THE IMPACT OF PROLONGED EXPOSURE ON PTSD SYMPTOMS, ASSOCIATED PSYCHOPATHOLOGY, AND MEDICATION ADHERENCE IN PEOPLE LIVING WITH HIV

A thesis submitted
to Kent State University in partial fulfillment of the requirements for the degree of Master of Arts

by

Maria L. Pacella

August, 2010
Thesis written by
Maria L. Pacella
B. A., St. Vincent College, 2006
M. A., Kent State University, 2010

Approved by
Douglas L. Delahanty, Ph.D.  Advisor
Maria S. Zaragoza, Ph.D.  Chair, Department of Psychology
Timothy Moerland, Ph.D.  Dean, College of Arts and Sciences

ii
# TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>LIST OF TABLES</td>
<td>iv</td>
</tr>
<tr>
<td>LIST OF FIGURES</td>
<td>v</td>
</tr>
<tr>
<td>ACKNOWLEDGMENTS</td>
<td>vi</td>
</tr>
<tr>
<td>INTRODUCTION</td>
<td>1</td>
</tr>
<tr>
<td>METHOD</td>
<td>17</td>
</tr>
<tr>
<td>Participants</td>
<td>17</td>
</tr>
<tr>
<td>Procedures</td>
<td>21</td>
</tr>
<tr>
<td>Measures</td>
<td>23</td>
</tr>
<tr>
<td>RESULTS</td>
<td>29</td>
</tr>
<tr>
<td>DISCUSSION</td>
<td>40</td>
</tr>
<tr>
<td>REFERENCES</td>
<td>46</td>
</tr>
</tbody>
</table>
LIST OF TABLES

TABLE 1…………………………………………………………………………………………………….. 30
FREQUENCY OF GENDER AND RACE BY GROUP AT BASELINE, POST-INTERVENTION, AND 3-MONTHS POST-INTERVENTION

TABLE 2…………………………………………………………………………………………………….. 31
MEANS AND STANDARD ERRORS FOR CONTINUOUS LEVEL DEMOGRAPHIC VARIABLES BY GROUP AT BASELINE, POST-INTERVENTION, AND 3-MONTHS POST-INTERVENTION

TABLE 3…………………………………………………………………………………………………….. 32
MEANS AND STANDARD DEVIATIONS OF PSYCHOPATHOLOGY-RELATED OUTCOMES AND ADHERENCE SELF-EFFICACY BY GROUP AT BASELINE, POST-INTERVENTION, AND 3-MONTHS POST-INTERVENTION (N = 43)

TABLE 4…………………………………………………………………………………………………….. 33
MEANS AND STANDARD DEVIATIONS OF PSYCHOPATHOLOGY-RELATED OUTCOMES AND ADHERENCE OUTCOMES THROUGH 6-MONTHS POST-INTERVENTION (N = 27)
LIST OF FIGURES

FIGURE 1.................................................................................................................. 18
FLOW DIAGRAM OF PARTICIPANT PROGRESS THROUGHOUT THE VARIOUS PHASES OF THE PRESENT RANDOMIZED CONTROLLED TRIAL.

FIGURE 2.................................................................................................................. 39
PLOTTED VALUES ILLUSTRATING HIV-RELATED POSTTRAUMATIC STRESS SYMPTOMS (PTSS) ASSESSED WITH THE POSTTRAUMATIC SYMPTOM SCALE-INTERVIEW (PSS-I) AT BASELINE, POST-INTERVENTION, AND 3-MONTHS POST-INTERVENTION (N=43).

FIGURE 3.................................................................................................................. 39
PLOTTED VALUES ILLUSTRATING ADHERENCE SELF-EFFICACY AT BASELINE, POST-INTERVENTION, AND 3-MONTHS POST-INTERVENTION (N =42).
Acknowledgments

I wish to acknowledge and extend special thanks to my advisor, Douglas Delahanty, for his continued support, advice, and expertise throughout this project, as well as to Jessica Boarts and Aaron Armelie, for their diligent work in the execution of this project. I would also like to thank the members of my thesis committee (Dr. David Riccio, Dr. Jeff Ciesla, and Dr. Joel Hughes). Finally, I wish to acknowledge and thank the Delahanty Lab (Adam Morris, Crystal Gabert-Quillen, Bryce Hruska, Leah Irish, and Eddie Waldrep) for their encouragement and support.
INTRODUCTION

Individuals exposed to a traumatic event are at risk for developing posttraumatic stress disorder (PTSD), a condition known to produce functional impairment and to adversely impact quality of life. Whereas incidence rates of PTSD in the general population range between 7-10% (Kessler et al., 2005; Kessler, Sonnega, Bromet, Hughes, & Nelson, 1995), certain groups may be at higher risk for developing the disorder than others. People living with HIV (PLWH) report disproportionately high levels of trauma exposure and have a greater incidence of PTSD (22-54%) than the general population (Gore-Felton, Koopman, & Spiegel, 2001; Kimerling, et al., 1999; Martinez, Israelski, Walker, & Koopman, 2002; Smith, Egert, Winkel, & Jacobson, 2002). PLWH also suffer from high rates of HIV-related PTSD, a relatively recently documented phenomenon. With the publication of the fourth edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM) in 1994, (American Psychiatric Association), diagnosis with a life-threatening physical or terminal disease was first recognized as a traumatic event that may lead to the development of PTSD. Prior to this time, diagnosis with HIV, or any other life-threatening illness, was excluded as an event that could lead to PTSD.

Research examining incidence rates of HIV-related PTSD has demonstrated that between 30%-61% of PLWH develop PTSD from either a diagnosis of HIV, or from other issues related to the HIV disease (Kelly et al., 1998; Kimerling et al., 1999;
Martinez et al., 2002; Safren, Gershuny, & Hendriksen, 2003). PLWH experience one of the highest rates of PTSD observed for any medical trauma/diagnosis population (e.g., cancer patients, myocardial infarction (MI), cardiac surgery, stroke, childbirth, miscarriage, abortion, etc.) (Tedstone & Tarrier, 2003).

Posttraumatic Stress Disorder

To receive a diagnosis of PTSD, an individual must react with intense fear, helplessness, or horror after exposure to a traumatic event that involved actual or threatened death to oneself or others. Additionally, PTSD involves a host of symptoms generally categorized in the following three clusters: reexperiencing, avoidance and numbing, and hyperarousal (American Psychiatric Association, 1994). Reexperiencing symptoms include unwanted thoughts or images of the trauma, often in the form of flashbacks or nightmares. Symptoms of avoidance and numbing include disengaging in or avoiding trauma-related thoughts, people, feelings, places, or activities. Hypervigilance, anxiety, problems with sleep or concentration, irritability, and motor restlessness are common expressions of hyperarousal symptoms. Individuals who suffer from PTSD display heightened risk of comorbid disorders (e.g., depression, anxiety) (Breslau, 1991; Kessler et al. 1995; Marshall et al., 2001), suicidal ideation (Marshall et al., 2001), impaired psychosocial functioning (Kuhn, Blanchard, & Hickling, 2003; Maia et. al., 2007), physical health complications (Lauterbach, Vora, & Rakow, 2005; Sareen
et. al., 2007; Schnurr, Green, & Stacey, 2007), and poor quality of life (Sareen et al., 2007).

HIV

The Center for Disease Control and Prevention (CDC) reported that 1.1 million adults and adolescents in the United States (prevalence rate: 447.8 per 100,000 population) were living with HIV at the end of 2006. HIV is a retrovirus that compromises the immune system by destroying white blood cells that protect the body from infection (specifically CD4+ T-cells), rendering the individual susceptible to opportunistic infections (O’Cleirigh, Hart, & James, 2008). Once an HIV molecule enters the body, it attaches to a host cell of the immune system and HIV ribonucleic acid (RNA) is released into the cell (Sloan, Collado-Hidalgo, & Cole, 2007). Reverse transcriptase, which reverses the usual pattern of translating a genetic message (DNA → RNA), then transcribes the RNA into DNA and the DNA becomes integrated into the host cell’s DNA by the enzyme integrase. The HIV infected DNA then becomes part of the host DNA and is replicated to produce new HIV particles (Sloan, Collado-Hidalgo, & Cole, 2007).

Symptoms such as fever, fatigue, and muscle weakness are associated with the beginning stages of HIV, whereas symptoms such as night sweats, severe fatigue, and peripheral neuropathy are associated with later stages of HIV (O’Cleirigh, Hart, & James, 2008). Though an individual with HIV may remain symptom free for years, HIV progresses into
AIDS when the number of CD4 cells falls below 200 cells/mm$^2$ (O’Cleirigh, Hart, & James, 2008; Sloan, Collado-Hidalgo, & Cole, 2007).

Most PLWH are prescribed a regimen of highly active antiretroviral treatment (HAART), a combination of different medications from at least 2 of the six primary antiretroviral drug classes (Department of Health and Human Services, 2009). HAART has an extremely high success rate at countering drug resistance and controlling HIV (decreasing HIV viral load, increasing number of CD4 lymphocyte counts, and increasing length of survival) (Hunt et al., 2003; Lima et al., 2007; Murphy et al., 2001; Palella et al., 1998). However, the complexity of this medication regimen makes adherence difficult (for a review, see Chesney, 2003), as many of the HAART therapies involve rigorous dietary restrictions, 3 or more daily medications (which may translate into a dozen pills a day) and various side effects including fatigue, nausea, diarrhea, insomnia, abnormal fat accumulation, taste alterations, and peripheral neuropathy (Ammassari et al., 2001; Chesney, 2003; Chesney et al., 1999; Laws, Wilson, Bowser, & Kerr, 2000). Suboptimal adherence and non-adherence (rates less than 90-95%) are large problems, as they are both associated with increased viral load, faster immune system deterioration, opportunistic infections, and drug resistant forms of HIV (Chernoff, 2007; Chesney, 2003; Weaver et al., 2005), one consequence of which is a higher probability of transmitting the virus to others (Paterson et al., 2000). Bangsberg et al. (2001) previously found that every 10% decline in adherence was associated with a doubling of viral load and a 28% increased risk of progression to AIDS. Unfortunately, adherence rates in
PLWH are far from optimal, with one study reporting nonadherence rates ranging from 18-73% (Weaver, 2005).

Consequences of PTSD in PLWH

PLWH are faced not only with health-related challenges consequent to the lifestyle changes and the chronic, unpredictable nature of the disorder, but also with non-health related social and psychological challenges due to the difficulties associated with obtaining social support for this stigmatizing disease (Mulder et al., 1994). These issues alone deserve attention from the mental health community (Katz & Nevid, 2005); however an accompanying diagnosis of PTSD or comorbid disorders present additional difficulties. Cohen and Rodriguez (1995) proposed a theoretical model to explain the bidirectional relationship between physical disease and psychological disturbance. They suggested that diagnosis with a physical disease may lead to alterations in biological, behavioral, cognitive, and social pathways that influence affective and psychological disturbance. Vice versa, affective disturbances lead to alterations in the aforementioned systems which serve to worsen parameters of the physical disease (Cohen & Rodriguez, 1995; Chandra, Desai, & Ranjan, 2005). This model can provide a simple framework for understanding the interplay of HIV, PTSD, and related psychopathology.

The course of HIV infection is often dependent on not only disease qualities (route of transmission, quantity of viral exposure, strain of the virus) and individual factors (age, gender, presence of other infection, genetic factors: Sloan,
Collado-Hidalgo, & Cole, 2007), but also on psychosocial factors, such as distress, depression, PTSD and cumulative stressful life events (Leserman, 2003). Given the widespread evidence that psychosocial factors influence immunity and disease through both direct and indirect routes (Ader, 2007; Cohen & Herbert, 1996), these psychosocial factors may explain some of the variability in disease course of HIV (Chandra, Desai, & Ranjan, 2005; Cohen & Herbert, 1996; Leserman, 2003; 2008; Leserman et al., 1999; Tsao, Dobalian, Moreaua, & Dobalian, 2004). Psychosocial factors have been shown to directly impact HIV disease course by being associated with compromised immunity. Both PTSD and depression have been associated with lower CD4/CD8 cell count ratios (Brief et al., 2004; Reilly et al., 2009). Research also suggests that HIV-related PTSD is specifically associated with a higher risk of developing other psychological conditions (especially major depression) (Kelly et al., 1998) and with experiencing a greater number of HIV physical symptoms (Katz & Nevid, 2005). PTSD can also indirectly impact disease course in PLWH through several mechanisms. The hallmark PTSD symptoms of avoidance may lead PLWH to not adhere to medication regimens or to miss more doctors’ appointments, as both of these events are a constant reminder of their diagnosis (Delahanty, Bogart, & Figler, 2004; Radcliffe et al., 2007). This finding is consistent with other reports that patients with PTSD stemming from medical events have been found to avoid medical treatments (Shalev, Schreiber, Golai, & Melmed, 1993). PTSD symptoms stemming from diagnosis/living with HIV/AIDS may be especially likely to be associated with poor adherence to medication regimens, as 64% of PLWH with adherence problems were found to meet PTSD criteria related to HIV (Safren et al., 2003). Avoidance
symptoms of PTSD may also prevent individuals from disclosing their HIV status to
friends, family, and employers (Radcliffe et al., 2007).

Individuals who develop acute or chronic PTSD also tend to display continued
negative posttraumatic cognitions, such as negative thoughts about the self (I cannot cope
with this situation) and the world in general (the world is a dangerous place), and self
blame (trauma-related guilt and responsibility) (Foa & Jaycox, 1999; Foa & Rauch, 2004;
Foa, Ehlers, Clark, Tolin, & Orsillo, 1999). These cognitions are associated with an
inability to cope with threat and stress, which may lead to counterproductive ways of
coping and risky behaviors such as poor adherence and substance use. Further, the	
tendency of individuals with PTSD to avoid trauma-related thoughts serves to prevent the
individual from overcoming or disproving these negative cognitions (Foa & Jaycox,
1999; Nemeroff et al., 2006). Therefore, negative posttraumatic cognitions contribute to
the development of the disorder through the maintenance of counterproductive thought
patterns and through preventing positive cognitive changes (Foa et al., 1999a; 1999b) that
may alter the perception of themselves, their world, and the trauma itself. Research also
suggests that lower perceived threat and higher controllability are associated with more
positive psychological functioning in PLWH (Pakenham & Rinaldis, 2001). Given that
negative posttraumatic cognitions are related to a perceived inability to cope with threat,
the irrational thought patterns that emerge in individuals with continued negative
posttraumatic cognitions may lead to a negative prognosis for PLWH.
Comorbid Disorders

PTSD also increases health risk in PLWH, as PTSD is also highly comorbid with depression. Rates of comorbidity for PTSD and depression range from 35-50% (Breslau et al., 1997, 1998; Keane & Kaloupek, 1997; Kessler et al., 1995; Tsao et al., 2004). Rates of depression in PLWH are also high, as recent studies estimated rates to range between 5-45% (Olatunji, Mimiaga, O’Cleirigh, Safren, 2006). Research suggests that depression is associated with nonadherence (Boarts, Sledjeski, Bogart, & Delahanty, 2006; Sledjeski, Delahanty, Bogart, 2005; Vranceanu et al., 2008) and faster disease progression (Boarts et al., 2006; Kalichman, Sikkema, DiFonzi, Luke, & Austin, 2002; Leserman, 2003; Leserman et al., 2002). Results from a meta-analysis revealed that depression is associated with 3 times the risk of nonadherence to medical treatment regimens in a variety of medically ill populations (DiMatteo, Lepper, Croghan, 2000). Though it is difficult to tease apart the independent effects of PTSD and depression given their high rates of comorbidity, results from a recent study revealed that depression, and not PTSD, predicted lower CD4 cell counts and higher viral load, whereas both disorders were associated with low medication adherence (Boarts et al., 2006). On the other hand, a similar study revealed that depressive symptoms (as compared to PTSD and comorbid depression and PTSD) had the strongest relationship to CD4 cell counts and medication adherence (Sledjeski, Delahanty, & Bogart, 2005). However, a few studies have found that depressive symptoms were positively correlated with higher adherence to HIV medications in a sample of substance using PLWH (Berger-Greenstein et al., 2007) and
that HIV-related PTSD was positively related to adherence (Schonnesson, Diamond, Ross, Williams, & Bratt, 2006; Schonnesson, Williams, Ross, Bratt, & Keel, 2007).

Substance use is also common in both PTSD and PLWH. PTSD rates range from 30-50% in substance abusers (Dansky, Roitzsch, Brady, & Saladin, 1997), and comorbidity rates of substance abuse/dependence in PTSD are high (up to 43%: Breslau, Davis, & Schultz, 2003; Deering, Glover, Ready, Edelman, & Alarcon, 1996; Friedman, 1991; Friedman & Yehuda, 1995; Kessler, Sonnega, Bromet, Hughes, & Nelson, 1995). Further, HIV is associated with increased risk for substance use disorders as alcohol and substance use disorders are between 2.5 to 7.5 more prevalent in PLWH than in the general population (Pence, Miler, Whetten, Eron, & Gaynes, 2006). Substance use alone is independently associated with faster disease progression, less than optimal medication adherence, failure of HAART medication regimens, and immune suppression (Brief et al., 2004; O’Cleirigh, Hart, & James, 2008; Petry, 1999).

Taken together, PTSD, depression, and substance use may cumulatively confer a detrimental effect on disease course and adherence to medication regimens. Considering the negative health consequences of inconsistent adherence, individuals with these comorbid disorders may be at risk for transmitting potent HIV strains to others. Several studies have also demonstrated that PLWH with PTSD who use substances suffer from a greater decline in immune function (as assessed through CD4 cell counts and CD4/CD8 ratios) and health status than PLWH without these disorders (Crum et al., 1996; Kimerling et al., 1999; Samet et al., 2003). Substance use and PTSD may also contribute to negative health behaviors that either maintain psychological disturbances or place
PLWH at even higher risk of developing physical health problems or other infections (Brief et al., 2004, Myers & Durvasula, 1999).

Treatment Studies

The high prevalence of HIV combined with the host of psychological variables that may influence its progression make this chronic illness a good candidate for intervention studies (Leserman, 2003; Leserman et al., 2005; Sloan, Collado-Hidalgo, & Cole, 2007; Whetten, Reif, Whetten, & Murphy-McMillan, 2008). Psychotherapy is often a more practical and efficacious intervention for psychological disorder in PLWH, as the number of medications that patients take is already high, and the side effects associated with pharmaceutical remedies may worsen quality of life (Olatunji, Mimiaga, O’Cleirigh, Safren, 2006). Mental health services for PLWH also directly result in fewer dollars being spent on HIV treatment and more positive health outcomes (Whetten et al., 2006; Whetten et al., 2008), and may be associated with a decreased risk of mortality from AIDS and related infections (Cook et al., 2004).

Results from a recent meta-analysis conducted on group and individual stress management intervention studies revealed small to moderate effects for reducing levels of anxiety, depression, distress, and fatigue, as well as improving quality of life in PLWH (Scott-Sheldon, Kalichman, Carey, & Fielder, 2008). Interestingly, interventions were less effective at reducing anxiety when they included information about medication adherence, and more effective when the level of anxiety was greater at the beginning of
the study. Two similar meta-analyses on group psychotherapy (Himelhoch, Medoff, & Oyeniyi, 2007) and individual psychotherapy in depression (Olatunji, Mimiaga, O’Cleirigh, Safren, 2006) concluded that CBT, whether focused directly or indirectly on depression in HIV, was associated with declines in depression symptomology.

Despite the demonstrated efficacy of psychotherapeutic interventions for depression, the majority of mental health needs, specifically regarding PTSD, are unmet in PLWH (Whetten et al., 2008). Research suggests that addressing PTSD and mental health comorbidities may be a necessary step in the process of improving adherence in PLWH, given that PTSD may be partially responsible for nonadherence (Brief et al., 2004; Chander et al., 2006; Cook et al., 2006). In a recent case study examining the efficacy of exposure-based cognitive-behavioral therapy for PTSD, Chernoff (2007) reported improvements in PTSD and depressive symptoms and in medication adherence following therapy. Further, the skills learned in treatment also prevented a recurrence of PTSD when the individual was faced with a subsequent trauma. Developing these skills in newly diagnosed PLWH may be especially important, as a prior diagnosis of PTSD (from a non-disease related trauma) is one of the largest predictors of PTSD in response to HIV infection (Katz & Nevid, 2005; Kelly et al., 1998). However, one study estimated that 78% of the women with partial PTSD and 59% of the women with full PTSD were not receiving treatment for their disorder (Martinez et al., 2002). Additionally, Israeliski and colleagues (2007) reported that 43% of patients recruited from a primary care services system who met criteria for either depression, PTSD, or acute stress disorder were not being treated for their psychiatric problems. Given that depression and
substance use are often a consequence of PTSD, successful treatment of PTSD in PLWH may be associated with a consequent decrease in comorbid symptoms.

Taken together, PLWH are in need of effective interventions to decrease post-traumatic psychological symptoms and other comorbid symptoms, especially considering their association with non-adherence, negative overall functioning, and detrimental effects on the immune system. Whereas rates of general anxiety disorders in PLWH seem to be comparable or even lower than rates of anxiety disorders in the general population, rates of PTSD in PLWH (Myers & Durvasula, 1999; O’Cleirigh, Hart, & James, 2008) are high. Perhaps through addressing the underlying PTSD in PLWH, related psychopathology and health outcomes may also demonstrate consequent improvements.

**Prolonged Exposure therapy**

Prolonged exposure (PE) therapy, a form of cognitive-behavioral therapy, is considered the most appropriate and first-line PTSD treatment (Ballenger et al., 2000; Foa, 1999a; 2003; Foa et al., 2009). To date, PE is also the only empirically supported evidence-based treatment available for individuals with PTSD (Institute of Medicine, 2008). Research has demonstrated the efficacy of PE for the treatment of PTSD and comorbid symptoms across several controlled studies with varied trauma samples (for a review, see Powers, Halpern, Ferenschak, Gillihan, & Foa, in press). PE is also equally effective at decreasing PTSD symptoms in African-American and Caucasian participants (Zoellner et al., 1999). Recent research has suggested that the treatment of PTSS in
substance using individuals may consequently result in decreases in substance use, and PE may be beneficial for those who are substance-dependent (for a review, see Henslee & Coffey, 2010). Further, in a recent state-of-the-science review, Nemeroff and colleagues (2006) reported that the Substance Abuse and Mental Health Services Administration recommends PE for national dissemination, as it represents a model program for PTSD treatment. The superior efficacy of PE (as compared to cognitive restructuring and the combination of cognitive restructuring and PE) at producing improvements in good end-state functioning was also cited (Nemeroff et al., 2006).

PE involves repeated imaginal exposure to the traumatic event (trauma reliving) and repeated in-vivo exposure to situations encountered in daily life that may be avoided due to the traumatic memory or PTSS (Foa, Rothbaum, Riggs, & Murdock, 1991). Through habituation, the traumatic memory becomes incorporated into normal cognitive schemas which then prevent generalization of the traumatic memory to safe situations (Foa & Rothbaum, 1998). Techniques of PE also involve systematic repeated confrontation with traumatic memories that serve to disconfirm negative posttraumatic cognitions (Foa & Rauch, 2004). Foa and Rauch (2004) demonstrated that PE therapy alone was just as effective at reducing negative posttraumatic cognitions, depression, and general anxiety as PE with an additional cognitive restructuring component in a sample of adult female sexual and nonsexual assault victims. Despite the high rates of PTSD in PLWH, and the demonstrated efficacy of PE therapy in individuals with PTSD, no study to date has examined the efficacy of PE for PTSD in a sample of PLWH.
Adapting PE for HIV

PE was designed specifically to treat PTSD in female rape victims; however, subsequent research has demonstrated its efficacy in a variety of trauma populations. Although it is a manualized, structured intervention, slight adaptations must be considered when testing PE in PLWH. Specifically, researchers have suggested that interventions should be tailored towards both men and women with HIV, specifically those with complex traumatic histories (O’Cleirigh, Hart, & James, 2008; Scott-Sheldon et al., 2008), as a preexisting diagnosis of PTSD may serve to interfere with HIV treatment and quality of life (Martinez et al., 2002).

Despite the demonstrated efficacy of PE for various populations, and the widespread occurrence of HIV-related PTSD in PLWH, a recent article by Kagee (2008) stimulated controversy regarding the HIV-related PTSD diagnosis and the appropriateness of PTSD treatment for this group of individuals. Specifically, he argued that a PTSD diagnosis is not appropriate for individuals whose symptomology arises from fear of any future event. However, PTSD stemming from a medical diagnosis or life-threatening disease may indeed involve intrusions about events that are likely to happen in the future, whereas intrusions from external physical traumas (combat, sexual or physical assault, other violent acts, motor vehicle accidents, natural disasters) are based solely on an event that occurred in the past (Mundy & Baum, 2004). For example, PLWH may experience intrusions based on physical and health changes due to worsening of the disease, potential of a shortened life span, hassles and complications of treatment,
stigma of the illness, and bereavement for the loss of others due to the disease (Chandra, Desai, & Ranjan, 2005; Mundy & Baum, 2004; Siegel & Krauss, 1991; Tedstone & Terrier, 2003). Kagee (2008), however, stated that PTSD must arise from the notification of an HIV diagnosis, and all symptoms must relate to that specific point in time (intrusions must be centered around the person who informed them of the diagnosis, re-experiencing symptoms must involve flashbacks to the point of learning about the diagnosis, cues that remind them of the situation of being informed). Should this be the case, treatment approaches (including PE) may be wrongfully attempted in patients whose PTSD does not stem from the original time of diagnosis. However, little to no research exists on specific treatments for PTSD in PLWH, so this theoretical question has yet to be addressed through empirical studies.

The present study tested the efficacy of PE therapy at reducing HIV-related and non HIV-related PTSD symptoms in male and female PLWH meeting criteria for PTSD. It was hypothesized that patients receiving PE therapy would report significantly fewer PTSD symptoms in relation to both traumatic experiences. Further, as PE therapy has been shown to be effective at reducing a range of psychological symptoms not specifically targeted in therapy, we also hypothesized that the PE group would report fewer depression symptoms, fewer negative posttraumatic cognitions, and reduced substance use. Additionally, we examined whether successful treatment of PTSD would indirectly reduce non-adherence to highly active antiretroviral therapy (HAART). Good end-state functioning was also explored as a final outcome, since evaluating the success
of a therapy should encompass improvements in several affected domains (Jaycox, Foa, & Morral, 1998).
METHOD

Participants

PLWH were recruited from two social service agencies near Cleveland, OH. Ninety-nine adult PLWH were screened to determine eligibility for the study. Participants were eligible for participation if they were fluent in English, met criteria for a likely diagnosis of PTSD as assessed through the self-report PTSD Diagnostic Scale (PDS: Foa et al., 1995), and were currently taking antiretroviral medications for HIV. Exclusionary criteria included diagnosis of a psychotic disorder, current or previous diagnosis of schizophrenia, and current suicidal ideation. Of the 99 PLWH assessed for eligibility criterion, 34 participants did not meet requirements for the study for the following reasons: presence of psychotic symptoms (n = 14), failure to display significant PTSD symptoms (n = 9), lack of antiretroviral medication regimen (n = 2), suicidal ideation (n = 3), and participation in a different study/treatment program (n = 6). Sixty-five participants (24 females and 41 males) were eligible to participate and completed the baseline questionnaires (see Figure 1 for a flow diagram of participant progress). The sample at baseline consisted of 29 African Americans, 25 Caucasians, 4 Hispanics, and 7 individuals who identified with more than one race. The mean age was 46 years (Range: 31-61). Participants had been living with a diagnosis of HIV for approximately 13 years (Range: 13 months to 26 years) and were a low income sample, with 84% of the participants earning below 20,000 dollars annually.
Figure 1. Flow diagram of participant progress throughout the various phases of the present randomized controlled trial

Assessed for eligibility (N = 99)

Eligible (n = 65)

- Randomized to PE Intervention 10 sessions; 5 weeks (n = 40)
  - Baseline (n = 40)
    - *Received intervention (n = 34)
    - *Did not receive intervention (n = 6)
  - Post-Intervention (n = 25)
    - *Discontinued participation (n = 9)
  - 3-months Post-Intervention (n = 19)
    - *Discontinued participation (n = 6)

- Randomized to Weekly monitoring/Wait List control group (n = 25)
  - Baseline (n = 25)
  - Post-Intervention (n = 24)
    - *No longer eligible for participation (n = 1)
  - 3-months Post-Intervention (n = 24)
    - *Discontinued participation (n = 0)

Excluded (n = 34)

- * Did not meet inclusion criteria (n = 28)
- * Participating in other treatment/study (n = 6)

6-months Post-intervention
All PE Participants (n = 27)
Forty individuals were randomized to receive PE therapy and 25 were randomized to the weekly monitoring/wait list control group. No one meeting screening criteria refused to participate; however, four participants randomized to the PE group chose to not participate after the baseline assessment, but before the initiation of therapy. This was likely due to the fact that a significant amount of time was spent detailing that the intervention was stressful, involving reliving traumatic experiences. Additionally, 1 PE participant had to withdraw due to a jail sentence, and 1 PE participant chose not to participate before notification of the results from the randomization process. Regarding those assigned to the weekly monitoring control group, a PTSD diagnosis could not be confirmed following the baseline assessment for 1 control participant, and that individual was withdrawn from the study. Therefore, the final sample consisted of 34 individuals randomized to receive PE therapy and 24 randomized to the weekly monitoring control group. At the post-intervention follow-up assessment, 25 participants were retained in the PE group (26.5% drop-out rate) and 24 participants were retained in the control group (0% drop-out rate). Of the 9 participants who withdrew from the study during the intervention, 5 decided they were no longer interested in participating due to having other personal issues arise and/or PE therapy being more than they could handle at the time. Of the remaining 4 dropouts, 1 was hospitalized for pneumonia, 2 repeatedly cancelled sessions, and 1 dropped due to scheduling conflicts. The final sample at the 3-month follow-up assessment consisted of 43 PLWH (29 males and 14 females; 19 PE participants and 24 control group participants).
After the completion of the 3-month assessment, all of the participants in the original weekly monitoring/wait list control group were then given the opportunity to participate in the intervention. Fourteen of the control participants (8 males and 6 females) chose to receive the intervention. All participants receiving PE (whether they had originally been in the waitlist group or not) were again assessed at 6-months post-intervention. Seventeen of the original PE participants (11 males and 6 females) and 10 (6 males and 4 females) of the original waitlist participants who subsequently completed PE were retained throughout the 6-month follow-up. In order to assess the efficacy of the intervention in all participants who received PE therapy, the data were collapsed between the original PE therapy group and the control participants who later received PE. Therefore, we were able to analyze data through the 6-month follow-up timepoint on a total of 27 individuals (17 males and 10 females).

At the post-intervention follow-up, a greater number of participants in the PE group dropped out of the study than participants in the control group ($p < .001$). Participants who dropped out of the study post-intervention also reported higher levels of posttraumatic stress symptoms in reference to the non-HIV-related trauma than participants who were retained at this time point ($p < .04$). There were no significant differences in any other demographic or study variables between participants who dropped out and those who were retained at any time point (all $p$s $> .05$). Further, drop-out rates did not differ ($p$s $> .05$) between participants whose most distressing trauma was HIV-related compared to those whose most distressing trauma was non-HIV-related.
Prolonged Exposure Group: The prolonged exposure intervention was conducted individually in a private room within the social service agency by one of two Ph.D.-level clinical psychology post-doctoral fellows. Each participant was only seen by one therapist throughout the duration of the therapy. The treatment program followed standard PE protocol (Foa et al., 1991) and consisted of 10 sessions conducted twice per week for 5 weeks. Each session lasted between 90-120 minutes. Treatment procedures included education about common reactions to trauma, breathing retraining, prolonged (repeated) exposure to trauma memories, repeated in vivo exposure to situations the client was avoiding due to trauma-related fear, and discussion of thoughts and feelings related to exposure exercises (including negative posttraumatic cognitions). Though the structure and format of the sessions remained the same as standard PE, the content varied, as the therapy was individually tailored to each participant (their most distressing trauma) and focused on HIV-related trauma for some, and non-HIV-related trauma for others.

Weekly monitoring/wait list control group: Participants assigned to the weekly monitoring/wait list control group continued with their standard visits to the social service agency, but were also contacted by their case manager once a week for 5 weeks (the duration of the PE therapy) in person or by telephone to monitor PTSD symptom progression.

Procedure

The study protocol was approved by the human subjects review boards of Kent State University and Summa Health System. Potential participants were initially approached
about the study by their case manager at the social service agency. Interested participants completed the PTSD Diagnostic Scale (PDS: Foa, 1995) to determine initial eligibility for the study. Participants who met criteria for PTSD then met with a Ph.D.-level clinical psychology student who described the study in detail to them. Interested participants provided written informed consent. The Structured Clinical Interview for the DSM-IV with Psychotic Screen (SCID: First, Gibbon, Spitzer, & Williams, 1996) was then administered to ensure the presence of diagnostic levels of PTSD and the absence of any psychotic disorder or other exclusionary criteria. Within one week of this initial screening procedure, all eligible participants were administered the PTSD Symptom Scale-Interview (PSS-I) with regards to both HIV-related PTSD and the most severe non-HIV-related trauma. They then completed the self-report baseline questionnaires which consisted of the Center for Epidemiological Studies – Depression Scale (CES-D) the Posttraumatic Cognitions Inventory (PTCI), substance use, subjective adherence to antiretroviral medication regimens, and treatment self-efficacy questionnaires. Following this baseline assessment, participants were then randomly assigned to the PE therapy or the weekly monitoring/wait list control group. Participants in the intervention began the PE protocol shortly after the therapist initiated contact. Participants in the weekly monitoring/wait list group were contacted weekly by their case manager to ensure that no symptom exacerbation occurred in this group.

All follow-up assessments were conducted at the social service agency by an interviewer who was blind to group assignment. Participants again completed all measures of PTSD, depression, substance use, adherence, and treatment self-efficacy
immediately post-treatment, and at the 3-month follow up assessment. The same protocol and questionnaires were used for all participants in the weekly monitoring/wait list control group who later received the intervention. Finally, all participants who received PE (the original PE group and the weekly monitoring/wait listed control group) also completed these same assessments 6-months post-intervention. Participants received $25 for each assessment (initial screening, baseline, immediate post-treatment, and at the 3- and 6-month follow-ups) for a total of $125.00. Additionally, participants received $10 for every intervention session they completed (up to $100 total) and an extra $25 if they completed all of the intervention sessions (possible $250 total throughout the course of the entire study).

Measures

Sociodemographics: Standard demographic questions about age, gender, race/ethnicity, number of years living with HIV, sexual orientation (rated on a scale of 1-9 where 1 = exclusively homosexual/gay, 5 = bisexual, and 9 = exclusively heterosexual/straight), and income were administered at baseline.

PTSD Diagnosis (PDS: Foa, 1995; 1997): Participants completed the 17-item Posttraumatic Stress Diagnostic Scale (PDS) at pre-screening to determine whether they met criteria for a PTSD diagnosis. Participants were asked to rate the frequency (0 = not at all or only one time; 3 = five or more times a week/almost always) with which each of the 17 PTSD symptoms corresponding to the criteria in the DSM-IV were experienced within the past month. A diagnosis of PTSD is present when participants endorse at least
one reexperiencing symptom, three avoidance symptoms, and two arousal symptoms with a rating of at least 1 (once a week/once in a while) on the PDS.

**PTSD Symptoms:** A trained clinician assessed the presence and severity of PTSS with the PTSD Symptom Scale-Interview (PSS-I; Foa, Riggs, Dancu, & Rothbaum, 1993) at each assessment (baseline, immediately post-intervention (6-weeks), 3-months and 6-months post-intervention). The PSS-I is a 17-item semi-structured interview designed to measure the three symptom clusters of PTSD based on the DSM: reexperiencing (4 items), avoidance (7 items), and hyperarousal (6 items). The total score is calculated based on the sum of the individual items (0 = not at all to 3 = very much). Internal consistency for the PSS-I was acceptable in our sample (HIV-related trauma baseline alpha = .81; PI = .89; 3-month = .86; 6-months = .84; Non-HIV-related trauma baseline alpha = .81; PI = .93; 3-month = .86; 6-months = .78).

**Depression:** The Center for Epidemiological Studies – Depression Scale (CESD; Radloff, 1977) was administered to assess participants’ level of self-reported depression symptoms within the week prior to assessment at all time points. The CES-D consists of 20 items summed to create a total score. Response choices range from 1 (rarely or none of the time) to 4 (most of the time). The CES-D displayed acceptable internal consistency in our sample (baseline alpha = .71; PI = .76; 3-months = .77; 6-months = .84).

**End-state functioning:** End-state functioning represents a composite of psychological outcomes. It is typically computed from scores on measures of PTSD, depression, and anxiety (Jaycox et al., 1998; Rothbaum, Astin, & Marsteller, 2005; vanMinnen & Foa, 2006); however, end-state functioning has also been computed from
PTSD and depression scores alone (Bryant, Moulds, Guthrie, Dang, & Nixon, 2003). Given relatively low rates of anxiety in PLWH, and that we did not formally assess anxiety in the current study, composite scores for good end state functioning were created based on post-intervention and 3-months post-treatment reports of HIV-related PTSS, non-HIV-related PTSS, and depression. The criteria for good end-state functioning (yes or no) were calculated based on scores from the following three measures: 20 or less on the HIV-related PSS-I (Foa et al., 1999a), 20 or less on the non-HIV-related PSS-I, and 16 or less on the CES-D (Radloff, 1977). A cutoff score of 20 on the PSS-I was used previously to compute end-state functioning by Foa and colleagues (1999a), as 20 is the clinical cutoff score specified in the manual for the PSS-self report (Foa, 1995). Further, a score of less than 16 on the CES-D is associated with depression remission.

Substance Use: A self-report substance use questionnaire was administered at each time point to assess the frequency (measured in # of days) of use of 11 different substances within the month prior to assessment. Substances included alcohol, marijuana, cocaine, ecstasy, amphetamines, GHB, PCP, hallucinogens, rohypnol, ketamine, and heroin. Total frequency was obtained by summing the number of days in the prior month during which substances were used.

Posttraumatic Cognitions: The Posttraumatic Cognitions Inventory (Foa et al., 1999b), a self-report questionnaire, was used to assess the degree of negative posttraumatic thoughts participants endorsed after their trauma. Participants rated each of the 36-items based on how much they agreed or disagreed with the negative thought (1 = totally disagree to 7 = totally agree). This instrument yields a sum total score as well as
three individual subscale scores: negative cognitions about the self ("I can’t trust that I will do the right thing"), negative cognitions about the world ("I have to be on guard all the time"), and self-blame ("The event happened because of the way I acted"). Internal consistency for the present sample was high (baseline alpha = .94; PI = .94; 3-month = .96; 6-month = .95).

**HIV Adherence Self-efficacy:** HIV adherence self-efficacy (HIV-ASES; Johnson et al. 2007) was assessed through a 12-item self-report measure. During the baseline and follow-up assessments, participants were presented with various obstacles to their medication regimen and other activities related to their treatment plan such as diet and exercise. Participants were instructed to rate their current level of confidence in handling each obstacle from a scale of 0 (cannot do it at all) to 10 (certain you can do it). Sample items include the following: “How confident are you that you can: Include your treatment in your daily routine? Stick to your treatment plan even when side effects begin to interfere with daily activities?” The 12 items were averaged to create a total score of treatment self-efficacy score, with higher numbers indicating greater adherence self-efficacy. This measure demonstrated high reliability (baseline alpha = .92; PI = .96; 3-months = .95; 6-months = .96).

**Medication Adherence:** Self-reported medication adherence was assessed at all time points with questions designed to examine how closely participants adhered to their medication regimen in the past 3 days and 2-weeks. After prompting participants with a calendar about recent activities to cue their recall, they were instructed to indicate the number of antiretroviral medication pills in their prescribed regimen that they skipped on
each of the past three days. These items were summed to create a total score of medications missed within the past three days. Participants also estimated the number of doses missed in past 2 weeks.

Data Analysis

Data were initially screened for normality. Two outliers (< 3 SDs above the mean) were removed from the substance use analyses due to violations of skewness and kurtosis. In order to test for possible control variables, chi square analyses were applied between the categorical variables of group (PE or control), gender, and race (African American, Caucasian, Hispanic, other) at the baseline, post-intervention, and 3-month assessments. One-way ANOVAs were also conducted between categorical and continuous variables to examine group differences in age, time living with HIV, and sexual orientation at the baseline, post-intervention, and 3-month assessments. If significant differences emerged, these variables were used as covariates in the analyses. Further, to test whether randomization to the therapy vs. weekly monitoring/wait list control groups was successful, one-way ANOVAs were conducted between group and baseline outcomes.

A series of mixed model repeated measures ANOVAs were then conducted to test whether PE therapy was efficacious at reducing symptoms of HIV, psychopathology, and substance use, as well as increasing medication adherence and treatment self-efficacy. For these analyses, group (PE vs. weekly monitoring/wait list control) was the between subjects factor and time of assessment (baseline, post-intervention, 3-months) was the
within subjects factor. Tests of between subjects effects were examined for an overall
main effect of group, and multivariate results (Wilks Lambda) were examined for a main
effect of time and an interaction between group x time on the outcome variables. If a
significant main effect of time emerged, pairwise comparisons within SPSS were
conducted to determine which time points were significantly different from each other. In
the presence of a significant group x time interaction, post-hoc analyses were conducted
in the form of one-way ANOVAs on the change scores between each timepoint. Further,
to test whether the gains of PE therapy were maintained over the 6-month follow-up,
within subjects repeated measures ANOVAs were conducted using data from the
baseline, post-treatment, 3-month, and 6-month post-treatment on outcomes of interest
for all participants who received the PE therapy (including weekly monitoring/wait list
control group participants who later received the intervention). Finally, chi square
analyses were conducted to determine good end state functioning between groups at the
3-and 6-month follow-up assessments.
RESULTS

Preliminary Analyses

On average, participants reported experiencing 4.91 (SD = 1.78) different types of prior trauma, and 34% of the participants reported that their most distressing trauma was related to their HIV diagnosis; 66% reported that their most distressing trauma was not HIV-related. Descriptive statistics for all study variables are presented in Tables 1 and 2. Results from chi square analyses revealed that the PE and weekly monitoring/wait list control groups did not differ by gender or race (ps > .05). Results from one-way ANOVAs also revealed no significant differences between groups on age, time living with HIV, or sexual orientation (ps > .05). One-way ANOVAs examining differences between the PE group and the weekly monitoring/wait list control group on HIV-related PTSS, non-HIV-related PTSS, depression, posttraumatic cognitions, substance use, adherence self-efficacy, and total medications missed in the past 3 days were not significant (all ps > .1). However, significant baseline differences were present in that the number of pills missed within the past two weeks was higher for PE participants (p < .04). Therefore, the baseline levels of adherence within the past 2 weeks were entered as a control variable in the analysis with 2-week adherence.
<table>
<thead>
<tr>
<th></th>
<th>Baseline (n = 65)</th>
<th>Post-Intervention (n = 47)</th>
<th>3-Months Post Intervention (n = 43)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>PE (n)</td>
<td>Control (n)</td>
<td>χ²</td>
</tr>
<tr>
<td><strong>Gender</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>25</td>
<td>16</td>
<td>.02</td>
</tr>
<tr>
<td>Female</td>
<td>15</td>
<td>9</td>
<td>.00</td>
</tr>
<tr>
<td><strong>Race</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>African American</td>
<td>21</td>
<td>12</td>
<td>1.9</td>
</tr>
<tr>
<td>Caucasian</td>
<td>17</td>
<td>10</td>
<td>.17</td>
</tr>
<tr>
<td>Hispanic</td>
<td>2</td>
<td>2</td>
<td>.2</td>
</tr>
<tr>
<td>Other</td>
<td>0</td>
<td>1</td>
<td>.0</td>
</tr>
</tbody>
</table>

*Note.* (n) = frequency; PE = Prolonged exposure therapy group; Control = Weekly monitoring/wait list control group.

*χ² = chi square value from analyses examining group differences in gender and race.*

* p<.05, **p<.01, ***p<.001
Table 2. Means and Standard Errors for Continuous Level Demographic Variables by Group at Baseline, Post-Intervention, and 3-Months Post-Intervention

<table>
<thead>
<tr>
<th>Demographics</th>
<th>Baseline (n = 65)</th>
<th></th>
<th>Post-Intervention (n = 47)</th>
<th></th>
<th>3-Months Post-Intervention (n = 43)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>PE M(SD)</td>
<td>Control M(SD)</td>
<td>F test&lt;sup&gt;a&lt;/sup&gt;</td>
<td>PE M(SD)</td>
<td>Control M(SD)</td>
<td>F test&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td>Age</td>
<td>46 (5.8)</td>
<td>48(7.0)</td>
<td>1.92</td>
<td>45(4.9)</td>
<td>47 (6.8)</td>
<td>1.15</td>
</tr>
<tr>
<td>Sexual Orientation</td>
<td>5.12 (3.5)</td>
<td>5.76 (3.5)</td>
<td>.51</td>
<td>5.13 (3.5)</td>
<td>5.67(3.5)</td>
<td>.27</td>
</tr>
<tr>
<td>Months Living with HIV</td>
<td>157 (68)</td>
<td>163(55)</td>
<td>.70</td>
<td>167 (68)</td>
<td>161(55)</td>
<td>.15</td>
</tr>
</tbody>
</table>

Note. M = mean; (SD) = standard deviation. PE = Prolonged exposure therapy group; Control = Weekly monitoring/wait list control group.

<sup>a</sup>F test = F value from analyses examining group differences in demographic variables.<sup>b</sup>Sexual orientation = The mean score here reflects sexual orientation on a continuum from 1=9 (1 = completely homosexual; 5 = bisexual; 9 = completely heterosexual).

<sup>p</sup><.05, **p</sup><.01, ***p</sup><.001.
Table 3. Means and Standard Deviations of Psychopathology-Related Outcomes and Adherence Self-Efficacy by Group at Baseline, Post-Intervention, and 3-Months Post-Intervention (n = 43)

<table>
<thead>
<tr>
<th>Group x Time Interaction</th>
<th>HIV-related PTSS M(SD)¹</th>
<th>Non-HIV related PTSS M(SD)¹</th>
<th>Depression M(SD)¹</th>
<th>Posttraumatic Cognitions M(SD)¹</th>
<th>Adherence Self-Efficacy M(SD)¹</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prolonged Exposure</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Baseline</td>
<td>26.42(2.12)</td>
<td>28.80 (2.00)</td>
<td>26.47(2.40)</td>
<td>116.97 (8.71)</td>
<td>88.95 (4.68)</td>
</tr>
<tr>
<td>Post-Intervention</td>
<td>8.32(1.99)</td>
<td>7.42 (1.21)</td>
<td>14.90(2.41)</td>
<td>84.53 (7.61)</td>
<td>96.95 (6.28)</td>
</tr>
<tr>
<td>3-months Post-Intervention</td>
<td>7.32(1.85)</td>
<td>6.11 (1.68)</td>
<td>13.53 (2.64)</td>
<td>78.26 (9.08)</td>
<td>99.18 (5.35)</td>
</tr>
<tr>
<td>Weekly monitoring/wait list control</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Baseline</td>
<td>26.83(1.88)</td>
<td>32.22(1.82)</td>
<td>27.25 (2.14)</td>
<td>114.54 (7.75)</td>
<td>100.15 (4.16)</td>
</tr>
<tr>
<td>Post-Intervention</td>
<td>24.13(1.77)</td>
<td>28.17 (1.81)</td>
<td>25.58 (2.14)</td>
<td>115.08 (6.81)</td>
<td>90.35 (5.70)</td>
</tr>
<tr>
<td>3-months Post-Intervention</td>
<td>20.46(1.64)</td>
<td>21.26 (1.52)</td>
<td>22.08 (2.35)</td>
<td>100.71 (8.08)</td>
<td>95.87 (4.87)</td>
</tr>
</tbody>
</table>

Note. M = mean; (SD) = standard deviation. Means are symptom level scores. PTSS = Posttraumatic stress symptoms.

¹M(SD) = Means and standard deviations of significant (p < .05) group x time interactions. ²M(SD) = Means and standard deviations of trend level (p < .01) group x time interactions.
Table 4. Means and Standard Deviations of Psychopathology-Related Outcomes and Adherence Outcomes through 6-Months Post-Intervention (n = 27)

<table>
<thead>
<tr>
<th>Treatment Outcomes</th>
<th>Baseline</th>
<th>Post-Intervention</th>
<th>3-Months Post-Intervention</th>
<th>6-months Post-Intervention</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M (SD)</td>
<td>M (SD)</td>
<td>M (SD)</td>
<td>M (SD)</td>
</tr>
<tr>
<td>HIV-related PTSS</td>
<td>26.81(9.67)</td>
<td>8.07(5.43)</td>
<td>10.33(9.34)</td>
<td>7.93(7.70)</td>
</tr>
<tr>
<td>Non-HIV-related PTSS</td>
<td>31.33(9.31)</td>
<td>7.67(5.06)</td>
<td>9.22(9.52)</td>
<td>7.52(6.71)</td>
</tr>
<tr>
<td>Depression</td>
<td>27.63(11.95)</td>
<td>14.59(10.21)</td>
<td>16.33(12.32)</td>
<td>17.48(13.50)</td>
</tr>
<tr>
<td>Substance Use</td>
<td>4.46(9.29)</td>
<td>2.38(5.91)</td>
<td>4.69(11.24)</td>
<td>6.62(11.80)</td>
</tr>
<tr>
<td>Posttraumatic Cognitions</td>
<td>115.31(43.00)</td>
<td>79.19(37.60)</td>
<td>78.52(33.67)</td>
<td>76.19(40.46)</td>
</tr>
<tr>
<td>Total Medications Missed- 3 days</td>
<td>.88(2.26)</td>
<td>1.86(4.24)</td>
<td>1.12(2.85)</td>
<td>1.36(2.41)</td>
</tr>
<tr>
<td>Medication Adherence-2 weeks</td>
<td>3.92(8.04)</td>
<td>6.02(16.31)</td>
<td>4.25(9.92)</td>
<td>3.42(5.60)</td>
</tr>
<tr>
<td>Adherence Self-Efficacy</td>
<td>97.41(20.21)</td>
<td>103.52(20.73)</td>
<td>104.39(18.66)</td>
<td>101.15(20.99)</td>
</tr>
</tbody>
</table>

Note. M = Mean, (SD) = Standard deviation; PTSS = Posttraumatic Stress Symptoms.

*a,b,c M(SD) = Means that share superscripts are significantly different from each other.

* p<.05, **p<.01, ***p<.001.
Between and within subjects analyses (Psychopathology outcomes)

Mixed model (between and within group) repeated measures ANOVAs were conducted on the following psychopathology-related outcomes: HIV-related PTSS, non-HIV-related PTSS, depression, negative posttraumatic cognitions, and substance use. Means and standard deviations of the significant group x time interactions are displayed in Table 3. Results revealed a main effect of time for both HIV-related PTSS (Wilk’s λ =.36; F(2,40) = 36.00, \( p < .001 \); partial η\(^2\) = .64) and non-HIV-related PTSS (Wilk’s λ =.18; F(2,39) = 88.36, \( p < .001 \); partial η\(^2\) = .82) in that all participants demonstrated significant decreases in symptoms over time (HIV-related PTSS: baseline \( M = 26.63, SD =1.42 \); PI \( M =16.22, SD =1.33 \); 3-months PI \( M =13.89, SD = 1.24 \); non-HIV-related PTSS: \( M = 30.50, SD =1.35 \); PI \( M =17.75, SD =1.40 \); 3-months PI \( M =13.68, SD =1.08 \)).

A main effect of group was present for both types of PTSS (HIV-related PTSS: F(1,41) = 21.10, \( p < .001 \); partial η\(^2\) = .34; non-HIV-related PTSS: F(1,40) = 40.21, \( p < .001 \); partial η\(^2\) = .50), demonstrating the PE participants had lower symptoms (HIV-related PTSS \( M = 14.02, SD = 1.60 \); non-HIV-related PTSS \( M = 14.11, SD =1.53 \)) than the control participants (HIV-related PTSS \( M = 23.81, SD =1.42 \); non-HIV-related PTSS \( M = 27.19, SD =1.40 \)). The main effects were qualified by a significant group x time interaction indicating that PE participants experienced a greater decrease in HIV-related PTSS (Wilk’s λ =.60; F(2,40) = 15.40, \( p < .001 \); partial η\(^2\) = .44) and non-HIV-related PTSS (Wilk’s λ =.45; F(2,39) = 24.18, \( p < .001 \); partial η\(^2\) = .55) than the control group participants. The group x time interaction for HIV-related PTSS is displayed in Figure 2 (though not presented below, all other significant interactions regarding psychopathology
outcomes resemble this figure). Post-hoc analyses indicated significantly larger reductions in HIV-related and non-HIV-related PTSS between baseline and post-intervention ($F(1,45) = 37.21, p < .001; F(1,45) = 50.62, p < .001$) and between baseline and 3-month follow-up PTSS scores ($F(1,41) = 16.51, p < .001; F(1,41) = 19.70, p < .001$) in PE participants versus controls, respectively.

Results for depression indicated a significant main effect of time (Wilks’s Lambda $\lambda = .70; F(2,40) = 8.55, p < .01$, partial $\eta^2 = .30$), in that depression improved throughout the course of the study for all participants (baseline $M = 26.86$, $SD = 1.61$; PI $M = 20.24$, $SD = 1.61$; 3-months PI $M = 17.81$, $SD = 1.80$), as well as a main effect of group ($F(1,41) = 7.55, p < .01$; partial $\eta^2 = .16$), in that overall symptoms of depression for PE participants ($M = 18.30$, $SD = 1.81$) were lower than symptoms of depression for control participants ($M = 24.97$, $SD = 1.61$). There was a trend for the PE participants to show a greater improvement in depression scores over time as compared to the control group participants (group x time interaction; Wilks’s $\lambda = .87; F(2,40) = 3.12, p = .055$; partial $\eta^2 = .14$). Post-hoc analyses indicated larger decreases in depression for PE participants than for control participants from baseline to post-intervention ($F(1,45) = 7.22, p = .01$). However, the change from baseline to the 3-month follow-up assessment was only marginally significant ($F(1,42) = 3.11, p = .085$).

A significant main effect of time emerged for substance use (Wilks’s Lambda $\lambda = .78; F(2, 39) = 5.38, p < .01$, partial $\eta^2 = .22$). Pairwise comparisons indicated that significant mean level differences were evident between baseline and post-intervention ($t(41) = 2.44, p < .05$) and between post-intervention and the 3-month follow-up ($t(39) = -$)
2.74, p < .01). Inspection of the means show that substance use decreased from baseline ($M = 5.21$, $SD = 1.44$) to post-intervention ($M = 2.35$, $SD = .77$) but increased thereafter in both groups ($M = 5.87$, $SD = 1.80$). However, there was no group main effect ($F(1,40) = 1.63$, $p > .05$) or group x time interaction (Wilks Lambda $\lambda = .96$; $F(2,39) = .82$, $p > .05$).

Regarding posttraumatic cognitions, a significant main effect of time indicated that negative posttraumatic cognitions decreased throughout the study (Wilks Lambda $\lambda = .61$; $F(2,40) = 12.91$, $p < .001$; partial $\eta^2 = .39$; baseline $M = 115.76$, $SD = 5.83$; PI $M = 99.81$, $SD = 5.08$; 3-months PI $M = 89.50$, $SD = 6.10$). The group main effect reached trend level significance ($F(1,41) = 3.00$, $p = .09$; partial $\eta^2 = .07$), in that PE participants ($M = 93.25$, $SD = 7.30$) had lower negative posttraumatic cognitions than control participants ($M = 110.11$, $SD = 6.50$). Further, PE participants experienced a greater improvement in PTCI scores than control participants (group x interaction; Wilks Lambda $\lambda = .78$; $F(2,40) = 5.51$, $p < .01$; partial $\eta^2 = .22$). Post-hoc analyses indicated greater reductions in PTCI for PE participants between baseline and post-intervention ($F(1,45) = 12.16$, $p = .001$) and baseline and 3-month follow-up ($F(1,42) = 16.51$, $p < .05$).

Between and within subjects analyses (Adherence related outcomes)

Repeated measures ANOVAs were conducted on the following adherence related outcomes: total medications missed within the past three days, within the past 2 weeks, and adherence self-efficacy. Means and standard deviations for significant group x time interactions are displayed in Table 3. No significant main effect of time (Wilks Lambda $\lambda = .94$;
*F*(2,38) = 1.31, *p* = .28), group (*F*(1,39) = 1.12, *p* = .30) or interaction of group x time (Wilk’s λ = .98; *F*(2,38) = .39, *p* = .70) was evident for total medications missed within the past three days. However, after controlling for baseline levels, there was a trend for time regarding total medications missed within the past two weeks (Wilk’s λ = .87; *F*(2,37) = 2.84, *p* = .07; partial η² = .13), in that both groups missed more medications over the course of past 2 weeks throughout the study (baseline *M* = 3.20, *SE* = .00; PI *M* = 6.45, *SE* = 2.41; 3-months PI *M* = 6.15, *SD* = 2.00). The main effect for group (*F*(1,38) = .00, *p* = .10) and the interaction between group and time (Wilk’s λ = .10; *F*(2,37) = .07, *p* = .94) were not significant. With regards to treatment self efficacy, there was no main effect of time (Wilk’s λ = .95; *F*(2,39) = 1.05, *p* = .37) or group (*F*(1,40) = .02, *p* = .89). However, the group x time interaction was significant (Wilk’s λ = .81; *F*(2,39) = 4.53, *p* < .05; partial η² = .19) (See Figure 3). Results revealed that while efficacy for the PE participants steadily increased over time, efficacy in the control group initially decreased from baseline to post-intervention, then increased from post-intervention to the 3-month assessment. Post-hoc analyses on change scores indicated significant increases in treatment self-efficacy for the PE group but decreases in efficacy for the control group from baseline to post-intervention (*F*(1,46) = 6.50; *p* < .05) and baseline to 3-months post-treatment (*F*(1,41) = 5.71; *p* < .05).

**Within subjects analyses**

Within subjects repeated measures ANOVAs were conducted to determine whether treatment gains persisted at the 6-month follow-up. Time of assessment
(baseline, post-intervention, 3-and 6-months post-treatment) was the within subjects factor. Means and standard deviations from the following analyses are displayed in Table 4. Results revealed significant main effects of time on the outcomes of HIV-related PTSS (Wilk’s λ = .16; $F(3,24) = 41.35, p < .001$; partial $\eta^2 = .84$), non-HIV-related PTSS (Wilk’s λ = .10; $F(3,24) = 75.08, p < .001$; partial $\eta^2 = .90$), depression (Wilk’s λ = .47; $F(3,24) = 8.96, p < .001$; partial $\eta^2 = .53$), and negative posttraumatic cognitions (Wilk’s λ = .42; $F(3,24) = 10.97, p < .001$; partial $\eta^2 = .58$), in that PE participants experienced a reduction in symptoms over the course of the study. Post-hoc analyses revealed significant mean differences between baseline and the 6-month assessment (all $ps < .05$), implying that the effects of the intervention were maintained through 6-months after the completion of therapy. No significant main effects of time emerged for substance use (Wilk’s λ = .77; $F(3,22) = 2.23, p > .05$), total medications missed within the past 3 days (Wilk’s λ = .87; $F(3,22) = 1.06, p > .05$), total medications missed within past 2 weeks (Wilk’s λ = .97; $F(3,22) = .21, p > .05$), or treatment self-efficacy (Wilk’s λ = .82; $F(3,24) = 1.78, p > .05$).

**End-state functioning**

Results from chi square analyses revealed that 15 PE participants (65.2%) compared to 2 control participants (8.3%) met criteria for good end state functioning ($\chi^2 (1, n = 47) = 16.50, p < .001$) post-intervention. Three-months post-treatment, 13 PE participants (68.4%) compared to 6 control participants (31.6%) met criteria for good end-state functioning ($\chi^2 (1, n = 43) = 8.11, p < .01$).
Figure 2. Plotted values illustrating HIV-related posttraumatic stress symptoms (PTSS) assessed with the Posttraumatic Symptom Scale-Interview (PSS-I) at baseline, post-intervention, and 3-months post-intervention (n=43).

Figure 3. Plotted values illustrating adherence self-efficacy at baseline, post-intervention, and 3-months post-intervention (n=42)
DiscusSion

To our knowledge, the current study was the first to test the efficacy of PE therapy for PTSD in PLWH in a randomized controlled trial. Consistent with hypotheses and prior intervention studies, results supported the use of PE in this population, as PE participants achieved good end-state functioning and demonstrated significant improvement in both HIV and non-HIV-related trauma symptoms compared to a weekly monitoring/wait list control group. PE was also successful at reducing negative posttraumatic cognitions, and there was a trend for PE to reduce depressive symptoms, both of which were indirect outcomes of the therapy. Though no treatment specific gains were maintained for the outcome of substance use, decreases were evidenced throughout the treatment period for both groups. Consistent with prior research (Brady et al., 2001; Triffleman et al., 1999), substance use did not worsen over the course of treatment.

Gains achieved in therapy for the outcomes of HIV-related and non-HIV-related PTSS, depressive symptoms, and negative posttraumatic cognitions were maintained at 3- and 6-month follow-up assessments. Though all effect sizes for the present findings were large (partial $\eta^2 \geq .14$), the intervention accounted for the largest proportion of variance in regards to HIV-related PTSS and non-HIV-related PTSS. Additionally, the magnitude of change for both types of PTSS was robust—the decline in HIV-related PTSS for PE participants was 19.1 points compared to a reduction of 6.37 for control participants. The change in non-HIV-related PTSS was equally large—a 22.7 point reduction for PE participants compared to a 10.96 point reduction for control participants. It is important
to keep in mind that although the largest reduction in PTSS occurred for the PE participants in regards to their HIV-related trauma, the PE therapy itself was aimed at treating participants’ most distressing trauma. As mentioned before, only 34% of participants regarded their HIV-related trauma as being the most traumatic, which implies that the remaining 66% of participants whose therapy was targeted at a prior traumatic event were able to learn a skill set that provided patients with the ability to transfer the gains of therapy to other traumas. That PE participants also experienced significant improvements in negative posttraumatic cognitions, marginal improvements in depressive symptoms, and continued symptom reduction throughout the 6-month follow-up provides additional support for the efficacy of PE at decreasing a range of posttraumatic sequelae.

Further, examination of the correlation between baseline HIV-related and non-HIV-related PTSS was only moderately strong (r = .40; no evidence of multicollinearity) demonstrating the independence of an HIV-related PTSD diagnosis. Although the HIV-related trauma was not necessarily anchored to the event at which the doctor or medical professional conferred the HIV diagnosis, these individuals still met criteria for PTSD as well as benefitted from the intervention. These findings provide indirect preliminary evidence that challenges the theoretical argument proposed by Kagee (2008) that treatment approaches may be inappropriate if PTSD symptoms do not arise from the original notification of HIV disease status. Results support the continued use of PE therapy in PLWH with PTSD symptoms related to HIV in general.
Consistent with prior research, negative posttraumatic cognitions showed a dramatic decrease throughout the course of the study for PE participants. Previous research demonstrated that reductions in posttraumatic cognitions were associated with reductions in overall PTSD symptoms in a sample of female assault victims (Foa and Rauch, 2004), possibly implying that negative posttraumatic cognitions may mediate the development of PTSD and other comorbidities. If PLWH are currently suffering from symptoms of PTSD due to the high amount of prior traumatization, negative posttraumatic cognitions may be responsible for the development of an additional PTSD diagnosis stemming from their HIV positive status. Early PE intervention for the prior trauma may be able to prevent or reduce future symptoms of PTSD, especially since reducing or eliminating negative cognitions of the self may also be associated with positive coping strategies and self-efficacy (Foa & Rauch, 2004).

Whereas medication adherence (total medications missed in the past 3 days and past 2-weeks) and adherence self-efficacy were also indirect aims of the therapy and therefore never directly addressed during the sessions, PE did appear to beneficially impact adherence self-efficacy. Future studies with longer follow-up assessment periods (up to 1 and 2-years post-intervention) may more readily detect the long-term effects of reduced psychopathology. It is possible that over time, adherence will improve following the reduction of PTSD and depressive symptoms. Adherence self- efficacy steadily increased throughout the study for PE participants, which may have future implications for general medication adherence, as previous research has found that treatment adherence self efficacy predicted positive schedule adherence (Schonnesson et al., 2006).
Participants who completed PE may be more prepared to receive a medication adherence intervention and may be more interested in improving their health behaviors following improvements in their mental health and well-being.

Though the dropout rate (26.5%) for PE participants in the current study is within the range of dropout rates reported in exposure therapies for treating PTSD in non-medical populations (20.5-34%; Foa et al., 2005; VanEtten & Taylor, 1998; Van Minnen, Arntz, & Keijsers, 2002; for recent reviews, see Bradley et al., 2005; Hembree et al., 2003), differential drop-out rate was an issue for the present sample. A greater number of PE participants were non-completers at post-intervention. Dropout was also more likely to occur for individuals with greater posttraumatic stress symptoms in regards to the non-HIV-related trauma post-intervention. However, only 5 participants dropped out because they were not interested in participating or thought the therapy was too much to handle. Although differential drop out may have impacted the findings, it is possible that the present results would have been more robust if more symptomatic participants remained in the study.

Given that psychiatric comorbidity is high in people with HIV, and treatments are known to improve psychological measures, PTSS and depression symptoms should be screened in routine visits to health care professionals (Basu, Chwastiak, & Bruce, 2005; Frank, Knox, & Wagaman, 2010; Israelski, et al., 2007; Mugavero et al., 2006). This is especially important as treatment may have carryover effects for adherence. The current study may not have been able to detect changes in adherence and substance use because the behaviors have been present for a long period of time. However, should programs be
implemented to either prevent the development of PTSD or intervene and address prior PTSD issues shortly after diagnosis with HIV, problems with emotional adjustment may not interfere with other correlates of the disease. Further, due to the success of the therapy in improving psychological comorbidities in PLWH, an intervention aimed at addressing PTSD as well as adherence or substance use issues may be even more beneficial to PLWH. The intervention would first require the administration of PE to treat the underlying psychopathology, followed by the administration of additional sessions addressing medication adherence and/or substance use. Future research should also consider mediators and moderators of PE therapy in larger samples to determine those most likely to benefit from PE.

Aside from the current study being the first examination of the efficacy of PE in a sample of PLWH, strengths of the study include the heterogeneity of the sample, as the exclusionary criteria were limited to the absence of a major psychotic disorder. Therefore, the sample included both men and women of all races and varying sexual orientation. Participants were also living with HIV for varying amounts of time, and acquired the disease in a variety of ways. Several of the prior studies in PLWH have been conducted in limited samples of only women (Katz & Nevid, 2005), or only men who have sex with men. That PE was efficacious in this heterogeneous sample provides strong support for its usefulness in PLWH. Further, the inclusion of PLWH with various comorbidities allows for high external validity, as it is rare for PTSD to exist as an independent psychological disorder (Bradley et al, 2005 reported up to 62% of interventions excluded comorbid substance use). PTSS were also assessed via interview
rather than self-reported questionnaire. Finally, to our knowledge, this was the first study to examine negative posttraumatic cognitions in PLWH. Future studies should examine these posttraumatic cognitions and their ability to mediate between disease states and health outcomes.

Though the present results provide preliminary evidence for the efficacy of PE in PLWH, they should be viewed with caution in the presence of some limitations. The small sample size of the present study limits power in conducting mediation or moderation analyses, and the lack of a control group at the 6-month assessment excludes the possibility for comparison of the long-term effects of therapy. Despite these limitations, results from this study provide support for the utility of PE therapy as an efficacious intervention for PLWH. The therapy was readily accepted by PLWH, with a drop-out rate comparable to other studies utilizing exposure therapy. The results expand and improve upon previous mental health interventions that have been offered to PLWH by specifically targeting PTSD with an evidence-based, first-line intervention for the disorder.
References


Traumatic Stress, 10, 141-148.


Psychology, 72(5), 879-884.


O’Cleirigh, C., Ironson, G., & Smits, J.A.J. (2008). Does distress tolerance moderate the impact of major life events on psychosocial variables and behaviors important in


Vranceanu, A.M., Safren, S.A., Lu, M., Coady, W.M., Skolnik, P.R. & Rogers, W.H.


