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# Beta-Testing of an Interactive Multimedia Computer Program of Exposure Therapy for PTSD

Marie C. Barrett

Western Michigan University, mariecb07@gmail.com

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BETA-TESTING OF AN INTERACTIVE MULTIMEDIA COMPUTER PROGRAM  
OF EXPOSURE THERAPY FOR PTSD

by

Marie C. Barrett

A dissertation submitted to the Graduate College  
in partial fulfillment of the requirements  
for the degree of Doctor of Philosophy  
Psychology  
Western Michigan University  
August 2018

Doctoral Committee:

Amy Naugle, Ph.D.  
C. Richard Spates, Ph.D.  
Scott Gaynor, Ph.D.  
Brian Horvitz, Ph.D.

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# BETA-TESTING OF AN INTERACTIVE MULTIMEDIA COMPUTER PROGRAM OF EXPOSURE THERAPY FOR PTSD

Marie C. Barrett, Ph.D.

Western Michigan University, 2018

Posttraumatic Stress Disorder (PTSD) results in significant impairment for the individual and substantial costs to society. Research indicates that cognitive behavioral psychotherapy (CBT) is the most effective treatment for PTSD and that among CBT treatments, exposure therapy is the treatment technique with the strongest evidence to recommend it for PTSD treatment. Computerized programs that deliver evidenced-based treatments offer a potential solution to barriers that prevent individuals from accessing and completing treatment. The present study evaluates the clinical and practical functionality of a computer-based program designed for the treatment of PTSD. Results indicate that completion of the program is associated with a significant decrease in both PTSD and depressive symptoms and that the program is generally perceived favorably. Results also indicate various barriers to engagement with the computer-based program. Future directions for the development and evaluation of the treatment program are discussed.

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Marie C. Barrett

## TABLE OF CONTENTS

ACKNOWLEDGMENTS .....	ii
LIST OF TABLES .....	v
LIST OF FIGURES .....	vi
INTRODUCTION .....	1
PTSD: Presentation, Prevalence, and Associated Costs .....	1
Barriers to Implementing Evidence-based Treatments .....	6
Computerized Treatments: A Method of Overcoming Treatment Barriers .....	8
Computer-based Treatments for PTSD .....	10
Computerized Treatments: Lessons from Instructional Design and Technology .....	11
Research Goals .....	14
METHOD .....	17
Participants .....	17
Materials .....	18
Measures .....	19
RESULTS .....	28
Data Analysis .....	28
Characteristics of the Data .....	28
Preliminary Analyses .....	28
Research Question One .....	31

Table of Contents—Continued

Research Question Two .....	40
Research Question Three .....	41
DISCUSSION.....	44
Summary of Findings .....	44
Limitations of the Study .....	47
Directions for Future Research .....	49
REFERENCES .....	53
APPENDICES .....	64
Living a Less Trauma-Driven Life through Exposure Therapy Manual .....	64
HSIRB Letter of Approval .....	80

## LIST OF TABLES

1. Participant Demographic Characteristics .....	29
2. Participant Clinical Characteristics .....	30
3. Pre-Treatment and Post-Treatment Means and Standard Deviations for CAPS Scores .....	31
4. Pre-Treatment and Post-Treatment Means and Standard Deviations for CAPS Symptom Cluster Scores .....	33
5. Individual Participant Assessment Scores .....	35
6. Means and Standard Deviations for Treatment Evaluation Measures .....	43

## LIST OF FIGURES

1. Participant One Assessment Scores .....	36
2. Participant Two Assessment Scores .....	37
3. Participant Three Assessment Scores .....	37
4. Participant Four Assessment Scores .....	38
5. Participant Five Assessment Scores .....	39
6. Participant Six Assessment Scores .....	49

## INTRODUCTION

### **PTSD: Presentation, Prevalence, and Associated Costs**

The Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-5, 2013) states that posttraumatic stress disorder (PTSD) is a psychiatric disorder that may occur after an individual is exposed to actual or threatened death, serious injury, or sexual violence (American Psychiatric Association, 2013). An individual may exhibit PTSD following directly experiencing a traumatic event, witnessing a traumatic event happen to another person, learning that a traumatic event has been experienced by a close friend or family member, or via repeated or extreme exposure to aversive details of traumatic events, such as occurs with some first responders (American Psychiatric Association, 2013).

The DSM-5 (2013) proposes four distinct clusters of PTSD symptoms, as opposed to the three clusters included in the previous edition of the manual. In DSM-5 parlance, symptoms of PTSD include re-experiencing symptoms (e.g., spontaneous memories of the event, dreams related to the trauma, flashbacks, etc.), avoidance symptoms (e.g., efforts to avoid thoughts, memories, places, people, etc. that are associated with the trauma), symptoms of negative cognitions or mood (e.g., blaming self or others, anhedonia, persistent negative emotional state, etc.), and arousal symptoms (e.g., aggressive or self-destructive behavior, sleep disturbance, etc.). To meet diagnostic criteria for PTSD, an individual must additionally report that their symptoms have persisted for at least one month and that the symptoms cause significant distress or impairment in social, occupational, or other important domains of functioning (American Psychiatric Association, 2013).

Exposure to potentially traumatic events is quite common in the general population. A recent study by Kilpatrick et al. (2013) sought to evaluate national estimates of exposure to

traumatic events and found that in a sample of nearly 3,000 American adults, 89.7% of participants had been exposed to a traumatic event and that exposure to multiple traumatic events was the norm. The same study reported an 8.3% lifetime prevalence rate of PTSD among the sampled population, with prevalence higher among women than men (Kilpatrick et al., 2013). These findings are consistent with previous research in the area. The National Comorbidity Replication Survey indicated that the prevalence rate of posttraumatic stress disorder among civilians in the United States is 6.8%, with women (9.7%) demonstrating higher rates of PTSD than men (3.6%) (Kessler et al., 2005).

Other studies have evaluated lifetime prevalence rates among specific trauma samples. Studies have found prevalence rates as high as 32% in female rape victims (Resnik et al., 1993), 22% in survivors of natural disasters (Briere & Elliot, 2000), and nearly 30% in victims of crime (Kilpatrick, Saunders, Veronen, Best & Von, 1987). The prevalence rates of PTSD are significantly higher in populations that are at an increased risk for exposure to potentially traumatic events due to occupational environments. For example, the prevalence rate of PTSD symptoms has been found to be as high as 20% in military populations (Thomas, Wilk, Riviere, McGurk & Hoge, 2010), as high as 37% in firefighters (Del Ben, Scotti, Chen & Forston, 2006; Bryant & Harvey, 1995), and to range from 16-34% among police officers (Carlier, Lamberts, & Gersons, 1997; Maia et al., 2007).

PTSD results in significant impairment for the individual and substantial costs to society (Kessler, 2000). According to Barlow (2002), the disorder may be chronic in nature, has a median duration of three to five years, and has an average duration of seven years. Individuals diagnosed with PTSD have also been found to be at a greater risk of developing comorbid psychological disorders (Barlow, 2002). Beyond psychological comorbidities, research indicates

that PTSD is also associated with a variety of physical health problems, including such serious conditions such as cardiovascular disease, chronic pain, and gastrointestinal illnesses (Sareen et al., 2007). In addition to a higher risk of suicidality, PTSD is associated with overall poor quality of life and with both short-term and long-term disability (Sareen et al., 2007).

Some studies have indicated that PTSD is additionally associated with an increased risk of suicidality (Davidson, Hughes, Blazer, & George, 1991; Marshall et al., 2001; Oquendo et al., 2005; Sareen et al., 2007). Research has also indicated that increased risk of suicidality is present even among individuals with PTSD who are not dually diagnosed with major depressive disorder or alcohol use disorder (Guerra & Calhoun, 2011) and that, perhaps contrary to expectations, dually-diagnosed individuals are not more likely to endorse suicidality than those who are diagnosed exclusively with PTSD (Ferrada-Noli, Asberg, Ormstad, Lundin, & Sundbom, 1998; Jakupcak et al., 2009; Shalev et al., 1998; Tarrier & Gregg, 2004).

There is also an economic burden associated with PTSD. This burden is felt not only by individuals who are diagnosed with PTSD, but also by the families, employers, and the larger society to which those individuals belong (McCrone, Knapp, & Cawkill, 2003). PTSD is associated with work impairment that is comparable to rates of work impairment seen in depressed populations (Kessler & Frank, 1997), and other research has found that PTSD is associated with greater utilization of healthcare resources (Stein, McQuaid, Pedrelli, Lenox, & McCahill, 2000).

### **Evidence-based Treatments for PTSD**

Current treatment guidelines indicate that psychotherapy is the most effective treatment for PTSD (National Collaborating Centre for Mental Health, 2005). Among the many modalities available for the treatment of PTSD, cognitive behavioral therapy (CBT) has the most robust

evidence base to support its use in the treatment of PTSD (Bradley et al., 2005). A 2007 meta-analysis by Bisson et al. reviewed 38 studies and indicated that CBT for trauma is significantly more effective in decreasing symptoms of PTSD than both waitlist control or usual-care groups (Bisson, Ehlers, Matthews, & Pilling, 2007). The same study also reported that CBT delivered in an individual format was superior to stress management training and to group CBT – both of which produced reductions in PTSD symptoms – while hypnotherapy, nondirective counseling, psychodynamic therapies, and supportive therapy failed to produce clinically significant effects on PTSD symptoms (Bisson, Ehlers, Matthews, & Pilling, 2007).

There are many forms of CBT for the treatment of trauma, including prolonged exposure, cognitive processing therapy, stress inoculation training, and EMDR (Marks, Lovell, Noshivrvani, Livanou, & Thrasher, 1998; Foa, Keane, & Friedman, 2000). In 2008, The Institute of Medicine issued an assessment report that evaluated the effectiveness of current treatments for PTSD. This report concluded that among the evaluated CBT treatments, exposure therapy is the treatment technique with the strongest evidence to recommend it for PTSD treatment (Institute of Medicine, 2008). The various types of CBT for trauma place different degrees of emphasis on exposure or behavioral elements of treatment versus the cognitive components, but prolonged exposure (PE) therapy, developed by Foa and colleagues, relies most heavily on exposure techniques, and within the discipline of psychology, it is widely accepted as the gold standard for CBT trauma treatment (Cukor, Olden, Lee & Difede, 2010).

Extinction models of learning, as well as emotional processing theory, provide the theoretical foundation of prolonged exposure therapy (McLean & Foa, 2011). The mechanism underlying exposure therapy can be linked to the process of extinction by application of Pavlovian conditioning. In this view, the traumatic event can be considered an unconditioned

stimulus (US) that has been paired with a variety of conditioned stimuli (CS; e.g., smells, sounds, people, etc.) In this model, PTSD is conceptualized as a disorder of extinction in which the individual's response to a traumatic event does not extinguish appropriately in the absence of the original fear stimuli. Exposure therapy seeks to address this problematic learning by repeatedly exposing individuals to the CS in the absence of the US, thereby reducing fear responses due to changes in the individual's association between the CS and US (McLean & Foa, 2011).

Emotional processing theory posits that fear is represented in memory as a cognitive structure, and that this structure contains information about the stimuli, the fear response, and the meaning that the individual assigns to the stimuli and their own response (McLean & Foa, 2011). In instances of PTSD, an individual's fear structure – and therefore a physiological, emotional, and cognitive response -- may be activated in a variety of non-dangerous settings (e.g., when hearing fireworks) rather than in settings that pose legitimate danger to the individual (e.g., a combat zone). Emotional processing theory indicates that to reduce this pathological fear that occurs as part of PTSD, effective treatments must activate the fear structure and then provide new information that is incompatible with the existing, maladaptive cognitive structure (McLean & Foa, 2011).

Based upon these two theories, effective treatment of PTSD involves repeated exposure to trauma-related stimuli in the absence of feared outcomes to activate the fear structure, provide opportunities to challenge the relationship between the CS and US, and to provide opportunities for individuals with PTSD to challenge negative and maladaptive cognitions. Foa's prolonged exposure therapy is designed to accomplish these goals (McLean & Foa, 2011).

The two main components of prolonged exposure therapy are imaginal exposure and in vivo exposure (Foa, Hembree, & Rothbaum, 2007). Both types of exposure require the

individual to revisit traumatic memories on a repeated basis to facilitate habituation to the memory, to decrease avoidance of stimuli associated with the event, and to reduce the frequency and intensity of PTSD symptoms. During imaginal exposure, the individual is required to revisit their trauma by thinking, writing, and speaking about their trauma. These tasks also involve processing thoughts the individual had during the traumatic event and beliefs they developed following the event. During in vivo exposure, the individual physically approaches locations, people, and activities that are associated with the trauma and that the individual may have been avoiding (Foa, Hembree, & Rothbaum, 2007).

### **Barriers to Implementing Evidence-based Treatments**

Despite the many evidenced-based treatments that are available for the treatment of PTSD, implementation of best practices has not been widespread. Dissemination and acceptance of evidenced-based treatments have proven to be significant obstacles to implementation, and are not unique to the treatment of PTSD or the implementation of exposure therapy. Research in the dissemination and acceptance of evidence-based practices as a whole has indicated that the most common provider concerns about implementing evidence-based treatments are concern for the therapeutic relationship, unmet client needs, competence, job satisfaction, treatment credibility, restriction of clinical innovation, and doubts about the feasibility of manualized treatments (Addis, Wade, & Hatgis, 1999).

Similar findings are reported regarding exposure therapy. A 2006 study of the dissemination of exposure therapies found that inadequate training, discomfort in using exposure techniques, concerns about decompensation due to treatment, and reservation about employing manualized treatments were all significant barriers to the implementation of exposure therapy as treatment (Cahill, Foa, Hembree, & Nacash, 2006). A study by van Minnen and colleagues

(2010) presented 255 trauma experts with case examples, inquired about preferred treatments, and found that exposure therapy was underutilized, that training in the technique was inadequate, and that providers were significantly more likely to utilize medication than exposure in instances when PTSD was comorbid with depression. Findings about the underutilization of exposure therapy have been replicated (Minnen, Hendriks & Olf, 2010). One study surveyed 217 psychologists and found that only 17% utilized exposure therapy for the treatment of PTSD, and even among providers who had received formal training in exposure, 38-46% did not choose to implement it when treating individuals diagnosed with PTSD (Becker et al., 2004).

Dissemination and acceptance are not the only obstacles between evidence-based therapies and their widespread implementation. Saxena and colleagues (2007) concluded that the most significant barriers to addressing mental health problems globally are scarcity, inequitable distribution, and inefficiency of resources. Factors such as financial cost, difficulties associated with transportation, and the limited availability of competent therapists are also significant obstacles. Moreover, impoverished and remote populations often have the greatest need for mental health services while simultaneously having the least access to them (Saxena, Thornicroft, Knapp, & Whiteford, 2007).

Another barrier to the implementation of evidence-based treatment is the stigma associated with mental illness and with seeking mental health services. Research indicates that stigma has profound and varied public health implications, as it may increase stress or contribute to suffering in the individuals experiencing psychopathological symptoms, delay or entirely discourage such individuals from seeking mental health services, or result in the termination of services for treatable health problems (Link & Phelan, 2006; Weiss & Ramakrishna, 2001).

Research has indicated that similar stigma-related barriers may prevent veterans from seeking treatment for PTSD. A study by Stecker and colleagues surveyed 143 veterans who screened positively for PTSD and had not sought treatment. The study found that four domains of beliefs were associated with the decision to refrain from seeking treatment: concerns about treatment (40%), emotional readiness for treatment (35%), stigma (16%), and logistical problems (8%) (Stecker, Fortney, & Ajzen, 2007). Similar studies have reported that among a sample of veterans who met criteria for a mental illness, only 38-45% indicated an interest in pursuing treatment and that among these veterans, concerns about stigma was the most widely cited reason for resisting treatment (Hoge et al., 2004).

### **Computerized Treatments: A Method of Overcoming Treatment Barriers**

In recent years, computer-delivered treatments have been investigated as a potential solution to various treatment barriers and have garnered attention as a method of providing services to at-risk individuals who may refrain from seeking traditional treatment. A study by McCrone et al. (2004) suggested that the delivery of evidence-based treatments via computer is a cost-effective alternative to typical face-to-face treatments. Computer-delivered interventions may also provide alternatives for individuals who lack access to a competent therapist who can deliver evidence-based treatment in a traditional manner (Ritterband, et al., 2003). Finally, such interventions may be accessed in the privacy of an individual's home or less stigmatizing environments such as their physician's office, reducing logistical issues and allowing the individual to avoid perceived or actual stigma associated with seeking treatment for mental health problems (Amstadter et al., 2009).

Over the past three decades, considerable effort has been put into developing computerized cognitive-behavioral therapy (CCBT) programs to help overcome the barriers

associated with receiving traditional cognitive behavioral therapy. CCBT is a catch-all term that refers to a variety of methods for delivering CBT via an interactive computer interface that utilizes patient input to make psychotherapy decisions (Kaltenthaler & Cavanagh, 2010). CCBT programs typically present CBT in a highly structured manner, and the interactive component may be accomplished via various methods such as quizzes, self-report measures, and homework assignments. Many CCBT programs include an introductory session involving psychoeducation and a concluding session about relapse prevention (Titov, 2007).

Beyond these common components, CCBT programs may vary widely. They may take various forms, including internet-based or software-based computer therapy and virtual reality therapy. They may be delivered via various devices, from desktop computers to iPhones. They may be used as the sole treatment intervention or used as a supplement to traditional, therapist-delivered interventions. The programs also vary in the types of media they use, with some programs relying upon text or audio only, while others utilize multiple forms of media such as text, audio, video, animations, and recording (Kaltenthaler and Cavanagh, 2010). The most complex form of computer-delivered intervention is the interactive multimedia (IMM) delivery system. Programs that employ IMM delivery systems are designed to incorporate patient input, including assessment and homework data, to facilitate the delivery of evidence-based, manual-guided treatment (Cavanagh & Shapiro, 2004).

Due to the novelty of computerized treatments, the wide variation in design, and the complexity of computerized treatment programs, the availability of and research on them is still limited. In one example, Proudfoot et al. (2003) conducted a randomized controlled trial to assess the efficacy of an interactive multimedia (IMM) CCBT treatment program entitled "Beating the Blues" to treat depression. The study indicated that individuals who received

treatment via "Beating the Blues" showed significantly larger reductions in depression and anxiety symptoms compared to the treatment-as-usual control group, both at the end of treatment and at 6-month follow-up (Proudfoot et al., 2003).

CCBT programs have been developed for the treatment of anxiety disorders (including phobia, panic disorder, obsessive compulsive disorder, posttraumatic stress disorder, and generalized anxiety disorder), depression, eating disorders, chronic back pain, headaches, sexual difficulties, schizophrenia, alcohol and substance abuse, and smoking cessation (Marks, Cavanagh, & Gega, 2007). Research thus far has yielded encouraging findings regarding the efficacy of CCBT for many of the aforementioned disorders and problems, although meta-analyses of CCBT programs for depression and anxiety suggest that programs with more prominent therapist roles have lower attrition rates and more robust effects (Titov, 2007).

Research regarding the acceptability of computerized treatment has been limited, but findings thus far have been encouraging. A 2008 review indicated that CCBT studies typically report attrition rates comparable to traditional CBT (Kaltenthaler et al., 2008). The same review indicated that, although few studies have gathered data on acceptability, those that have done so have reported positive high satisfaction and positive expectancies for those who completed treatment (Kaltenthaler et al., 2008). Similar findings have been reported studies conducted to assess the acceptability of CCBT programs for depression provided in secondary care settings (Carter, Bell, & Colhoun, 2012) and online (de Graaf et al., 2009).

### **Computer-based Treatments for PTSD**

Developments in technology have created many opportunities for researchers to advance the treatment of PTSD. Effective computer-based programs for the treatment of PTSD hold great promise due to their potential to facilitate the dissemination of evidence-based treatments, a

method for overcoming common treatment barriers like stigma, and a cost-effective alternative to traditional face-to-face therapy. Thus far research regarding the efficacy of computer-based programs for the treatment of PTSD has been promising.

Virtual reality is one form of technology that is currently being explored as one method of providing a technological alternative to traditional imaginal exposure techniques. Virtual reality programs allow users to interact with real-time computer graphics in a manner that creates a sense of immersion in the virtual environment. Multiple studies have indicated that virtual reality exposure therapy produces significant reductions in PTSD symptoms compared to waitlist control groups (Cahill, Foa, Hembree, & Nacash, 2006; Difede et al., 2007; Gerardi et al., 2008).

Internet-based programs have also been developed. A 2009 meta-analysis of Internet- and computer-based treatment programs for anxiety disorders reported moderate, significant effect sizes across outcome measures (Reger & Gahm, 2009). One such Internet-based program designed for the treatment of PTSD is called Interapy. Interapy is a computer-based program that provides contact with a therapist via writing (Lange et al., 2003). Treatment consists of repeated, structured writing assignments, utilizes exposure and cognitive restructuring techniques, occurs twice weekly for a total of 5 weeks. A randomized controlled trial of Interapy resulted in significantly more improvement in the treatment group than in the waitlist control group, with large effect sizes for both PTSD symptoms and general psychopathology (Lange et al., 2003).

### **Computerized Treatments: Lessons from Instructional Design and Technology**

While the potential for CCBT treatments to overcome barriers to treatment has led to the development of a variety of CCBT treatment programs, the current literature contains little discussion of the development process of these programs or methods for effective collaboration between the psychologists and technologists (instructional designers, programmers, software

developers, etc.) whose interaction is necessary for the development for computerized treatments. The current literature contains even fewer investigations of the impact and acceptability of the design of CCBT programs, and there appear to be no published studies that have evaluated the relative efficacy of various design components, such as comparison between video versus textual presentation of psychoeducation. Despite this dearth of literature, the discipline of instructional design and technology (IDT) has the potential to offer useful insights to psychology.

Some of the psychological research that has explicitly discussed the utility of the principles, process, and tools of IDT has done so in the context of dissemination of empirically-supported, manual-based therapies. Weingardt (2004) proposed that the application of IDT could facilitate the development of media-rich, Web-based training applications, which would represent a more effective way to train therapists than traditional, paper-based treatment manuals. Weingardt states that the challenge of dissemination of empirically-supported treatments can be viewed as an instructional challenge, and that IDT provides a useful framework for designing and developing the necessary instructional content and delivery system to address this challenge. While there are no published studies on the efficacy of IDT for the dissemination of empirically-supported treatments, Weingardt argues that the literature that supports the general efficacy of technology-delivered instruction represents promise for psychology and treatment dissemination as well (Weingardt, 2004).

In 2004, Chorpita, Daleiden, and Burns published a response to Weingardt (2004) to extend the implications beyond dissemination of treatments to the designs of psychological interventions themselves. The authors posit that although most manualized treatments follow a linear outline, the application of IDT to dissemination of such treatments will provide an avenue

for other structures of dissemination and other structures of interventions. Future psychological interventions, they write, “could be designed with dynamic structure from the onset” ... resulting in “a fundamental shift in manner of designing interventions” (Chorpita, Daleiden, & Burns, 2004).

Jones (2014) has attempted to provide a set of guidelines for developing technology as a delivery service vehicle for psychological interventions. Jones advocates for emphasis on a conceptual framework that considers both structure and function and states that selection of a delivery service vehicle (e.g., mobile phone, computer software, website) should consider the targeted population, components of the intervention to be delivered, and to what degree therapist involvement is hypothesized to impact outcomes. Jones additionally suggests that traditional models of evaluation in treatment outcome research should be reconsidered. Rather than develop entire treatment programs and then evaluate efficacy via the “gold standard” of a randomized control trial, Jones posits that models of evaluation used in software development and engineering may be more useful (Jones, 2014).

Within the field of instructional design, this type of approach has been discussed and modeled on the concept of “rapid prototyping” (Tripp & Bichelmeyer, 1990). Rapid prototyping, defined as a "system development methodology based on building and using a model of a system for designing, implementing, testing and installing the system," views research and development of a product as two parallel processes. This methodology involves a non-linear process in which analysis of objectives and content, setting objectives, construction of the prototype, utilization of the prototype, and maintenance and revision of the prototype are mutually-informed processes (Tripp & Bichelmeyer, 1990). In addition to involving parallel and mutually-informed processes,

rapid prototyping involves iterative processes that result in the development of a prototype that is subject to ongoing testing and refining until a final product is achieved.

Finally, Jones (2014) advocates for collaboration among technologists, consumers, and the psychologists developing the program. She describes the necessity of psychologists positioning themselves in the center of the design process, as an intermediate between technologists and consumers and in the role of expert regarding the intervention itself. Jones writes:

“An ideal industry partner is one who has experience with successful interdisciplinary collaboration, establishing and implementing procedures for designing and using the technology based on the unique needs of the target consumer, and transporting the technology into sustainable real-world application.”

The unfortunate dearth of research in this area means that the utility of IDT in informing and facilitating dissemination and provision of psychological interventions remain to be seen. There has been, however, no shortage of interest in the development of interventions that utilize technology in various forms, and studies that adhere to traditional models of evaluation have been conducted.

## **Research Goals**

The IMM computer-based program evaluated in this study utilizes psychoeducation about PTSD and exposure therapy, diverse patient exemplars, and professional therapists who deliver the treatment, review the psychoeducational material, and assign weekly homework exercises. Repeated assessments allow the program to assess participant progress in an ongoing, flexible manner and provide additional review of previous sessions as necessary. This multifaceted approach is designed to deliver exposure therapy in a titrated method to maximize the alleviation

of PTSD symptoms and ensure that each participant progresses through treatment at the appropriate pace. Additionally, the program seeks to guide the participant in constructing a life that is less trauma focused and more fulfilling. The program, entitled “Living A Less Trauma Driven Life Through Exposure Therapy,” represents a unique treatment program for PTSD.

The purpose of the present study was to evaluate the clinical and practical functionality of “Living A Less Trauma Driven Life Through Exposure Therapy.” Given how few computer-based treatments have been developed for PTSD and evaluated for their functionality, this study represents a novel contribution to the existing literature.

Regarding the practical functionality of the program, the study gathered a wide range of information about the acceptability of the program. Factors of interest included acceptability, satisfaction, and ease of program use. Regarding the clinical functionality of the program, the present study sought to evaluate whether completion of the treatment program is associated with a decrease in PTSD symptomatology. Collectively, this information can be used to inform evaluations of whether the program demonstrates enough clinical potential to warrant further evaluation via a randomized controlled trial or to warrant the development of a new “iteration” of the program as described in the model of development and evaluation proposed by Jones (2014) and described above.

Specific research questions of the present study include:

**Research Question One:** Does completion of the IMM treatment program result in a significant decrease in PTSD symptoms in a sample that meets criteria for subthreshold PTSD, as assessed by the Clinician Administered PTSD Scale at pre-treatment, post-treatment, and 3-month follow-up?

**Research Question Two:** Is the dropout rate associated with program participation comparable to dropout rates seen in face-to-face therapy?

**Research Question Three:** Do participants report general satisfaction with the treatment program, as assessed by the Treatment Acceptability Questionnaire and the in-program acceptability questions?

## METHOD

### **Participants**

Participants were recruited from Western Michigan University (WMU) and the Kalamazoo community area. Participants were recruited from various undergraduate courses, through flyers hung on campus and in the community, and by Kalamazoo area community providers who were provided with handouts with the study's email and laboratory phone number. All participants were required to be age 18 or older. Participants were considered qualified for the present study if they endorsed PTSD symptoms that qualified for a diagnosis of subthreshold PTSD as defined by Blanchard et al. (1994). This definition required that the participant endorsed exposure to a traumatic event, at least one re-experiencing symptom, and either three avoidance symptoms or two arousal symptoms while additionally endorsing significant distress and impairment. Of note, this definition was based upon DSM-IV criteria, which were in effect at the time this study began.

Participants were excluded from the study if they endorsed suicidal ideation; were currently receiving treatment for PTSD; or had a current or lifetime diagnosis of a psychotic disorder, bipolar disorder, mental retardation, a dementia related illness. These exclusion criteria were selected due to their exclusion in previously published research in PTSD treatment, their potential to limit the participant's ability to use the computerized program, their potential to limit the effectiveness of exposure therapy for PTSD, and the study's limited ability to provide appropriate support to participants who may be experiencing severe and persistent mental illness.

A total of six participants enrolled in and completed the treatment sessions and one-week follow up assessment session. Of note, the present study faced significant challenges in enrolling participants in the study. Recruitment efforts yielded approximately fifty potential participants

making contact with the student investigator, but only eight individuals were willing to sign the consent form after learning about the study. One of those individuals reported symptoms that disqualified them from the study and the other, upon asking follow-up questions about the study, reported that he was seeking an alternative to exposure therapy and therefore did not want to continue to participate.

Among participants who expressed interest in the study but declined to even sign the consent document, several other reasons for declining to participate emerged as common. Many participants cited the variable number of sessions as unappealing, and many stated that they had initial interest in the study because they thought a computerized treatment could be completed online from home computers or other Internet-capable devices. Another common scenario was that some participants were ineligible to participate because they were already engaged in treatment for PTSD. Finally, some participants inquired about the types of traumatic experience that might qualify them for the study and indicated that they had not experienced a potential index traumas (e.g., participants reporting only a recent break-up with a romantic partner as a traumatic experience).

## **Materials**

*Interactive Multimedia (IMM) Treatment Program for PTSD.* The treatment program utilized in the present study is entitled “Living a Less Trauma Driven Life through Exposure Therapy” and was developed at Western Michigan University. The program is software-based and was delivered via a desktop computer. The program has several core components. It provides psychoeducation about trauma, PTSD, and exposure therapy provided by a professional host and professional therapists, via video, voice-over narration, and text on screen. It additionally provides patient exemplars that are delivered via video. These patients are portrayed by trained

actors, feature patients who are diverse in terms of their age, gender, ethnicity, and trauma type, and are designed to illustrate the possible consequences of trauma and illustrate the possible experiences of exposure therapy. The program also assigns weekly homework exercises and offers ongoing review of psychoeducational material and previous assignments. Finally, the program contains a broad battery of assessments.

The assessment battery is designed to facilitate the maximum alleviation of PTSD symptoms. The program contains repeated assessment of depressive and PTSD symptoms, suicidality, homework completion, treatment experience, and comprehension of psychoeducational material. Responses to these assessments affect progression through the program. Therefore, each participant is able to progress through the therapy program at his or her own speed, to review important concepts from the psychoeducation component of the program as needed, to repeat homework assignments as needed, and is afforded ample, individualized opportunity to practice implementing the skills and behavioral exercises that are necessary components of exposure therapy.

The specific assessments used within the IMM program are included in the measures section below, and the program manual for “Living a Less Trauma Driven Life through Exposure Therapy,” written by the present author and including a detailed outline of program structure and content, is provided for reference in Appendix A.

## **Measures**

*Demographic Questionnaire.* The present investigator developed a brief questionnaire to gather relevant demographic information from each participant (e.g., age, ethnicity, treatment history, technology use, comfort with technology, etc.).

*Life Events Checklist* (LEC; Blake et al., 1995). The Life Events Checklist (LEC) is a 17-item self-report measure designed to screen for potentially traumatic events. The LEC assesses exposure to potentially traumatic events that have been known to result in PTSD or significant distress and has been found to have adequate psychometric properties as a stand-alone assessment for trauma exposure. However, the LEC is typically administered prior to the Clinician-Administered PTSD Symptom (CAPS) Scale, with which the LEC was concurrently developed. Additionally, the LEC has demonstrated convergent validity with other measures of trauma exposure and measures of psychopathology associated with trauma exposure (Gray, Litz, Hsu, & Lombardo, 2004). Participants were required to endorse at least one potentially traumatic event to be invited to participate in the study.

*PTSD Checklist* (PCL; Weathers et al., 1993): The PCL is a 17-item self-report measure designed to assess DSM-IV symptoms and functional impairment associated with PTSD. The PCL is used for a variety of purposes including PTSD screening and monitoring symptom change across treatment. Both the civilian and military versions of the PCL will be used in this present study, based upon self-reported information provided on the Demographic Questionnaire. Research has indicated that all versions of the PCL are well-validated and that they demonstrate good internal consistency, test-retest reliability, convergent validity, and temporal stability (Wilkins, Lang, & Norman, 2011).

The PTSD Checklist was utilized as a screener to ensure that in addition to a life history that includes at least one potentially traumatic event known to be associated with PTSD, participants were likely to at least meet the definition of subthreshold PTSD developed by Blanchard et al. (1994). This definition requires that the participant endorses at least one re-experiencing symptom and either three avoidance symptoms or two arousal symptoms while

additionally endorsing significant distress and impairment (Blanchard et al, 1994). For the purposes of this study and per the standard scoring procedures for the PCL (Weathers et al., 1993), responses of 3-5 (moderately or higher) will be considered indicative of PTSD symptoms.

*Clinician-Administered PTSD Symptom Scale (CAPS; Blake et al., 1995):* The CAPS is a semi-structured clinical interview utilized for the assessment and diagnosis of PTSD. The CAPS is considered the gold standard in PTSD assessment, has impressive inter-rater reliability (.92 to .99), and has strong internal consistency ( $\alpha = .73$  to .85). The CAPS additionally demonstrates good specificity (.79) and sensitivity (.79), as well as strong correlation with many other assessments of PTSD (Weathers, Keane, & Davidson, 2001).

The Clinician-Administered PTSD Symptom Scale was utilized in the present study to assess PTSD symptomatology in a manner that is more detailed and reliable than the PTSD Checklist. The CAPS was administered prior to treatment and at follow-up sessions, thereby facilitating assessment of the treatment program's effect on PTSD symptomatology. During this assessment, participants were asked to provide a brief but detailed description of the most distressing traumatic life event they have experienced and their emotional responses to that event. Per the CAPS administration protocol, participants were next asked to report the frequency and intensity of PTSD symptoms related to that event during various periods of time. The final part of the CAPS involves participants reporting the degree to which their reported PTSD symptoms have affected their occupational, social, or other functioning.

*Beck Depression Inventory-II (BDI-II; Beck, Steer & Brown, 1996):* The BDI-II is a 21-item self-report measure designed to assess depressive symptoms in adolescents and adults. It has been demonstrated to possess good reliability ( $r = 0.93$ ) and strong internal consistency ( $\alpha =$

.91). The BDI-II is not intended as a diagnostic tool, and as such was used in the present study only as a measure of the severity of depressive symptoms including suicidality.

*Treatment Acceptability Questionnaire (TAQ)*: The present investigator developed a brief treatment acceptability questionnaire. The questionnaire consists of the Credibility/Expectancy Questionnaire (CEQ, Borkovec & Nau, 1972) and additional, investigator-created items related to perceived ease of program use and comparison to other forms of treatment. Research indicates that the CEQ has strong internal consistency ( $\alpha = .84$ ), high test-retest reliability (.83), and higher CEQ scores are considered indicative of higher levels of treatment acceptability (Deville & Borkovec, 2000). The CEQ items were modified to an 11-point Likert-type scale (0-10) to provide consistency with assessments used within the IMM program.

#### Measures Used Within the IMM Program

*Subjective Units of Distress Scale (SUDS; Wolpe, 1969)*: The Subjective Units of Distress Scale, developed by Wolpe (1969), is a one-item scale designed to assess the level of subjective of distress experienced by an individual. The SUDS is considered an important component of many forms of behavior therapy, as repeated measures taken at baseline and throughout sessions are used to monitor any change in the participant's distress and evaluate the progress of therapy (Ciminero, Nelson, & Lipinski, 1977; Sloan & Mizes, 1999; Wolpe, 1990).

In the IMM program, the scale is an 11-point Likert-type scale that spans from 0 (no distress) to 10 (extreme distress). This is consistent with standard usage of the SUDS, which was originally defined as self-rated scale ranging from 0 (a state of total calm) and 100 (the worst anxiety ever experienced; Wolpe, 1969). In later versions of the SUDS, Wolpe (1990) proposed the use of a more compact scale ranging from 0 to 10. The SUDS is used commonly in exposure

therapy and other trauma therapies, and has been posited to offer not only an evaluation of distress but to represent a valuable source of information about what is happening during trauma processing (Kim, Bae, & Park, 2008).

Within the IMM program, the SUDS was utilized to ensure that the participant was engaging with treatment and coming into contact with appropriate exposure to trauma-related stimuli. It was anticipated that participants might experience increasing distress at the beginning of each exposure exercise and decreasing distress after repetition of the exercise and after completion of the program. Participants who repeatedly endorsed extreme or unchanging levels of distress experienced a program lock and were provided with on-screen instructions to contact the program administrator.

The program also utilized SUDS scores to determine participant progression through each of the 6 unique therapy sessions contained within the program. The program algorithm allows the participant to progress to the next session if the participant indicates that he or she has completed all exposure exercises and endorses at least a 3-point SUDS reduction after the completion of the exercises. However, the participant may begin the sixth and final session only if the participant has completed all exposure exercises and endorses a SUDS score that is considered a terminal score (i.e., 0-2). If the participant reaches session 6 but does not endorse a terminal score, the program automatically cycles back to a prior, relevant session. At that time, the participant must continue forward through the program sessions until a terminal score is endorsed. When the terminal score is endorsed, the participant is permitted to progress to the sixth and final session.

*Mood Assessment Questionnaire:* The program contains a mood questionnaire designed to assess the participant's symptoms of depression. Although modeled after many established

assessments of depression, such as the Beck Depression Inventory, the mood questionnaire is unique to the program.

*PTSD Symptom Scale:* The program contains a PTSD symptom assessment at the beginning of each session. Although only identified as the "PTSD Symptom Scale" by the narrator and the on-screen text, the questionnaire is the PTSD Checklist (PCL) previously described in the measures section of the present proposal. The IMM program uses the PCL to assess changes in PTSD symptomatology over time. After completing the questionnaire, the participant was shown graphs that display the frequency and intensity of their PTSD symptoms as reported throughout the treatment program.

*Program Experience Questionnaire:* Each session of the IMM program asked two questions related to the experience of the session. These questions were posed at the end of each treatment session. One question asked the participant about how helpful the session was perceived to be and the other asked about how encouraging the session was perceived to be. Both questions offered the following options, scored on a scale from 1 to 3: not at all, somewhat, very.

### *Procedure*

*Pre-Treatment Assessment Session.* Individuals interested in the study were asked to contact the student investigator for further information and to schedule the pre-treatment assessment session. At the appointment participants were greeted by the student investigator. The student investigator began pre-treatment assessment session by each explaining the purpose and procedure of the study and obtain informed consent. Per instructions of the HSIRB at Western Michigan University, particular emphasis was placed on the variable length of treatment.

After obtaining informed consent, the student investigator began the assessment battery to ensure that the participant met criteria to be enrolled in the study. First the student investigator

administered the Psychiatric Diagnostic Screening Questionnaire and an investigator-developed Demographic Questionnaire to determine whether the participant meets any exclusionary criteria. Next the student investigator administered the Life Events Checklist (LEC) to determine that the participant has experienced a potentially traumatic event, the PTSD Checklist (PCL) to determine if the participant meets the required definition of subthreshold PTSD, the Beck Depression Inventory-II to evaluate depressive symptoms including current suicidality, and the Clinician Administered PTSD Scale (CAPS) to obtain a detailed assessment of PTSD symptoms. After the CAPS interview was completed, the participant scheduled session two, and if the participant's schedule permitted it, a standing weekly appointment was made. Particular emphasis was placed on the necessity of completing assignments between sessions. All participants were provided with a list of therapeutic resources in the Kalamazoo area.

*Program Session One.* The student investigator first oriented the participant to the computer and computer equipment that was utilized throughout the treatment program. The student investigator provided the participant with a notebook and pen for use throughout the study that the participant could use for written assignments and keeping track of homework. Finally, the student investigator explained the log-in and lock-out features of the program. The participant was instructed to return to the research lab and notify the research assistant if they encountered a program lock.

The participant was left alone in a private room to complete session one of the IMM treatment program. After the session was completed, the participant completed the TAQ and the BDI- II to facilitate evaluation of depressive symptoms and treatment acceptability following his or her initial experience with the program. The student investigator reminded the participant of

the important of completing all homework assignments and ensured that the participant is scheduled for the next session.

*Sessions Two through Twenty.* Due to the flexible and individualized nature of the IMM program, each participant could complete a minimum of six sessions with the computer program and a maximum of twenty treatment sessions. At the beginning of each session, the student investigator reminded the participant to return to the lab and notify the student investigator in the event of a program lock.

Although the program algorithm might require some participants repeat sessions, there are a total of six unique program sessions. The student investigator monitored participant progress through the IMM program and administered the TAQ after the participant completed program sessions one, three, and six to evaluate how perceptions of the program may change throughout the treatment experience.

After each treatment session, the student investigator reminded the participant to complete any homework assignments and ensured that the next session was scheduled. In the event that any participant terminated treatment prematurely, the student investigator provided the participant with a list of therapeutic resources in the Kalamazoo area.

*One-Week Follow-Up Session.* After completing the sixth and final program session, the participant was asked to return for a final treatment session within seven days. At this session, the student investigator administered the Beck Depression Inventory II, the CAPS, and the TAQ. The student investigator scheduled a follow-up session approximately three months from the date of this session. Finally, the research assistant provided the participant with a list of therapeutic resources in the Kalamazoo area.

*Three-Month Follow-Up Session.* At this session, the student investigator administered the Beck Depression Inventory II and the Clinician-Administered PTSD Symptom Scale. The participant was also provided with another copy of the a of therapeutic resources available in the Kalamazoo area.

## RESULTS

### **Data Analysis**

The study sought to evaluate the clinical and practical functionality of an interactive multimedia program of exposure therapy for PTSD entitled “Living A Less Trauma Driven Life Through Exposure Therapy.” Factors of interest included PTSD symptomatology and acceptability. All analyses utilized in the present study were conducted using *Statistical Packaging for the Social Sciences* (SPSS) Version 24.

### **Characteristics of the Data**

The collected data is best represented by nominal and ordinal levels of measurement. Due to the very small sample size ( $n = 6$ ), normality could not be assessed visually or statistically. As a result of these characteristics, nonparametric statistical tests, which do not require normally distributed data and which may be conducted on nominal and ordinal data as well as small and unequal sample sizes, were utilized throughout the analyses conducted (Pett, 1997; Sheshkin, 2011).

### **Preliminary Analyses**

Table 1 displays demographic characteristics of the sample of six participants, including variables such as age, gender, ethnicity, education level, history of mental health treatment, history of PTSD treatment, and military history. Half of the sample reported their gender as female and half the participants reported that they have served in the military. Participants ranged in age from 19 to 29 with a mean age of 22 ( $SD = 3.66$ ). The most commonly reported ethnicity within the sample was Caucasian/white (50%,  $n = 3$ ). All of the participants reported that they were current college students (100%,  $n = 6$ ), and most reported that they utilized

interactive technology such as a computer or smart phone one to five hours daily (66.7%, n = 4) and that they were very comfortable using interactive technology (50%, n = 3).

Table 1.  
*Participant Demographic Characteristics*

<b>Variable</b>		<b>n</b>	<b>%</b>
Gender			
	Female	3	50%
	Male	3	50%
Ethnicity			
	Asian	1	16.7%
	Black	1	16.7%
	Other	1	16.7%
	White	3	50%
Education			
	Current College Student	6	100%
Military History			
	Yes	3	50%
Technology Use			
	1-5 Hours Daily	4	66.7%
	> 5 Hours Daily	2	33.3%
Technology Comfort			
	Very Uncomfortable	1	16.7%
	Comfortable	2	33.3%
	Very Comfortable	3	50%

A range of clinical characteristics of the participants were also assessed. Table 2 displays clinical characters of the sample, including variables such as their history of mental health treatment, whether their previous treatment had addressed their PTSD symptomatology, and the reported number of and type of potential traumatic events (as assessed by the Life Events Checklist). The number of potential traumatic events reported by participants ranged from 3 to 12 with a mean of 8.5 ( $SD = 3.56$ ), and the most commonly reported types of potential traumatic event in the sample were “life threatening illness or injury” and “transportation accident.” Of note, these reports include exposure to potential traumatic events by directly experiencing the event, witnessing the event, and learning about the event occurring to a family member or friend.

The type index trauma reported and assessed during each participant's CAPS interview is also included in Table 2.

Table 2.  
*Participant Clinical Characteristics*

<b>Variable</b>		<b>n</b>	<b>%</b>
Previous Mental Health Treatment			
	Yes, currently	3	50%
	Yes, but not currently	2	33.3%
	Never had treatment	1	16.7%
Previous PTSD Treatment			
	Yes	4	66.7%
Potentially Traumatic Experiences			
	Happened to Me	6	100%
	Witnessed It	3	50%
	Happened to Family or Close Friend	5	83.3%
	Not Sure	2	33.3%
Type of Experiences			
	Natural Disaster	2	33.3%
	Fire or Explosion	4	66.7%
	Transportation Accident	5	83.3%
	Serious Accident	3	50%
	Physical Assault	2	33.3%
	Assault with a Weapon	1	16.7%
	Sexual Assault	1	16.7%
	Other Unwanted Sexual Experience	2	33.3%
	Combat	3	50%
	Life-Threatening Illness or Injury	5	83.3%
	Severe Human Suffering	3	50%
	Sudden Violent Death	4	66.7%
	Sudden Accidental Death	4	66.7%
	Serious Harm Caused to Other	2	33.3%
	Any Other Very Stressful Event	3	50%
Type of Index Trauma			
	Combat	2	33.3%
	Physical Assault	1	16.7%
	Sexual Assault	1	16.7%
	Transportation Accident	2	33.3%

### Research Question One

The primary research goal of the study was to evaluate the effect of completing the computerized treatment program on PTSD symptomatology. It was hypothesized that completion of the treatment program would be associated with a decrease in overall PTSD symptomatology.

For the purposes of the present study, PTSD symptomatology was evaluated via the Clinician Administered PTSD Scale for DSM-IV (CAPS), which was to be administered at pre-treatment, post-treatment, and three-month follow-up. However, none of the participants completed the three-month follow-up assessment session, and therefore those analyses could not be conducted as anticipated. Of note, at pre-treatment assessment, four of the six participants met full diagnostic criteria for PTSD. At post-treatment assessment, three of the four continued to meet full diagnostic criteria for PTSD.

The means and standard deviations obtained from the CAPS data are presented in Table 3. The scores are total severity scores, which per standard CAPS scoring methodology are the sums of the frequency and intensity scores for each PTSD symptom that was reported during the interview.

Table 3.

*Pre- and Post-Treatment Means and Standard Deviations for CAPS Scores*

<b>Time</b>	<b>n</b>	<b>Mean</b>	<b>Standard Deviation</b>
Pre-Treatment CAPS Severity Score	6	50	10.3
Post-Treatment CAPS Severity Score	6	28.8	11.6

When considered in light of the severity score ranges indicated within the CAPS manual (Blake et al., 2000), these means indicate noteworthy changes, as the pre-treatment CAPS severity score mean falls within the “moderate PTSD/threshold” severity range and the post-treatment CAPS severity score falls within the “mild PTSD/subthreshold” severity range,

suggesting that these findings are clinically meaningful. Additional analyses were conducted to determine whether these results were statistically significant.

Due to the characteristics of the sample, the Wilcoxon signed-rank test was identified as an appropriate nonparametric alternative to a paired-samples t-test. However, conducting the Wilcoxon signed-rank test indicated that the distribution of differences in the sample was not symmetrical, which is a critical assumption of the test (Sheshkin, 2011). Therefore, an exact sign test was conducted instead, as it does not require symmetrical distributions of differences but is otherwise appropriate for the dataset and research design. Of note, the sign test is less powerful than the Wilcoxon signed-rank test (Sheshkin, 2011).

An exact sign test was used to compare the differences in CAPS severity scores at pre-treatment and post-treatment. Data are medians unless otherwise stated. The scores of all six participants included in the analysis indicate decreases in PTSD symptomatology as assessed by the CAPS; no participants experienced a worsening or maintenance of symptoms. Results of the sign test indicate that participants scored higher ( $Mdn = 52.0$ ) on the pre-treatment CAPS assessment than the post-treatment CAPS assessment ( $Mdn = 33.5$ ); a statistically significant decrease in the median of the differences of 20.5 CAPS severity points,  $p = .031$ .

To better understand the nature of the change in PTSD symptomatology experienced by participants enrolled in the study, analyses were also conducted to compare pre-treatment and post-treatment CAPS scores for each symptom cluster. Per DSM-IV-TR structure, the symptom clusters evaluated via the CAPS include re-experiencing symptoms (e.g., vivid memories, flashbacks, recurring dreams), avoidance symptoms (e.g., avoiding thoughts of the traumatic events or places that remind the individual of the traumatic event), and hyperarousal symptoms (e.g., exaggerated startle responses, hypervigilance, irritability, etc.) (American Psychiatric

Association, 2000). The means and standard deviations obtained for each symptom cluster are presented in Table 4.

Table 4.

*Pre- and Post-Treatment Means and Standard Deviations for CAPS Symptom Cluster Scores*

<b>Time</b>	<b>n</b>	<b>Mean</b>	<b>Standard Deviation</b>
<b>Pre-Treatment CAPS Severity Scores</b>			
Re-experiencing Symptoms	6	17.5	3.8
Avoidance Symptoms	6	19.0	4.7
Hyperarousal Symptoms	6	13.7	6.2
<b>Post-Treatment CAPS Severity Scores</b>			
Re-experiencing Symptoms	6	10.3	2.4
Avoidance Symptoms	6	11.7	3.6
Hyperarousal Symptoms	6	10.0	5.6

As the distribution of differences in the sample was not symmetrical for the variables of interest, exact sign tests were used to compare the differences in CAPS severity scores at pre-treatment and post-treatment. Data are medians unless otherwise stated. The CAPS severity scores of all six participants decreased in each of the PTSD symptom clusters.

With respect to re-experiencing symptoms, results of the sign test indicate that participants scored higher ( $Mdn = 18.0$ ) on the pre-treatment CAPS assessment than the post-treatment CAPS assessment ( $Mdn = 10.0$ ); a statistically significant decrease in the median of the differences of 7.0 CAPS severity points,  $p = .031$ . With respect to avoidance symptoms, results of the sign test indicate that participants scored higher ( $Mdn = 19.5$ ) on the pre-treatment CAPS assessment than the post-treatment CAPS assessment ( $Mdn = 11.5$ ); a statistically significant decrease in the median of the differences of 6.5 CAPS severity points,  $p = .030$ . With respect to hyperarousal symptoms, results of the sign test indicate that participants scored higher ( $Mdn = 14.5$ ) on the pre-treatment CAPS assessment than the post-treatment CAPS assessment ( $Mdn = 8.5$ ); a statistically significant decrease in the median of the differences of 2.5 CAPS severity points,  $p = .031$ .

To further understand the effect of completing treatment on psychopathology, analyses were also run to assess differences in depressive symptoms at pre-treatment and post-treatment assessment. As the distribution of differences in the sample was not symmetrical for the variables of interest, an exact sign test was used to compare the differences in BDI-II scores at pre-treatment and post-treatment. Data are medians unless otherwise stated. The BDI-II scores of five out of six participants decreased; one participant's BDI-II score was unchanged. Results of the sign test indicate that participants scored higher ( $Mdn = 18.0$ ) on the pre-treatment BDI-II assessment than the post-treatment BDI-II assessment ( $Mdn = 9.5$ ); a statistically significant decrease in the median of the differences of 5.5 CAPS severity points,  $p = .041$ .

The small sample size utilized in the present study affords the opportunity to present individual assessment data, which was collected both by the computerized treatment program during treatment sessions and by the student investigator during semi-structured interviews, for consideration.

It is important to note that due to a limitation of the program software, PTSD checklist (PCL) data from within the computerized treatment program is only available for the last iteration of each of the six, unique program sessions. Additionally, the program provides information regarding the total number of sessions each participant completed, but does not indicate which sessions were repeated. Finally, it must be noted that repetition of sessions does not necessarily occur in chronological sequence; participants may initially advance through the program in sequence and later be redirected to repeat an earlier, previously-completed session. Therefore, while the pre-treatment and post-treatment data presented in Table 5 can be interpreted as representing distinct points in time, the PCL data presented in Table 5 should be interpreted with caution.

Table 5.  
*Individual Participant Assessment Scores*

<b>Participant</b>	<b>Total Sessions</b>	<b>Pre-Tx CAPS</b>	<b>Post-Tx CAPS</b>	<b>Pre-Tx BDI-II</b>	<b>Post-Tx BDI-II</b>	<b>PCL 1</b>	<b>PCL 2</b>	<b>PCL 3</b>	<b>PCL 4</b>	<b>PCL 5</b>	<b>PCL 6</b>
1	12	50	35	26	25	13	16	31	27	25	24
2	7	54	33	8	5	35	25	16	13	16	16
3	7	37	28	21	10	31	32	26	19	6	10
4	6	54	34	17	9	23	19	24	18	12	12
5	8	30	6	41	20	57	16	48	41	13	12
6	7	65	37	6	4	24	22	16	12	3	5

To further facilitate the consideration of data on an individual participant basis, a summary of each participant and a graph of their assessment scores is presented.

Participant one, a twenty-two-year-old white male veteran, had a pre-treatment CAPS severity score of 50 (moderate PTSD/threshold range) and BDI-II score of 26 (moderate depressive range). His reported index trauma was combat-related. The participant's post-treatment CAPS severity score was 35 (mild PTSD/subthreshold range) and BDI-II score was 25 (moderate depressive range). The participant's assessment scores are presented in Figure 1.

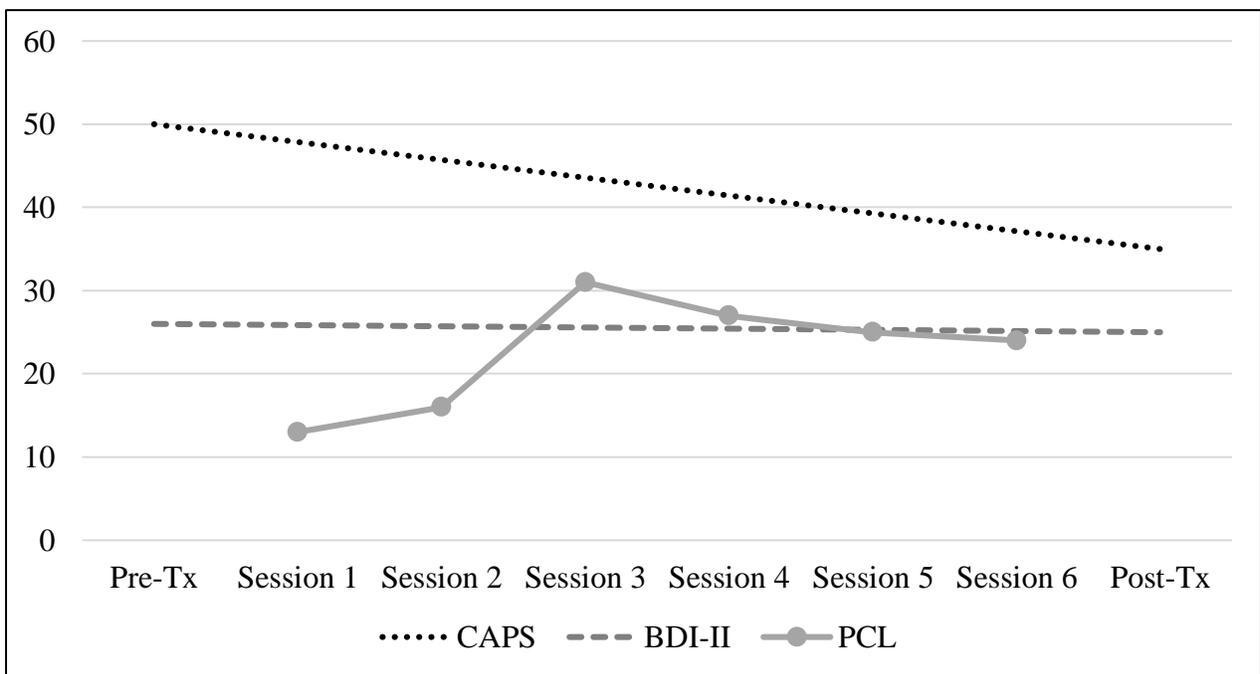


Figure 1.  
*Participant One Assessment Scores*

Participant two, a twenty-three-year-old white male veteran, reported that a combat-related index trauma. The participant had a pre-treatment CAPS severity score of 54 (moderate PTSD/threshold) and pre-treatment BDI-II score of 8 (minimal depression). The participant's post-treatment CAPS severity score was 33 (mild PTSD/subthreshold) and his BDI-II score was 5 (minimal depression). The participant's assessment scores are presented visually in Figure 2.

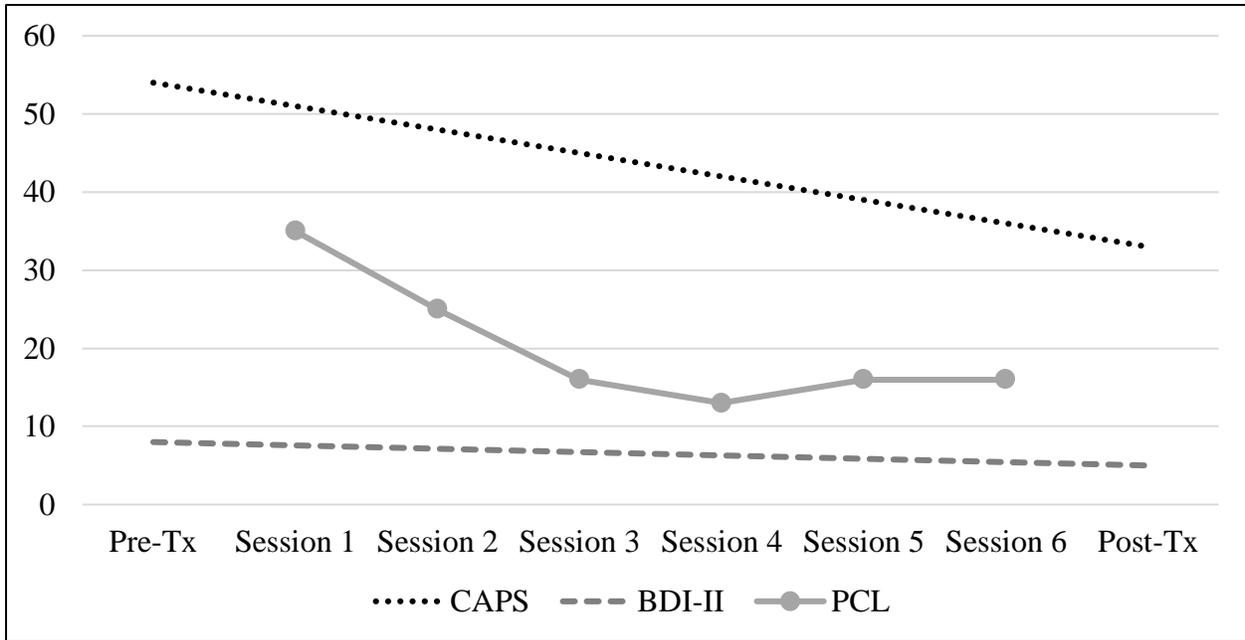


Figure 2.  
Participant Two Assessment Scores.

Participant three, a twenty-nine-year-old white male veteran, reported that his index trauma was witnessing an assault. He had a pre-treatment CAPS severity score of 37 (mild PTSD/subthreshold) and BDI-II score of 21 (moderate depression). His post-treatment CAPS severity score was 28 (mild PTSD/subthreshold) and BDI-II score was 10 (minimal depression).

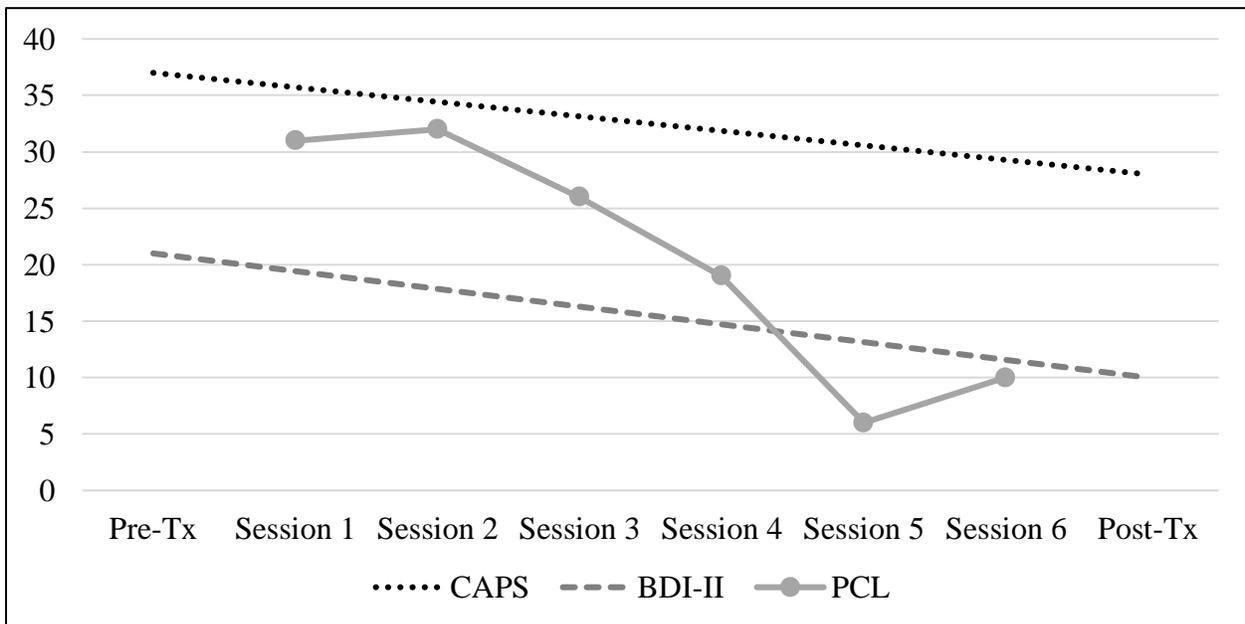


Figure 3.  
Participant Three Assessment Scores

Participant four was a twenty-year-old African American female civilian. The participant's reported index trauma was experiencing a sexual assault. She had a pre-treatment CAPS severity score of 54 (moderate PTSD/threshold range) and a pre-treatment BDI-II score of 17 (mild depression range). Following completion of the treatment sessions, the participant's post-treatment CAPS severity score was 34 (mild PTSD/subthreshold range) and her post-treatment BDI-II score was 9 (minimal depression range). The participant's assessment scores are presented visually in Figure 4.

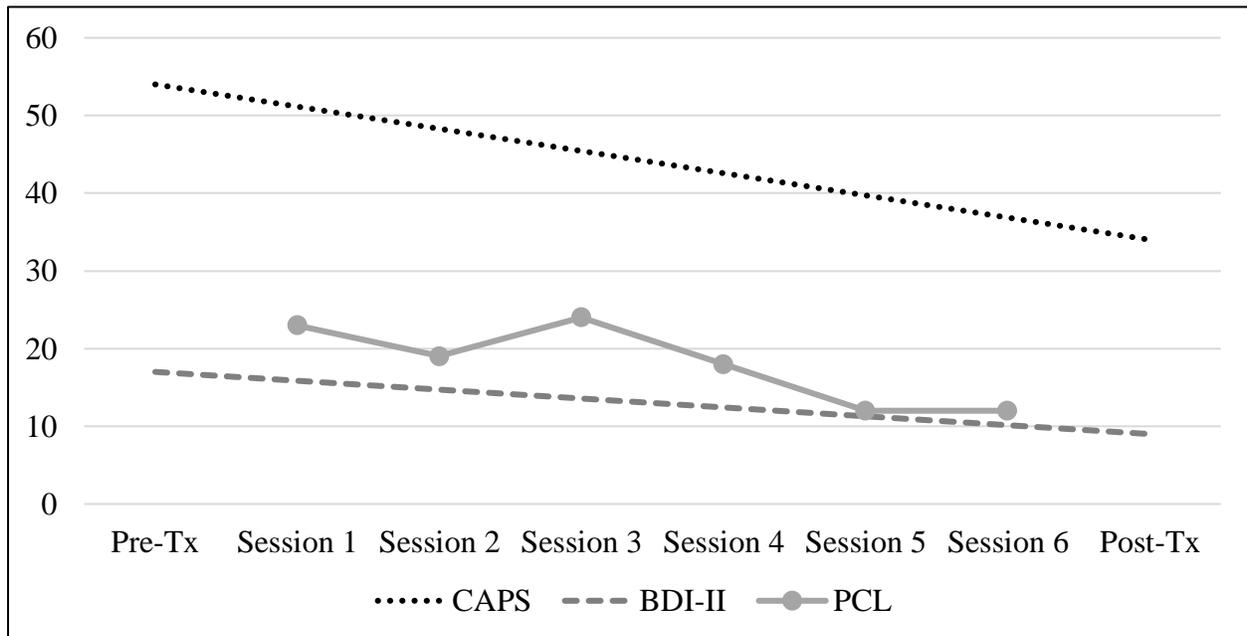


Figure 4.  
Participant Four Assessment Scores

Participant five was a twenty-year-old Asian-American female civilian. The participant's reported index trauma of experiencing an automobile accident. The participant had a pre-treatment CAPS severity score of 30 (mild PTSD/subthreshold range) and a pre-treatment BDI-II score was 41 (severe depression severity range). Following completion of the treatment sessions,

her post-treatment CAPS severity score was 6 (asymptomatic of PTSD/few symptoms range) and her post-treatment BDI-II score was 20 (moderate depression severity range). The participant's assessment scores are presented visually in Figure 5.

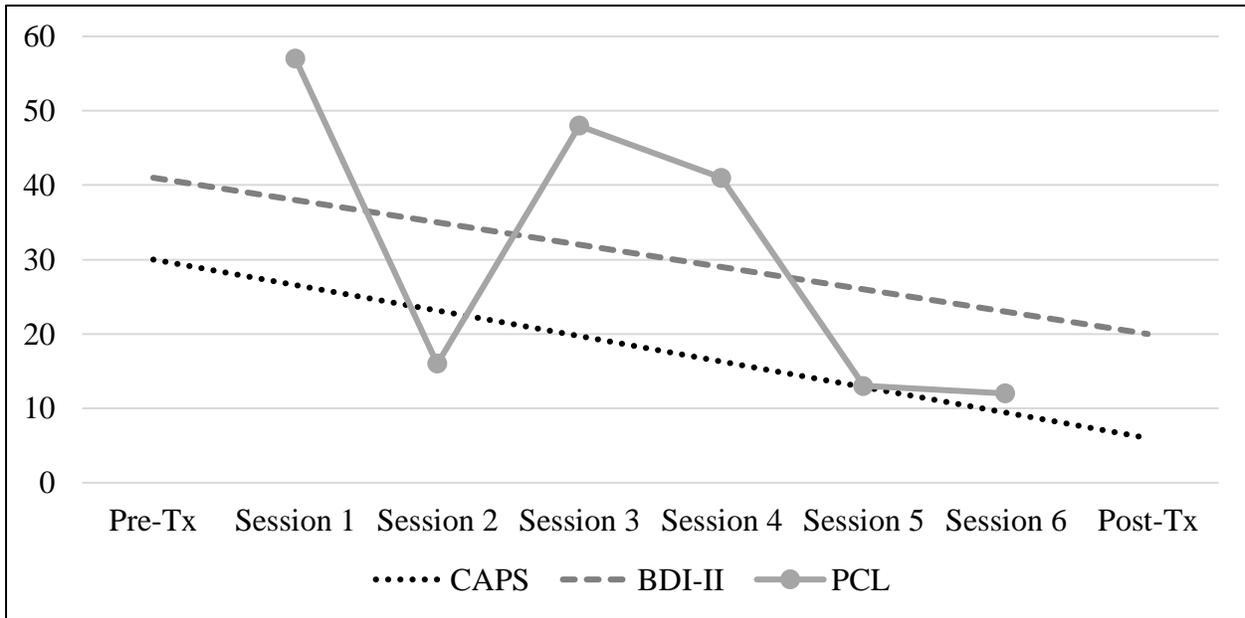


Figure 5.  
*Participant Five Assessment Scores*

Participant six, a female civilian who indicated her ethnicity as “other,” reported that her index trauma was an automobile accident. She had a pre-treatment CAPS severity score of 65 (severe PTSD symptomatology range) and BDI-II score of 6 (minimal depression range). The participant's post-treatment CAPS severity score was 37 (mild PTSD/subthreshold range) and BDI-II score was 4 (minimal depression range). Her scores are presented visually in Figure 6.

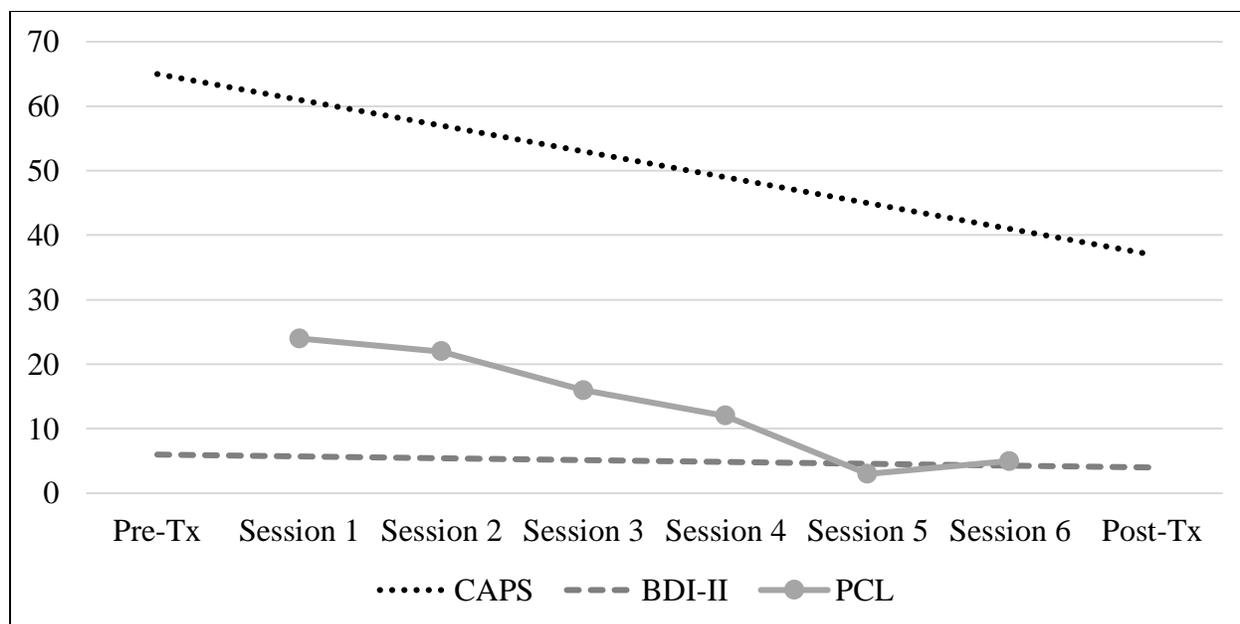


Figure 6.  
Participant Six Assessment Scores

### Research Question Two

The second research goal of the study was to evaluate the dropout rate associated with completing the computerized treatment program on PTSD symptomatology. It was hypothesized that the dropout rate associated with program participation would be comparable to dropout rates seen in face-to-face therapy for PTSD. An analysis of 25 PTSD treatment studies found an average dropout rate of 20.5% (Hembree et al., 2003).

In the present study, participants completed between six and twelve sessions of the treatment program, with a mean number of sessions of 7.8 sessions. All participants who consented to participate and qualified to participate in the study completed the treatment sessions and post-treatment assessment session, indicating a 0% dropout rate. However, this finding must be interpreted with caution due to the very small sample size; the dropout of only one participant would have resulted in dropout rates comparable to those reported in the study conducted by Hembree et al. (2003). Additionally, it must be acknowledged that none of the participants

completed the three-month follow-up session. While some participants scheduled the three-month follow-up session but did not attend, others declined to schedule the session entirely, citing reasons such as uncertain availability, moving out of the area permanently or between semesters, and feeling that the study had already required too much of their time.

Finally, the present study's difficulty with recruiting participants should be considered as relevant to this research question. Recruitment efforts yielded approximately fifty potential participants who made contact with the student investigator, but only eight individuals were willing to sign the consent form after learning about the study, and only six individuals ultimately enrolled in the study. While attrition was measured following enrollment in the treatment study, this high rate of rejection following education about the study and exposure therapy is relevant when considering issues of treatment engagement and has clear parallels to clinical settings in which patients may make first steps to seek treatment but fail to engage with treatment following initial intake or psychoeducation sessions. Issues of acceptability are discussed in greater detail within the analysis of research question three and in the discussion section of the present document.

### **Research Question Three**

The third research goal of the study was to evaluate the general satisfaction with the treatment program. Two measures were used to address this question, the Program Experience Questionnaire (PEQ; an in-program assessment administered at the end of each of the six unique treatment sessions) and the Treatment Acceptability Questionnaire (TAQ; an investigator-developed assessment administered at program sessions one, three, and six, as well as at post-treatment assessment). For both measures, higher scores are indicative of higher levels of

treatment satisfaction and acceptability. Means and standard deviations for each measure are presented in Table 6.

Table 6.  
*Means and Standard Deviations for Treatment Evaluation Measures*

Measure	Session 1		Session 2		Session 3		Session 4		Session 5		Session 6		Post-Tx	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
PEQ (max = 6)	5.2	0.98	4.8	0.98	5.1	0.98	6.0	0.0	4.2	0.98	4.8	0.75	--	--
TAQ (max = 80)	43.5	13.2	--	--	52.8	10.5	--	--	--	--	58.5	9.0	63.0	9.3

A Friedman test was run to determine if there were differences in PEQ scores during the treatment study. Pairwise comparisons were performed with a Bonferroni correction for multiple comparisons. PEQ scores were statistically significantly different at the different time points during the treatment study,  $\chi^2(5) = 16.933, p < .005$ . Post hoc analysis revealed statistically significant differences in PEQ scores from session four ( $Mdn = 6.00$ ) and session five ( $Mdn = 4.500$ ) ( $p = .014$ ), but not between any other points in time.

It is possible that the statistically significant drop in scores, indicating lower levels of treatment satisfaction and acceptability, reflect participant frustration or confusion with being required to repeat session five. Anecdotal evidence in the form of comments that participants made to the student investigator support this hypothesis. A limitation of the software is that it records only the participant's final PEQ score, completed during their last iteration of session five, rather than their initial or repeated evaluations of the session. Due to this limitation, further analyses could not be conducted to support or refute this hypothesis.

A Friedman test was also conducted to determine if there were differences in TAQ scores during the treatment study. Pairwise comparisons were performed with a Bonferroni correction for multiple comparisons. TAQ scores were statistically significantly different at the different

time points during the treatment study,  $\chi^2(3) = 14.600, p < .002$ . Post hoc analysis revealed statistically significant differences in TAQ scores from session one ( $Mdn = 42.00$ ) to post-treatment assessment ( $Mdn = 60.50$ ) ( $p = .001$ ), but not between any other points in time. These results indicate that by participants viewed the treatment program more favorably by the post-treatment assessment session than they did at the commencement of the treatment program.

## DISCUSSION

The present study sought to evaluate the clinical and practical functionality of “Living A Less Trauma Driven Life Through Exposure Therapy.” Regarding the clinical functionality of the program, the present evaluated whether completion of the program was associated with a decrease in PTSD symptomatology. Measures included in the study additionally facilitated the evaluation of PTSD symptomatology change by symptom cluster and the evaluation of change in depressive symptomatology. Regarding the practical functionality of the program, the study gathered information about the acceptability of the program. Factors of interest included treatment acceptability, satisfaction, and ease of program use.

The goal of the present study was to inform future evaluation and development of “Living A Less Trauma Driven Life Through Exposure Therapy” by providing data to determine whether the program demonstrates enough clinical potential to warrant further evaluation via a randomized controlled trial or to warrant the development of a new iteration of the program.

### **Summary of Findings**

The primary research goal of the study was to evaluate the effect of completing the computerized treatment program on PTSD symptomatology. It was hypothesized that completion of the treatment program would be associated with a decrease of overall PTSD symptomatology. Participant PTSD symptomatology was evaluated via the via the Clinician Administered PTSD Scale for DSM-IV (CAPS), which was administered at pre-treatment and post-treatment; participant drop-out did not allow further assessment at three-month follow-up.

At pre-treatment assessment, four of the six participants met full diagnostic criteria for PTSD. At post-treatment assessment, three of the four continued to meet full diagnostic criteria for PTSD. However, all six participants reported a decrease in overall PTSD symptomatology,

with pre-treatment CAPS scores ( $M = 50, SD = 10.3$ ) falling in the “moderate PTSD/threshold” severity range and post-treatment CAPS scores ( $M = 28.8, SD = 11.6$ ) falling in the “mild PTSD/subthreshold” severity range. Statistical analysis of CAPS data indicated statistically significant decreases in overall CAPS severity scores and in severity scores for each PTSD symptom cluster.

To further understand the effect of completing treatment on psychopathology, analyses were also run to assess differences in depressive symptoms at pre-treatment and post-treatment assessment. Review of participant data indicated that the BDI-II scores of five out of six participants decreased between pre- and post-treatment assessments. The BDI-II score of one participant remained unchanged at the end of the treatment study. Statistical analysis of participant BDI-II scores indicated a statistically significant decrease in depressive symptoms between pre- and post-treatment assessment.

The secondary research goal of the study was to evaluate the practical functionality of “Living A Less Trauma Driven Life Through Exposure Therapy” by evaluating attrition and acceptability of the program. These findings were somewhat complicated and must be considered in a larger context rather than based solely on the scores obtained on the included measures.

All six participants who enrolled in the study completed all treatment sessions and reported generally high levels of acceptability via the Program Experience Questionnaire and the Treatment Acceptability Questionnaire. Statistical analysis of these scores throughout the treatment program indicated that differences in PEQ scores were statistically significant only between program session four and program session five, with acceptability scores decreasing at that point in time and indicating lower levels of treatment satisfaction and acceptability. Based

upon unsolicited verbal feedback provided by participants, the student investigator hypothesized that this decrease may reflect participant frustration or confusion with being required to repeat session five. Statistical analysis of TAQ scores indicated that there were statistically significant differences in TAQ scores between session one and the post-treatment assessment session, indicating that participants viewed the treatment program more favorably by the post-treatment assessment session than they did at the commencement of the treatment program.

However, the six participants who enrolled and completed the study represent a minority group, as many times more potential participants declined to enroll after learning about the study, citing a range of reasons that they found the study or treatment program itself to be unacceptable. Among participants who expressed interest in the study but declined to even sign the consent document, several common reasons for declining to participate emerged as the most commonly reported. While some of these were related to the requirement of the study (e.g., no extra credit offered, no concurrent PTSD treatment permitted, etc.), two commonly-reported reasons for declining to participate were related to the acceptability of the treatment program itself. Many potential participants cited the variable number of sessions as unappealing, stating that they did not wish to engage in a treatment if they could not know exactly how many sessions would be required. These participants frequently indicated that they were initially interested in the study because they believed that a computerized treatment would be a brief intervention that required a minimal time commitment.

Additionally, a number of participants stated that they were initially interested in the study because they thought a computerized treatment could be completed online from home computers or other Internet-capable devices. These participants frequently cited busy schedules, limited transportation capabilities, desire for privacy, and desire for flexibility as their reasons

for interest in a computerized treatment that could be completed at home or during travel. These participants frequently cited examples of online therapy programs like TalkSpace and BetterHelp when describing the type of services that they desired.

It is also worth noting that among the participants who did enroll in the study, several shared that they were enrolled in the study as a “last resort.” Some participants indicated that they had previously received PTSD treatment and found it to be insufficient for addressing their symptoms and that they therefore needed or wanted to try something different. Others indicated a mistrust of mental healthcare professionals in general and a desire for treatment that they could complete independently. Still other participants indicated that financial constraints made participation in the study the only viable option for them.

Taken together, these findings suggest that completion of “Living A Less Trauma Driven Life Through Exposure Therapy” is associated with a clinically and statistically significant decrease in PTSD and depressive symptomatology. However, they also suggest that in its current form, the treatment program may only appeal to a niche group of individuals and may lack aspects that would support appealing to a much broader audience.

### **Limitations of the Study**

The present study has several limitations that warrant comment. The first of these limitations is the small sample size. It was the intention of this study to keep the sample size quite small, with a desired sample size of 10 and an actual sample size of 6. This decision was made because the treatment program utilized in the present study had not been previously evaluated and a small beta-testing study allowed for assessment of difficulties that could be handled more effectively with a small sample size. This decision proved to be advantageous as

considerable difficulties with recruitment and acceptability were encountered. However, it must be noted that the small sample size limits the generalizability of the findings of this study.

Another limitation of the present study is its utilization of measures that are based on DSM-IV. These measures were selected because of the lack of availability of DSM-V compatible measures at the time of the study's inception. Due to the study's lengthy duration, by the time the study concluded, DSM-V versions of measures such as the CAPS had been developed and were in widespread use in clinical and research settings. Unfortunately, due to significant changes in the DSM-V criteria for PTSD and significant changes in the updated measures, data from the present study could not be converted to the new measures. This represents a limitation as the data gathered in the present study cannot be directly compared to the most recent PTSD research.

A third limitation of the study is related to a limitation of the program software itself. While the program administers regular assessments and evaluates participant scores for each session, the current program algorithm stores data only for the most recently completed program session. As such, if an individual repeats a session multiple times, the researcher is provided only with the data for their final iteration of that session. This limits the ability to track participant progress throughout the program. Because of this software limitation, the present study deliberately selected well-established, reliable measures such as the CAPS and BDI-II to evaluate participant symptomatology and administered these measures separately from the treatment program. This decision allowed for evaluation of the study's research questions, but a more robust program database would have allowed for a more detailed analysis of participant symptomatology and the effect of repeating program sessions. Additionally, the inclusion of other measures external to the program would have facilitated further analysis.

A fourth limitation of the study is also related to the program software. In its current form, the treatment program notifies participants that the program will evaluate symptoms and tailor progress through the program for each individual who utilizes it, resulting in a variable number of treatment sessions. This was also conveyed to the participant during the informed consent process. While this aspect of the program reflects a desirable degree of individualization and flexibility, it also means that pre-treatment and post-treatment assessments of the sample include participants who may have completed twice as many treatment sessions as the next participant. Additionally, participant awareness of this aspect of the treatment program may have motivated individuals who wanted to complete the program quickly to report decreasing symptomatology and decreasing SUDS scores regardless of accuracy. It is unclear if this occurred, to what degree, and to what degree this may have influenced reporting during the evaluation that occurred outside of the treatment program, such as during CAPS interviews conducted by the student investigator.

### **Directions for Future Research**

The present study provided a variety of indications for future research. The typical future direction for any beta-testing study would be to continue to evaluate the effectiveness of the program by conducting a similar study with a larger sample size. While this remains a consideration for future research, the present study's difficulty with recruitment and the reported reasons for declining to participate suggest that a more strategic approach may be a revision of the current treatment program. Utilization of a "rapid prototyping" model of revision and evaluation (Tripp & Bichelmeyer, 1990) would be consistent with recent recommendations made by psychologists involved in the development of computerized treatments (Jones, 2014).

While many revisions could be made with the goal of enhancing the treatment program, it is recommended that any initial revisions to the treatment program address the most commonly-reported reasons for declining to participate. If the program is altered to be more acceptable to a wider audience, further evaluation of the program will be supported as access to larger samples will be more feasible. Developing an online version of the program would address one of these issues and may be the single most important step in the future of the “Living A Less Trauma Driven Life Through Exposure Therapy” program.

An additional consideration for an initial or early revision of the program is the inclusion of treatment rationale or participant choice regarding the repetition of sessions. One possibility is inserting an alert in which the program states that it has evaluated participant data and recommends the repetition of a specific session. Despite being informed that repetition of sessions was a possibility, during the present study, some participants reported confusion and frustration with returning to the study only to log in and find that they were repeating a session. Some participants indicated the belief that they were sufficiently improved and indicated that they wanted to move on to the next session despite the program’s algorithm indicating that they were not ready to do so, and others sought information about how and why the program was coming to its conclusion. Provision of such information may make repetition of a session more acceptable to participants.

Additionally, provision of the ability to “opt out” of a repeated session and continue forward through the treatment program may also increase the acceptability of the treatment program by fostering a sense of control and affording participants the ability to determine treatment duration. The inclusion of such an option could be paired with a disclaimer regarding deviation from recommendations. Additionally, this option could facilitate a range of additional

studies that might evaluate the influence of greater personal control over the program on acceptability of the program and evaluate differences in outcomes for individuals who complete all recommended sessions versus those who complete only the six unique program sessions in sequence.

It is additionally recommended that future research goes beyond evaluating the clinical outcomes and acceptability of the treatment program. Many other aspects of the program warrant deliberate evaluation, such as whether the program actually assists individuals in living a less trauma-driven life. During the present study, participants frequently shared that they had begun to engage in various healthy and rewarding activities by the end of treatment, and the inclusion of measures that evaluate quality of life or values-consistent behaviors would be useful in evaluating any positive effect the program may have in this regard.

While the above recommendations indicate important first steps in continuing to develop and evaluate the “Living A Less Trauma Driven Life Through Exposure Therapy” program, it is important to recognize that the program has the potential to be expanded, revised, and evaluated in many ways. For example, the present study sought to evaluate the program in large part because of its potential to help increase access to evidence-based treatments. As such, future studies should consider evaluating the program in a diverse array of settings, such as within mental health clinics, primary care clinics, and within participant homes, rather than just on a university campus. If the program continues to demonstrate efficacy and acceptability, future studies should also evaluate outcomes in comparison to other active treatments, investigate ways to evaluate mechanisms of action, and consider the development of more detailed in-program evaluations of homework completion.

In summary, the present study represents preliminary support for the use of an interactive multimedia program of exposure therapy for PTSD. Future research in this area should be dedicated to the ongoing refinement of the treatment program and consider a variety of avenues for expansion and improvement of the current product. Future prototypes should be revised in a systematic, controlled manner so that research can inform the process and track variables of influence with confidence. Continued development of the “Living A Less Trauma Driven Life Through Exposure Therapy” program represents an opportunity to offer a modern, effective, easily-accessible treatment for PTSD.

### **HSIRB**

This study was reviewed and approved by the Human Subjects Institutional Review Board of Western Michigan University. A copy of the letter of approval from the Human Subjects Institutional Review Board is provided in Appendix B.

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## Appendix A

### **Living a Less Trauma-Driven Life through Exposure Therapy Manual**

#### **Introduction**

The purpose of this manual is to introduce clinical professionals to an interactive multimedia, computer-based program for the treatment of post-traumatic stress disorder (PTSD) entitled "Living a Less Trauma-Driven Life Through Exposure Therapy." The program was developed to research the efficacy of a computerized treatment program for the treatment of PTSD via prolonged exposure therapy. This version of the program is intended for research use only.

The program utilizes a professional host, expert voice-over narration, verbal and on-screen instructions, patient exemplars, and professional therapists who provide psychoeducation, deliver the prolonged exposure treatment, and assign weekly homework. This multifaceted approach has been designed to deliver exposure therapy in a systematic, titrated method to maximize the alleviation of PTSD symptoms. Additionally, the program seeks to guide the participant in constructing a life that is less trauma focused and more fulfilling.

#### **Introduction to PE**

Prolonged exposure therapy (PE) is a form of exposure therapy designed to help individuals decrease distress they experience related to a specific traumatic event. This therapeutic method involves approaching trauma-related thoughts, physical sensations, emotions, and situations that the individual has been avoiding due to the distress they cause. Over time, repeated exposure to these trauma-related stimuli helps reduce the power they have to cause distress in the individual. PE is considered empirically validated and highly efficacious, in

addition to being a flexible therapy that can be used in many contexts, for many individuals, and in relation to many different types of trauma.

Desensitization to trauma-related stimuli is accomplished through two types of exposure. The first is imaginal exposure, in which the traumatic memory is revisited repeatedly. In this component, patients may be asked to verbally describe the traumatic event, listen to a recording of their trauma account, write about the event in detail, and to read their trauma account. The second type of exposure is *in vivo* exposure, in which the situations and objects that cause distress (but are not inherently dangerous) are revisited repeatedly. This component of the therapy may involve the individual repeatedly visiting specific locations or types of settings, and the client and therapist work together to develop a hierarchy of *in vivo* exposure assignments. Additionally, individuals enrolled in PE are encouraged to pursue activities that they value, enjoy, or previously enjoyed, as many of these activities may have been ceased due to the trauma-related distress they have been experiencing.

### **Advantages**

This program gives the patient access to a computer program that provides psychoeducation about the etiology, nature, maintenance of PTSD symptoms and systematic guidance through the process of reducing symptoms and overcoming difficulties in pursuing a meaningful, valued life. To maximize the patient's understanding and the reduction of PTSD symptoms, the program is designed to allow the patient to proceed at his or her own pace and includes repetition of important concepts. The patient is assessed regularly to track progress, ensure safety, and gather feedback about the patient's experience of the program and prolonged exposure therapy. Homework assignments ensure that the patient is given opportunity to practice

distress tolerance skills, make progress in confronting aversive trauma-related stimuli, and move toward a less trauma-driven life.

### **Format of the Manual**

This manual is designed to guide the trained clinician or researcher who will oversee the patient's progress through the computerized treatment program. The manual begins with general overview of the program and then covers the program's critical operational features. Instructions on startup, login procedures, program management, progress and performance review, and instructions for planned stops are all provided. The manual also includes orientation to session structure, summaries of session content, and details of possible program stops.

## **Program Sessions**

### **General Outline of Sessions**

To maintain confidentiality, each session requires that the patient login to the program. Each session also requires the patient to complete a mood assessment, a PTSD symptom assessment, and multiple SUDS ratings. The results of each mood and PTSD symptom assessments are displayed onscreen in the form of a line graph, which allows the patient to easily review their progress through the program and any changes in their mood or symptoms.

Each session includes introduction and/or review of psychoeducational information about PTSD and PE, the opportunity to choose one of four therapists, the opportunity to watch up to four different patient exemplars related to the content of the current session, in-session practice of skills or assignments, and a new homework assignment from the therapist. Each session concludes with a brief review of the main points of the session and of the homework assignment.

Throughout each session, quizzes ensure that the patient has acquired satisfactory mastery of the content. This information is analyzed by the program at session 5, and the results of the analysis determine whether the patient should progress to session 6 or should repeat previous sessions. The trained professional overseeing the patient will have administrative access that allows them to review the patient's progress and all data entered during the session.

### **Program Accommodations Recommended**

Each session of LALTDL is designed to require approximately 45-60 minutes. It is recommended that the patient and computer be located in an area that affords privacy and quiet, while also allowing the patient and the supervising personnel to access each other easily. Additionally, while the patient will be oriented to the program via the self-contained introduction video, it is recommended that the supervising personnel orients the client to the possibility and purpose of "program stops." These stops are deliberate pauses in the progression of a session that require a response from the supervising personnel. Program stops occur when the patient demonstrates repeated, unsatisfactory mastery of session objectives, when the patient endorses suicidal thoughts or behaviors, and when the patient indicates unusual responses that should be investigated.

When a stop occurs, the program will halt and a pop-up message will direct the patient to contact the supervising personnel. The patient will not be permitted to proceed until the supervisor enters a password, which will reinitiate the program exactly where it halted. Means of reaching the supervisor in the instance of a program stop should be made clear to the patient. In the case of a program stop due to suicidality, agency policy and clinical professional judgment is required. In such a situation, the supervising personnel should administer a thorough suicide assessment and, if the results of the assessment necessitate it, the program should be stopped and

the appropriate local agencies or providers should be contacted to provide additional care for the actively suicidal or highly distressed patient.

Finally, it is strongly recommended that the supervision personnel spend 3-5 minutes with the patient before and after each session. Before each session, personnel should inquire about the completion of homework and any problems that may have been encountered. After each session, the staff should inquire about the lesson viewed, any problems that may have been encountered, and remind the patient to complete his or her homework assignment.

### **Starting the Program LALTDL**

1. Double click on the WMU Interactive Therapy icon on the desktop to open the program.
2. Click the title of the program: Living a Less Trauma Driven Life Through Exposure Therapy.
3. The LALTDL program will open. The main screen provides the options of viewing program acknowledgements, watching an overview video that describes both PTSD and the treatment program, and the initiating the treatment program.
4. Upon selecting the treatment program, patients will be asked whether they are beginning their first session or if they already have a username and password. Patients who indicate that they are beginning their first session will immediately view the introduction video featuring the host of the treatment program. This video will orient the patient to the program and walk him or her through the process of selecting a username and password.

### **Session 1**

This session orients the patient to the treatment program and includes introduction to login procedures; the recurring session format, the possibility and purpose of program stops; the nature and purpose of mood assessment, trauma-related symptom assessment, and SUDS rating;

therapist options and selection process; the use of patient exemplars; session material; homework assignments and their importance, and a session review. The therapeutic goals of this session are educating the patient about PTSD, introducing exposure therapy and its components, and teaching deep breathing as a calming exercise. Patients are assigned homework to obtain a journal to bring to sessions and to practice controlled breathing exercises three times each day.

### **Session 1 Summary for Patient**

This session explains the nature of PTSD, a persistent condition that may develop after a person experiences an intensely traumatic event. Those with PTSD often report sensations of re-experiencing their trauma, elevated arousal, and avoiding reminders of the traumatic event. Although avoidance is very common and completely understandable, it actually contributes to the maintenance of PTSD symptoms.

This session also introduces the concept of prolonged exposure therapy, which involves repeated, gradual exposure to reminders of traumatic event. Over time, this process of exposure results in desensitization to distressing reminders of the trauma and overall decreases in PTSD symptoms. The pace of the prolonged exposure treatment program is determined by each client's progress. Finally, this session introduces controlled breathing exercises. These exercises can be used to calm oneself by slowly exhaling and thinking of a soothing word such as "calm" or "relax."

### **In this session patients will be introduced to:**

#### *1. The Mood Assessment*

Each session requires the patient to complete a mood assessment that consists of several screens of questions that assess symptoms of depression and suicidal ideation. The patient must select their preferred response from provided answers and may change their answers on the

current page. The patient must answer each question on each page and may do so at his or her own pace. The patient proceeds from page to page by clicking "Continue to next section."

### *2. The Mood Assessment Graph*

Each session will display two line graphs after the completion of the mood assessment. The first graph displays the patient's score only for the current session. The second graph displays the patients mood scores across all completed sessions.

### *3. The PTSD Symptom Assessment*

Each session requires the patient to complete a PTSD symptom assessment that consists of several screens of questions that assess symptoms of PTSD. Each question asks about the frequency and intensity of the targeted symptom. The patient must select their preferred response from provided answers and may change their answers on the current page. The patient must answer each question on each page and may do so at his or her own pace. The patient proceeds from page to page by clicking "Continue to next section."

### *4. The PTSD Symptom Assessment Graph*

Each session will display two line graphs after the completion of the PTSD symptom assessment. The first graph displays the patient's score only for the current session. The second graph displays the patients PTSD symptom scores across all completed sessions.

### *5. The Subjective Units of Distress Scale (SUDS) Rating*

Each session requires that the patient evaluates their distress on a numeric scale at different points throughout the session. This scale is used to ensure that patients are not too highly distressed by any session content and that any elevated levels of distress experienced during exposure tasks have decreased by the conclusion of the current session. If the patient's

SUDS rating is markedly high at the end of a task or session, they will be asked to repeat the exposure task or to repeat controlled breathing exercises as is appropriate for the session.

### *6. Typical Session Format*

Patients are given the choice of one of the four therapists each session. The main ideas of prior sessions are reviewed and new content is introduced. Each session poses multiple-choice questions to ensure that the patient understands the main ideas of all the content that has been presented to them thus far. As required by the particular session, clients are asked to engage in exposure tasks and controlled breathing exercises. At the end of each session, patients are asked to provide their subjective opinion of program material. Session reviews and concluding videos often correspond to the particular opinions endorsed by the patient.

### *7. Therapists*

The patient is oriented to the four therapist options, including the ability to select a new therapist each session or to continue with the same therapist for multiple sessions. Patients are permitted to view a therapist overview video to help guide their choice.

### *8. Patient Exemplars*

Each of the four patient exemplars used throughout the program are introduced. The introduction video acquaints the patient with the storyline for each patient exemplar and his or her feelings about their experience with exposure therapy. These patient exemplars service as examples and encouragement throughout the LALTDL program.

## **Session Content Summary**

1. Login
2. Mood assessment
3. Psychoeducation about PTSD and prolonged exposure therapy

- a. PTSD is a real condition
  - b. Avoidance can maintain PTSD symptoms
  - c. Prolonged exposure therapy says, "Confront your trauma and it will retreat."
  - d. Intermittent patient exemplars
4. PTSD symptom assessment
  5. Controlled breathing introduction and practice
  6. Review

### **Homework**

Purchase a notebook to bring to all future sessions. Practice controlled breathing exercises at least three times each day.

### **Program Stops**

Program stops ("stops") are points within the treatment program when it asks the patient to contact the supervising personnel. The supervisor should determine and discuss the reason for the current stop, and once the issue is resolved, the supervisor should enter the administrator name and password. This login information is required to reinitiate the program.

Anticipated Stops for Session 1:

1. Endorsement of suicidal ideation or behavior
2. Responding to comprehension questions in ways that indicate lack of understanding
3. If printing function does not work
4. If all session evaluation questions are answered negatively

### **Session 2**

This session begins with the mood, PTSD symptom, and SUDS assessments. After selecting a therapist for the session, the lesson begins with further psychoeducation about PTSD,

prolonged exposure therapy, and the role of avoidance. The lesson then proceeds to the first exposure assignment: writing a narrative of the traumatic experience. Patient exemplars are provided before the patient is asked to write each draft. SUDS ratings are required after each draft. The patient is asked to write a total of three drafts of his or her trauma story, each with increasing levels of detail. Next, the patient is asked to copy the third draft and take a SUDS rating and to continue doing so until the computer tells them to stop.

The therapeutic goals of this session are to ensure that the patient understands PTSD, the principles and process of prolonged exposure therapy, the purpose of the SUDS ratings, and that the patient has begun taking steps to confront his or her anxiety related to the trauma that they experienced.

### **Session Content Summary**

1. Mood assessment
2. PTSD symptom assessment
3. SUDS review and assessment
4. Lesson
  - a. Review and further psychoeducation
    - i. PTSD and avoidance
    - ii. The principles and process of prolonged exposure
  - b. First step of exposure: writing your trauma story
    - i. Purpose and assignment
    - ii. Patient exemplars
    - iii. Controlled breathing exercises
5. Review of content covered thus far

## **Homework**

Copy most detailed version of story two times a day and take a SUDS rating each time. Practice controlled breathing exercises three times a day.

## **Program Stops Anticipated for Session 2**

1. Endorsement of suicidal ideation or behavior
2. Endorsement of marked worsening of mood or PTSD symptoms
3. If printing function does not work
4. If all session evaluation questions are answered negatively

## **Session 3**

This session begins with the mood and PTSD symptom assessments. The patient is also required to answer a question regarding homework completion. The lesson begins with patient exemplars that provide examples of experiences with writing and reading traumatic experiences. The lesson then proceeds to psychoeducation about the many pathways to exposure. The second exposure assignment requires the patient to read aloud and record their narrative four times. Patient exemplars are provided before the patient is asked to record and SUDS ratings are taken after each recording. When the patient's SUDS ratings are acceptably low, the lesson proceeds to more information and patient exemplars about avoidance.

The therapeutic goals of this session are to ensure that the patient understands the role and effects of avoidance and that prolonged exposure therapy is a repetitive process that involves many types of exposure. The patient accomplishes the second step in exposure: reading aloud and recording their trauma story.

## **Session Content Summary**

1. Mood assessment
2. PTSD symptom assessment
3. Homework completion check
4. Lesson
  - a. The many pathways to exposure
  - b. Second step of exposure: reading and recording the trauma story
  - c. More about avoidance
  - d. Controlled breathing exercises
5. Review

## **Homework**

Read the trauma story aloud at least two times each day and take a SUDS rating each time.  
Listen to your story at least two times a day and take a SUDS rating each time. Continue to practice controlled breathing.

## **Program Stops Anticipated for Session 3**

1. Endorsement of suicidal ideation or behavior
2. Endorsement of marked worsening of mood or PTSD symptoms
3. If recording or saving function does not work
4. If all session evaluation questions are answered negatively

## **Session 4**

This session begins with the mood and PTSD symptom assessments. The patient is also required to answer questions regarding trends in their SUDS ratings and regarding homework

completion. The lesson begins with psychoeducation about in-vivo exposure. The lesson then proceeds to viewing patient exemplars about beginning in-vivo exposure, making an action plan, and the experience of completing in-vivo exposure tasks.

The therapeutic goals of this session are to ensure that the patient understands the purpose and process of in-vivo exposure. The patient follows the five steps to develop their own action plan.

### **Session Content Summary**

1. Mood assessment
2. PTSD symptom assessment
3. SUDS review and homework check
4. Lesson
  - a. Psychoeducation about in-vivo exposure
  - b. Patient exemplars about in-vivo exposure
  - c. Developing an in-vivo exposure action plan
    - i. Make a list of avoided stimuli
    - ii. Develop specific actions to counter avoidance
    - iii. Prioritize by difficulty
    - iv. Break actions into smaller steps
    - v. Faithfully monitor SUDS
    - vi. Be mindful about the in-vivo exercises
  - d. Controlled breathing exercises
5. Review

## **Homework**

Continue working on your own action plan by selecting one easy and one difficult task from the list. Break down the tasks into steps if necessary and work on them every day. Record a SUDS rating each time you work on a task or a step of a task.

## **Program Stops Anticipated for Session 4**

1. Endorsement of suicidal ideation or behavior
2. Endorsement of marked worsening of mood or PTSD symptoms
3. Endorsement of failure to complete homework
4. If all session evaluation questions are answered negatively

## **Session 5**

This session begins with the mood and PTSD symptom assessments, followed by a review of developing an in-vivo action plan. The patient is also required to answer questions regarding trends in their SUDS ratings and regarding homework completion. The lesson begins with psychoeducation about in-vivo exposure, enhanced with various patient exemplars in-vivo exposure. Other topics in the lesson are appropriate dosing and durations for exposure, as well as types of exposure and how to move on from a traumatic event.

The therapeutic goals of this session are to ensure that the patient understands the proper process of and the potential benefits of in-vivo exposure.

## **Session Content Summary**

1. Mood assessment
2. PTSD symptom assessment

3. SUDS review and homework check

4. Lesson

a. Psychoeducation about in-vivo exposure

i. Dosing of exposure

ii. Duration of exposure

ii. Types of exposure: simple, complex, mixed

iii. When to move on

b. Patient exemplars about in-vivo exposure

c. Controlled breathing exercises

5. Review

### **Homework**

Continue working on same two in-vivo activities as last week, and continue until they are no longer significantly distressing. Select two additional activities from your list. Break down the tasks into steps if necessary and work on them every day. Record a SUDS rating each time you work on a task or a step of task.

### **Program Stops Anticipated for Session 5**

1. Endorsement of suicidal ideation or behavior
2. Endorsement of marked worsening of mood or PTSD symptoms
3. Endorsement of failure to complete homework
4. If all session evaluation questions are answered negatively

### **Session 6**

This session begins with narrator indicating that if the patient's anxiety levels have decreased significantly, this may be the final session. The patient is required to complete the

mood and PTSD symptom assessments. The lesson consists of patient exemplars that discuss the experience of completing exposure therapy. These exemplars are accompanied by intermittent, therapist-led review of psychoeducation about PTSD and exposure therapy.

The therapeutic goal of this session is to review the progress made by the patient and the exposure therapy process. Overcoming trauma is described as an ongoing journey.

### **Session Content Summary**

1. Mood assessment
2. PTSD symptom assessment
3. Patient exemplars about completing exposure therapy
4. Therapist-led review of psychoeducation about PTSD and exposure therapy
5. Conclusion

### **Homework**

Continue working on your own action plan by selecting one easy and one difficult task from the list. Break down the tasks into steps if necessary and work on them every day. Record a SUDS rating each time you work on a task or a step of task.

### **Program Stops Anticipated for Session 6**

1. Endorsement of suicidal ideation or behavior
2. Endorsement of marked worsening of mood or PTSD symptoms
3. Endorsement of failure to complete homework
4. If all session evaluation questions are answered negatively

APPENDIX B  
HSIRB Letter of Approval

WESTERN MICHIGAN UNIVERSITY



Human Subjects Institutional Review Board

Date: February 18, 2014

To: Amy Naugle, Principal Investigator  
Marie Barrett, Student Investigator for thesis

From: Daryle Gardner Bonneau, Ph.D., Vice Chair  
*Daryle Gardner - Bonneau*

Re: HSIRB Project Number 13-12-07

This letter will serve as confirmation that your research project titled "Beta-Testing of an Interactive Multimedia Computer Program of Exposure Therapy for PTSD" has been **approved** under the **full** category of review by the Human Subjects Institutional Review Board. The conditions and duration of this approval are specified in the Policies of Western Michigan University. You may now begin to implement the research as described in the application.

Please note: This research may **only** be conducted exactly in the form it was approved. You must seek specific board approval for any changes in this project (e.g., *you must request a post approval change to enroll subjects beyond the number stated in your application under "Number of subjects you want to complete the study."*) Failure to obtain approval for changes will result in a protocol deviation. In addition, if there are any unanticipated adverse reactions or unanticipated events associated with the conduct of this research, you should immediately suspend the project and contact the Chair of the HSIRB for consultation.

**Reapproval of the project is required if it extends beyond the termination date stated below.**

The Board wishes you success in the pursuit of your research goals.

**Approval Termination: December 18, 2014**