a private and quiet location for sessions, securing proper encryption settings for devices), safety concerns (e.g., implementing a safety plan from a distance), and logistical barriers (e.g., obtaining signed informed consent, administering assessment batteries and self-report measures, and adapting handouts/worksheets for digital presentation; Gros et al., 2013; Josepth, West, Shickle, Keen, & Clamp, 2011).

Telehealth Delivery of Trauma-Focused Cognitive Behavioral Therapy

Trauma-Focused Cognitive Behavioral Therapy (TF-CBT; Cohen, Mannarino, & Deblinger, 2017) is an evidence-based treatment for trauma-exposed youth that has garnered robust empirical support (e.g., Cohen, Mannarino, & Iyenger, 2011; Jensen et al., 2013; Salloum et al., 2016) and has been widely disseminated across a variety of service settings both nationally and internationally (see Cohen et al., 2017, pp. 74–80 for a review of published studies). TF-CBT is ideal for disseminating and testing via a telehealth mode of delivery as a means to reduce barriers in access to evidence-based TF treatment among underserved youth who are disproportionately impacted by trauma exposure. To our knowledge, there are no published outcome studies of TF-CBT or any other treatment of childhood PTSD delivered via telehealth, other than two case studies conducted by our group demonstrating feasibility of delivery, acceptability, and preliminary evidence of symptom reduction (Jones et al., 2013; Stewart, Orengo-Aguayo, Gilmore, & de Arellano, 2017). More research is needed in order to develop an evidence base supporting the effectiveness of telehealth as a service delivery model with trauma-exposed youth.

In an effort to address this gap in the literature, our group has expanded our community-based outreach program (Community Outreach Program-Esperanza, COPE; de Arellano et al., 2005), which serves traditionally underserved populations (e.g., ethnic minority, economically disadvantaged, and rural/remote) in community settings (e.g., home and school) utilizing evidence-based treatments (e.g., TF-CBT) to deliver TF treatment via telehealth (Jones et al., 2013). The current investigation is a proof-of-concept pilot study of TF-CBT delivered to underserved trauma-exposed youth and their nonoffending caregivers via telehealth technology (i.e., via one-on-one videoconferencing) either at their schools or their homes. Outcomes of interest include (1) strategies for providing TF-CBT via telehealth, (2) technical performance of the telehealth equipment, (3) safety issues, (4) number of sessions attended and rates of treatment completion, and (5) clinical outcomes related to self-reported and parent-reported symptoms of PTSD, depression, and anxiety. The present study was conducted through a closed chart review of patients who received services through the Telemental Health Outreach Program clinic. This study received institutional review board approval.

Method

Participants

Participants were 15 children and adolescents aged 7–16 who were referred for treatment at a trauma treatment center in the southeastern United States. The mean age of the sample was

10.80 years ($SD = 2.96$) and comprised the following demographic distribution: 93.3% female, 46.7% Hispanic, 40.0% African American, and 13.3% Caucasian. Five participants lived in a rural location (distance to clinic 40–110 miles) and 10 participants lived in underserved urban locations. Five youth had an index trauma of sexual abuse, one had an index trauma of physical abuse, three experienced the traumatic loss of a loved one, two witnessed the armed robbery of a family member, one witnessed the physical abuse of a sibling, and three experienced multiple traumas. All children met criteria for PTSD ($n = 12$) or adjustment disorder ($n = 3$) according to the *Diagnostic and Statistical Manual* (4th ed; *DSM-IV*; American Psychiatric Association, 2000), at the time of treatment initiation. Patient barriers to treatment included lack of transportation, language preference of the child and/or caregiver (Spanish), caregiver work schedule, and rural location.

Inclusion criteria were ages 7–18, at least one remembered/reported trauma on the University of California Los Angeles (UCLA) PTSD Reaction Index for DSM-IV (UCLA PTSD RI; Steinberg, Brymer, Decker, & Pynoos, 2004), significant symptoms of post-traumatic stress, as defined by meeting at least three symptoms of PTSD according to DSM-IV-TR criteria, the presence of a caregiver who could participate in treatment, and caregiver consent and child assent. Additionally, children and families had to have at least one barrier to accessing treatment (e.g., rural location, caregiver work schedule, limited English proficiency, etc.). Youth were excluded from participation (and were seen for in-person TF-CBT treatment) if they endorsed current significant suicidal ideation, exhibited serious externalizing behaviors that would endanger themselves or the telehealth equipment, or were under the age of 7.

Measures

The following standardized self-report and caregiver report instruments were used to measure child symptoms and satisfaction with services:

UCLA PTSD RI. The UCLA PTSD RI (Steinberg, Brymer, Decker, & Pynoos, 2004) assesses trauma exposure and post-traumatic stress symptoms among children and adolescents, aged 7–18 years. Parent- and youth-reported versions of the instrument are available. Part 1 consists of a lifetime trauma exposure screen. Part 2 evaluates A1 and A2 *DSM*-IV PTSD criteria of traumatic exposure and reaction to the exposure. Part 3 evaluates the frequency of occurrence of PTSD symptoms. Frequency of occurrence of PTSD symptoms is rated on a 5-point Likert-type scale. A total score of 38 or higher is indicative of likely PTSD (Steinberg et al., 2004). The UCLA PTSD-RI can be used as either a self-report or a clinician-administered instrument. In the present study, the instrument was used as a clinician-administered instrument with youth and with caregivers. The instrument has demonstrated good internal reliability in multiple studies, with Cronbach's α of .90–.92. (Roussos et al., 2005; Steinberg et al., 2013). Per communication with one of the instrument's authors, translation of the instrument into Spanish included translation, independent back-translation, and review of the back-translation for any discrepancies with the original instrument (Steinberg, personal communication, May 9, 2017). Information on the internal reliability for the Spanish language version of the instrument is unavailable.

Short Mood Feeling Questionnaire. The Short Mood Feeling Questionnaire (SMFQ; Angold et al., 1995) is a 13-item instrument to measure child and adolescent depression. Parent- and child report versions of the instrument are available. The SMFQ is derived from the Mood Feeling Questionnaire, Long Form (MFQ; Angold et al., 1995; Costello & Angold, 1988) and comprises the highest loading 13 items from the MFQ. A score of 8 or higher is indicative of likely depression. The SMFQ has exhibited good internal consistency ($\alpha = .85$). According to communication with the Duke Center for Developmental Epidemiology, where the instrument was originally developed, translation and blind back-translation of the SMFQ were completed by a team of researchers across multiple universities (Small, Duke University, personal communication, May 5, 2017). There are currently no published data on the psychometrics of the Spanish language SMFQ.

Screen for Children's Anxiety-Related Emotional Disorders, Child and Parent Versions. The Screen for Children's Anxiety-Related Emotional Disorders, Child and Parent Versions (SCARED; Birmaher et al., 1997) is a 41-item self-report and caregiver report measure for children's anxiety symptoms. Caregiver-, child-, and adolescent-report versions of the instrument are available. Internal consistency α values have ranged from .74 to .93. The parent report has moderate parent–child agreement and good internal consistency, test–retest reliability, and discriminant validity. The clinical cutoff score for the SCARED is 25. The Spanish-language versions of the parent and child instruments (Vigil-Colet et al., 2009) were developed by translating and then blind back-translating the original English items. Internal consistency α values for the full-scale score of the Spanish language instruments has ranged from .69 to .86. Similar to results found with the original instrument, the Spanish language parent report has moderate parent–child agreement (Cosí, Canales, Hernandez-Martinez, & Vigil-Colet, 2010).

Child Behavior Checklist. The Child Behavior Checklist (CBCL; Achenbach & Rescorla, 2001) is one of the most widely used parent-report measures of child emotional and behavioral problems, with well-established reliability and validity. For this study, only the broadband factors (internal, external, and total behavior problems) were analyzed. To develop the Spanish-language version of the CBCL (Achenbach & Rescorla, 2001), the instrument was translated and blind back-translated, and the back-translation was reviewed and approved by the instrument authors.

Telehealth Satisfaction Questionnaire. The Telehealth Satisfaction Questionnaire (TSQ; Stewart & Orengo-Aguayo, 2017) is a 15-item measure assessing acceptability, satisfaction, and perceived usefulness of a telehealth service delivery model. Caregiver- and child-report versions of the instrument are available. For the present study, the TSQ was administered as a telephone interview conducted with caregivers after treatment termination. A staff member who had not had previous contact with the caregivers conducted the phone interviews.

Intake Procedures

Participants completed a clinical evaluation consisting of semi-structured clinical interviews completed separately with the child and caregiver and completion of self-report questionnaires by the child and the caregiver. The clinical interview elicited information related to trauma history, medical and psychiatric history, and current mental health. Caregiver- and child-report measures included measures of trauma, depressive symptoms, and anxiety symptoms. Initial assessments were conducted either in person or via telehealth, depending on the patient's needs and logistical considerations. After it was determined that the youth was appropriate for TF-CBT treatment via telehealth, school- or home-based telehealth services were arranged and all psychotherapy sessions were provided via telehealth (i.e., via a Health Insurance Portability and Accountability Act (HIPAA)-compliant videoconferencing software). School-based telehealth services were provided for nine youth, and home-based telehealth services were provided for four youth. Two youth began treatment with school-based telehealth but transitioned to home-based telehealth after the family moved to a location where school-based telehealth was not available. Assessment and treatment were provided in either English or Spanish, depending of the language preference of the child and caregiver. Services were provided in English for 10 youth and in Spanish for 5 youth. Services for caregivers were provided in English for 8 caregivers and in Spanish for 7 caregivers. Assessment measures were used to track changes in PTSD severity, anxiety, and depression. Measures were administered at pretreatment and at the final session.

Treatment

TF-CBT. TF-CBT (Cohen et al., 2017) is an empirically validated, manualized treatment protocol utilized to treat posttraumatic stress symptoms in children and adolescents. TF-CBT is usually delivered in 12–20 weekly sessions and includes the following components, which are summarized by the acronym PRACTICE: (a) psychoeducation, (b) parenting skills, (c) relaxation skills, (d) affective modulation skills, (e) cognitive processing skills, (f) trauma narration and processing, (g) in vivo mastery of trauma reminders, (h) conjoint child–parent sessions, and (i) enhancing safety or future development. Efficacy for TF-CBT has been established through numerous randomized controlled trials in a range of populations (Cohen et al., 2017).

Treatment was provided by (1) a bilingual (English and Spanish) postdoctoral fellow with a PhD in clinical psychology or (2) a licensed master's level social worker. The therapists received initial TF-CBT training and weekly clinical supervision from a licensed clinical psychologist who is a national trainer in TF-CBT.

Telehealth procedure. Telehealth patients presented at their home or at their local school for weekly TF-CBT sessions. The therapists were located at an academic medical center located approximately 30–105 min away from the home and school locations. For home-based telehealth, families connected to their telehealth sessions using their own laptop or desktop computer or using an iPad that our program provided. Home-based telehealth patients who had access to their own computer or tablet and high-speed Internet connection used encrypted videoconferencing software on their home computer or tablet. Home-based telehealth patients who did not have their own computer and high-speed Internet connection were given a cellular data-enabled tablet for the duration of treatment, which allowed them to use encrypted videoconferencing software on a 3G or 4G wireless network. Home-based telehealth patients received assistance from staff in setting up their software and hardware before their first treatment session. A test call was conducted to teach families how to use the videoconferencing program and to ensure adequate connectivity. During this time, families were given basic guidelines for their videoconferencing sessions: select a room with minimal distractions and with adequate privacy, turn off cell phones or put them on vibrate and do not text during sessions, and refrain from using the computer for other activities (e.g., checking e-mail). The importance of the child's privacy during individual sessions (e.g., private location where caregiver or other family members are not likely to overhear the therapy session) was also emphasized with families. For school-based telehealth, students connected to their telehealth sessions using a laptop computer provided by our team. Our team staff assisted schools with setting up all needed software and hardware and instructing school staff on how to use the equipment.

All cases utilized Vidyo (Vidyo Inc., 2010) videoconferencing software. Vidyo is a web-based videoconferencing tool that was chosen as the treatment delivery platform, given its compliance with HIPAA confidentiality regulations and interactive capabilities (Vidyo Inc., 2010). The therapists utilized a desktop computer and Vidyo videoconferencing software. Vidyo allowed for the successful delivery of the individual treatment components, as the therapist was able to share treatment materials on the screen (e.g., psychoeducational fact sheets and TF-CBT workbook pages). The treatment regimen followed the TF-CBT protocol described above. All TF-CBT treatment components were delivered while providing services through the telehealth modality; however, the intervention required tailoring to address logistics associated with the telehealth service delivery model (presented below).

Results

Data Analysis

Qualitative description and descriptive statistics were used to describe strategies utilized for telehealth treatment delivery and feasibility outcomes, whereas inferential statistics are used to investigate pre- and postclinical outcomes. Changes in UCLA-PTSD-RI, SMFQ, SCARED, and CBCL scores from pre- to posttreatment were evaluated with paired sample *t* tests.

Strategies for Providing TF-CBT via Telehealth

A number of strategies specific to the telehealth delivery format were used in treatment. Our primary concern in delivering TF-CBT via telehealth was patient safety. To address this concern, pretreatment site visits to the schools were used to survey the physical premises and build relationships that would later serve to facilitate good communication between the treating clinicians and the school staff (e.g., guidance counselor and vice principal). During each session of TF-CBT, clinicians had contact information readily available for school staff. All appointments took place during regular school hours of operations; accordingly, the school staff were available in case of emergencies. For home-based telehealth, a caregiver was always present in the home at the time of sessions. During each session, clinicians had contact information available for the caregiver who was present in the home as well as additional emergency contacts for the child. Additionally, an emergency plan was discussed with each family that involved contacting local police or 911 if the clinician felt that the child or caregiver presented an imminent threat to themselves or others. Notably, there were no instances in which school staff or local authorities needed to be contacted due to patient safety concerns.

TF-CBT therapists make significant use of worksheets and visual aids. To implement these same strategies via telehealth, a variety of techniques were implemented, including the use of PowerPoint presentations, digital worksheets, and digital games. For example, when teaching about varying intensity levels of emotions, the clinicians utilized an animated PowerPoint presentation to show a thermometer with the temperature rising as emotions intensified. Additionally, worksheets and informational sheets were presented digitally throughout treatment (via the clinician "sharing" her screen with the client). For example, when reviewing physiological responses to emotions, the clinicians utilized a worksheet that asked patients to indicate where in their body they felt specific emotions. The clinicians utilized a PDF version of the document and enabled the "edit text and images" option in order to add text and images to the document. The patients indicated where in their body they felt a particular emotion and the clinician then colored the corresponding area of the body on the worksheet. The patients were able to see the clinician change the worksheet in real time through the use of screen sharing via the Vidyo software. Another example of a telehealth-specific strategy involved the clinicians reading an electronic version of trauma-specific children's books with patients as a part of psychoeducation. The clinicians uploaded a digital copy of each book via scanner onto the clinician's computer, with each page of the book displayed as a separate page of a PDF document. The clinicians "shared" the clinician's screen with the child, scrolling down the document page by page as the clinician read the book to the patient. During psychoeducation, clinicians also used a Jeopardy-style game presented via PowerPoint, which was used to review psychoeducation regarding sexual abuse, physical abuse, witnessing domestic violence, or traumatic grief, depending on the specific traumatic events each child had experienced. Additional strategies were also incorporated while completing the trauma narrative. For example, several children dictated the narrative while the clinician typed what the child said into a Microsoft Word document. The clinician was able to "share" the clinician's screen with the child so that she could see the words that the clinician was typing in real time. Additionally, children-colored pictures with crayons on paper to illustrate specific elements of their traumatic event. When the child completed each picture, she held it up in front of the camera. The clinician took a screen shot of the picture and then digitally added it to the child's trauma narrative. For the conjoint sessions, in several school-based cases, although the caregiver was unable to attend sessions at the school due to work- and transportation-related issues, the therapist was able to perform parallel caregiver sessions via telehealth in the caregiver's home or work location through the use of iPads and Vidyo videoconferencing software.

Technical performance of the telehealth equipment. There were few technical problems with the telehealth equipment. Occasionally, school sites and home-based patients experienced initial difficulty with logging into the videoconferencing software. This led to a delay in starting sessions; however, this issue was easily resolved via telephone calls with the treating clinician. Additionally, the telehealth video feed occasionally became pixilated for several seconds when using a WIFI-based Internet connection but was resolved by utilizing an Ethernet cable. Overall, the telehealth equipment worked properly and produced clear audio and video signals with little audio delay. Technical difficulties were minimized by predownloading all necessary software directly on to the equipment the family/school staff would be using, by creating and distributing easy-to-understand, step-by-step instructions on how to login and connect using Vidyo software and allowing for time for the child, parent, and/or staff to practice using the equipment (i.e., iPad, laptop, and hotspot) and to connect to Vidyo prior to beginning treatment (e.g., during the in-person intake session or during the school visit to set up the equipment).

Safety issues. As noted, there were no instances in which school staff or local authorities had to be contacted for patient safety concerns. Patient engagement in trauma work (e.g., writing and processing of the trauma narrative), which can include reactions such as increased anxiety, crying, and psychomotor activity, was handled adequately with the same protocol and clinical skills employed for in-person TF-CBT. There were no

Table 1. Quantitative Results.

Instrument	Pretreatment		Posttreatment		Pre- and Posttreatment *t* Tests and Effect Size
	M	*SD*	*M*	*SD*	
UCLA (youth)	32.36	10.52	8.71	4.34	$t(14) = 8.84$, $p < .0001$, $d = 2.93$
UCLA (caregiver)	27.50	13.89	12.42	10.84	$t(13) = 6.52$, $p < .001$, $d = 1.38$
SMFQ (youth)	9.27	5.69	3.87	5.00	$t(14) = 3.78$, $p < .001$, $d = 1.01$
SMFQ (caregiver)	7.00	4.14	3.10	3.04	$t(13) = 2.85$, $p = .02$, $d = 1.07$
SCARED (youth)	35.08	18.37	16.67	9.46	$t(12) = 3.22$, $p < .001$, $d = 1.26$
SCARED (caregiver)	20.36	18.43	12.55	8.71	$t(13) = 221$, $p < .001$, $d = .54$
CBCL-internalizing (caregiver)	61.00	10.39	50.75	11.21	$t(12) = 2.75$, $p = .02$, $d = .95$
CBCL-externalizing (caregiver)	55.09	6.01	47.82	7.73	$t(12) = 2.62$, $p = .03$, $d = 1.05$
CBCL-total problem (caregiver)	57.91	8.64	48.55	11.07	$t(12) = 2.52$, $p = .03$, $d = .94$

Note. UCLA = UCLA PTSD Reaction Index for DSM-IV; SMFQ = Short Mood Feeling Questionnaire; SCARED = Screen for Children's Anxiety-Related Emotional Disorders; CBCL = Child Behavior Checklist.

instances of patients leaving the room or otherwise inappropriately disengaging from the therapeutic communication. However, there was one instance of a patient leaving her chair and crouching on the floor out of view of the web cam. In this instance, the clinician was able to talk with the patient and ask her to return to the chair.

Number of sessions attended and treatment completion. The mean number of treatment sessions was 14.13 ($SD = 2.23$, range 12–19). Treatment sessions ranged from 45 to 90 min in length, consistent with session length for typical in-person TF-CBT sessions. All individuals who began treatment successfully completed treatment (0% dropout).

Caregiver engagement in treatment. A challenging issue in child mental health treatment can often be how to effectively engage caregivers, particularly in school-based treatment (Gopalan et al., 2010). For the present study, all youth had a caregiver who actively participated in treatment on a regular basis (i.e., attended treatment sessions weekly or biweekly). During each session, the therapist typically met individually with the child and then met conjointly with the child and caregiver. For home-based telehealth cases ($n = 4$), the therapist was able to meet with the caregiver in the home at the time of the session with the youth. For school-based telehealth cases ($n = 11$), 27% of caregivers ($n = 3$) met with the therapist via telehealth at the school location. The remaining caregivers were unable to attend telehealth sessions at their child's school, typically due to lack of transportation or an inflexible work schedule. For these cases, the child was seen at school via telehealth, and the parent component was completed via computer or iPad, after the parent returned home from work or during the parent's lunch break. For one case, the therapist met with the child via telehealth at school and the parent connected into the session via iPad from her work location during her lunch break, thus allowing for the child, parent, and therapist to meet together while the child was at school. Our program also utilized additional evidence-based strategies to enhance engagement through addressing logistical, perceptual, and cultural barriers to treatment engagement (Gopalan et al., 2010; McKay & Bannon, 2004). These strategies involved using reminder phone calls and text messages, directly addressing caregiver concerns and barriers at the time of the initial appointment and throughout treatment, and addressing ethnocultural beliefs and attitudes related to mental health treatment.

Clinical outcomes. Table 1 provides a summary of all quantitative results. Mean pre- and posttreatment UCLA-PTSD-RI self-report scores were 32.36 ($SD = 10.52$) and 8.71 ($SD = 4.34$), respectively. This difference is clinically and statistically significant, $t(14) = 8.84$, $p < .0001$, $d = 2.93$. Mean pre- and posttreatment UCLA-PTSD-RI parent-report scores were 27.50 ($SD = 13.89$) and 12.42 ($SD = 10.84$). This difference is also clinically and statistically significant, $t(13) = 6.52$, $p < .0001$, $d = 1.38$). Mean pre- and posttreatment SMFQ self-report scores were 9.27 ($SD = 5.69$) and 3.87 ($SD = 5.00$), respectively. This difference is clinically and statistically significant, $t(14) = 3.78$, $p < .001$, $d = 1.01$. Mean pre- and posttreatment SMFQ parent-report scores were 7.00 ($SD = 4.14$) and 3.10 ($SD = 3.04$), $t(13) = 2.85$, $p = .02$, $d = 1.07$. Mean pre- and posttreatment SCARED self-report scores were 35.08 ($SD = 18.37$) and 16.67 ($SD = 9.46$), respectively. This difference is clinically and statistically significant, $t(12) = 3.22$, $p < .001$, $d = 1.26$. Mean pre- and posttreatment SCARED parent-report scores were 20.36 ($SD = 18.43$) and 12.55 ($SD = 8.71$). This difference is also statistically significant, $t(13) = 221$, $p < .001$, $d = .54$. Although CBCL internalizing, externalizing, and total scores all decreased from pre- to posttreatment, the most notable change occurred for internalizing scores. Pre- and posttreatment mean scores for the CBCL internalizing subscale were 61.00 ($SD = 10.39$) and 50.75 ($SD = 11.21$), respectively, $t(12) = 2.75$, $p = .02$, $d = .95$. CBCL externalizing and total scores are presented in Table 1.

Caregiver satisfaction with the telehealth model. Caregiver satisfaction was measured with the Telehealth Satisfaction Questionnaire (Stewart & Orengo, 2017). Although attempts were

made to reach all caregivers, 47% ($n = 7$) of caregivers completed satisfaction surveys. Overall, caregivers were satisfied with telehealth 100% of the time, and 86% indicated that the telehealth equipment was easy to use. All caregivers responded that the level of rapport with the therapist was as good as in-person visits and that they would recommend telehealth to a family member or friend who was in need of mental health services. All caregivers reported that telehealth sessions were convenient and that the caregiver and child were comfortable interacting with the clinician via telehealth. The majority of caregivers indicated that they saw significant improvement in their child's symptoms. For example, one mother stated, "my daughter improved so much. Her self-esteem improved and she felt better after each visit." Another caregiver reported, "he really got a lot out of it. It really helped him open up about his feelings of grief of losing his dad." Although this pilot study is not powered to detect subgroup differences, based on qualitative data gathered from caregivers, all children were comfortable interacting with the therapist via telehealth.

Provider satisfaction with the telehealth model. Provider satisfaction was assessed with a semistructured interview conducted with providers. Both providers reported high satisfaction with the telehealth delivery model. Providers indicated that the telehealth sessions were as good as in-person sessions and that rapport with patients was not affected by the telehealth delivery model. The providers reported that they were comfortable interacting with patients and caregivers via telehealth and that they were comfortable using the telehealth equipment. One provider noted that she was initially skeptical about whether rapport with the patient via telehealth would be similar to in-person visits. The provider reported that she was "pleasantly surprised" that rapport during telehealth visits was similar to in-person visits, noting that she was able to easily build rapport with patients via telehealth.

Discussion

Significant barriers exist in access to evidence-based, TF treatment among youth from economically disadvantaged backgrounds, those living in rural areas, and belonging to a racial and ethnic minority group, despite the high prevalence rates of trauma exposure among these underserved groups (National Research Council and Institute of Medicine, 2009). The current pilot study aimed to test the delivery of TF-CBT via telehealth technology in order to address these barriers in accessing and completing TF treatment among underserved youth and their nonoffending caregivers. We were specifically interested in documenting the unique strategies utilized to provide TF-CBT via a telehealth delivery model, technical performance of the telehealth equipment, safety issues and how these were addressed, number of sessions attended and treatment completion rates, and pre- to posttreatment clinical outcomes of PTSD, depression, and anxiety symptoms.

The current study reveals that TF-CBT can be successfully delivered via a telehealth delivery format. Providers were able to deliver all of the treatment components by utilizing technology-based strategies that fit with the delivery model. These included strategies such as digitally presenting worksheets and written materials using the screen "sharing" function, utilizing the "edit text and images" function in PDF documents in order for the clinician and patient to edit worksheets in real time, creating digital versions of games and tools commonly utilized in office-based TF-CBT, typing the trauma narrative in real time, utilizing the web camera and "screen shot" function to view the patient's drawings and add to these to the trauma narrative, and allowing for the clinician to connect with the caregiver and patient in parallel for the conjoint sessions via separate iPad/laptop (when the caregiver was unable to attend the conjoint session at the school with the child). All of these techniques served to make the delivery of TF-CBT via telehealth technology possible without compromising fidelity to the treatment model.

Technical difficulties were minimal and appeared to be related to problems logging into the videoconferencing software and slow-speed Internet connections. These issues were adequately addressed via testing of the equipment before treatment began, handing out detailed and easy-to-understand instructions, and having the child/caregiver/staff practice using the equipment beforehand with the help of the clinician, thus illustrating the importance of utilizing a user-centered approach when developing and disseminating technological tools (Lyon & Koerner, 2016). Safety concerns were addressed by building a trusting relationship with school staff, having contact information of staff or caregivers readily available, and having a safety protocol in place for school-based and home-based telehealth sessions that was discussed with staff/caregivers/youth before treatment began. There were no safety concerns necessitating the use of such protocols, however, suggesting the feasibility of safely delivering TF-CBT via telehealth technology.

Finally, the treatment resulted in statistically significant and clinically meaningful change in pre-to post-symptoms of PTSD for all patients, with large effect sizes for youth-reported ($d = 2.93$) and caregiver-reported ($d = 1.38$) reduction in PTSD symptoms. Additionally, all youth no longer met criteria for PTSD or adjustment disorder at the completion of treatment. Furthermore, all youth completed treatment (0% dropout) with the average number of sessions to treatment completion comparable to those of office-based treatment (i.e., 12–19 sessions). These findings are promising in showing treatment effects that are comparable with TF-CBT delivered in an in-person, office-based setting (Cohen et al., 2011; Jensen et al., 2013; Salloum et al., 2016). Considering that attrition from office-based TF treatment remains a significant concern (e.g., approximately 33–77%; Cohen et al., 2011; Olfson et al., 2009; Scheeringa, Weems, Cohen, Amaya-Jackson, & Guthrie, 2011), treatment attrition of 0% for our telehealth pilot study is encouraging. Our prior multiple case study (Stewart et al., 2017) suggests that the reduction in barriers to accessing care that the use of telehealth technology affords (e.g., no need for caregivers to take time off from work, find transportation/gas/

parking money to reach our clinic, drive long distances to their appointments, and the availability of linguistically competent clinicians) may have contributed to the successful completion of TF-CBT of these youth and the resulting clinically meaningful symptom changes observed. It is important to note that our program also utilized additional engagement strategies, such as using reminder phone calls and text messages, directly addressing caregiver concerns and barriers at the time of the initial appointment and throughout treatment and addressing ethnocultural beliefs and attitudes related to mental health treatment. These engagement strategies may have decreased treatment attrition beyond what would be seen if we had utilized the telehealth delivery model without these additional engagement strategies. While the lack of treatment attrition in the present study is very encouraging, future controlled studies will be needed to directly compare attrition rates for the telehealth versus in-person treatment modalities.

More work is still needed to ensure that telehealth can adequately address the unique barriers in access to evidence-based trauma treatment for underserved youth. The present proof-of-concept pilot study provides preliminary evidence of the ability to successfully deliver TF-CBT via telehealth technology resulting in clinically meaningful symptom change posttreatment with no treatment attrition (0% dropout). Nevertheless, more work is still needed in order to further establish the empirical base for telehealth delivery of TF treatment for youth. Additional limitations of the present study include the small sample size and primarily female sample, which may reduce the generalizability of the study results. The study also lacked a comparison group and randomization. Pre- to post-improvements in symptoms in an uncontrolled study could potentially be influenced by regression to the mean, and thus a larger controlled study will be needed in order to assess whether improvements are due to the treatment content, treatment modality, or other factors. Further, a randomized clinical trial would be necessary to determine whether telehealth-based treatment is as good as clinic-based treatment for this particular population, consistent with studies among adults and Veterans (e.g., Acierno et al., 2016). Also, although treatment fidelity was informally assessed during weekly supervision provided by a national trainer in TF-CBT, formal measures of fidelity to the treatment model were not implemented in the current study. Additionally, further exploring patient satisfaction with this treatment modality and conducting cost-effectiveness analyses will be important future directions for this line of work. Despite the noted limitations, this proof-of-concept pilot study is an important first step in determining how to best address the mental health needs of trauma-exposed underserved youth.

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