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Psychological trauma exposure and co-morbid psychopathologies in HIV+men and women

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Abstract

This study examined the association between trauma exposure, PTSD, suicide attempts, and other psychopathology among 316 racially/ethnically diverse HIV-infected men and women who underwent semi-structured psychiatric assessment. In addition, the role of psychological resilience in trauma exposure was examined in the context of neurological symptoms and functional status. Nearly half (47.8%; 151/316) of the participants reported trauma exposure, of which 47.0% (71/151) developed PTSD. Among trauma-exposed individuals, those with a current psychiatric diagnosis reported more neurological symptoms and lower functional status. Trauma exposure without PTSD was associated with a higher rate of panic disorder and substance-induced mental disorders. Trauma-exposed individuals who did not develop PTSD were less likely than those who reported no trauma exposure to meet criteria for major depressive disorder (MDD). Trauma exposure, MDD, borderline personality disorder, and substance-induced mental disorders were independently associated with increased odds of suicide attempt. These results indicate that co-morbid psychiatric disorders are common among trauma exposed individuals with a history of PTSD, but those with trauma exposure who do not develop PTSD are less likely to experience MDD. The role of other co-morbid psychopathologies in the genesis of suicidal behavior among individuals living with HIV deserves further study.

Keywords

Posttraumatic stress disorder; Borderline personality; Suicide; Antisocial personality; Panic disorder; Depression; HIV

1. Introduction

The rates of psychological trauma exposure and PTSD are disproportionately higher among people living with HIV than the general population (Boarts et al., 2009; Martinez et al.,

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2009; Whetten et al., 2012). It is estimated that 80% of U.S. community residents have been exposed to at least one potentially traumatic event in their lifetime, but less than 10% develop PTSD (Kessler et al., 1995; Breslau, 2009; Wilcox et al., 2009). Yet, approximately 30% of women living with HIV have had PTSD and much higher rates of trauma exposure compared to a national sample (Machtinger et al., 2012). There is evidence that early life trauma, PTSD, and depression are associated with HIV risk behaviors (Beidas et al., 2012; Whetten et al., 2012; Marshall et al., 2013). However, the extent to which trauma exposure is associated with other psychopathology, including suicidal behavior, is unclear.

Regardless of the type, trauma exposure among HIV-infected individuals has been independently associated with substance use, depression, and PTSD (Simoni and Ng, 2000; Whetten et al., 2006; Spies et al., 2012). Although the relationship between trauma and particular psychopathologies in HIV has been investigated, the co-occurrence of these disorders is not well understood (Simoni and Ng, 2000; Whetten et al., 2006; Spies et al., 2012). Such an understanding will inform diagnostic procedures and appropriate clinical interventions. Furthermore, psychiatric comorbidity is a significant predictor of HIV disease progression and incident mortality, and thus is critical to HIV disease outcomes (Leserman et al., 2007; Mugavero et al., 2007; Leserman, 2008). Studies have shown an association between trauma exposure and antiviral non-adherence and decreased virologic control (Mugavero et al., 2009; Pence et al., 2012), as well as decreased health-related quality of life (Nightingale et al., 2011). As such, examining psychiatric co-morbidity may further elucidate the role of trauma, poor disease control and persistent non-PTSD psychiatric disorders among individuals with HIV.

In non-HIV studies, trauma exposure and PTSD are associated with substantial co-morbid mood, anxiety, and personality disorders (Kessler et al., 1995; MacMillan et al., 2001; Pagura et al., 2010; Pietrzak et al., 2012). The link between trauma exposure, PTSD and co-morbid psychopathologies are likely indicative of a vulnerable brain phenotype. For example, the presence of psychiatric illness prior to trauma exposure may significantly increase the risk of developing PTSD compared to trauma exposed individuals who do not develop PTSD (Brewin et al., 2000; Storr et al., 2007; Sandweiss et al., 2011). In addition, both trauma exposure with or without subsequent PTSD is associated with incident substance use disorders (Reed et al., 2007).

Suicide attempts and ideation are common among HIV-infected individuals, with an estimated prevalence of 13% and 26%, respectively (Carrico et al., 2007; Badiie et al., 2012). However, the association between trauma exposure, suicide attempts/ideation and psychopathology among HIV-infected individuals is less clear. In the general population, trauma exposure, PTSD, borderline personality disorder, and depression are associated with an increased risk for suicidality (Belik et al., 2007; Cougle et al., 2009; Wilcox et al., 2009; Bolton and Robinson, 2010). The co-occurrence of PTSD with other psychiatric disorders has been shown to further augment suicidal behaviors (Oquendo et al., 2005; Cougle et al., 2009; Bolton and Robinson, 2010). Although the link between suicide attempts/ideation and major depression is well established, less is known about the possible mediatory effect of personality disorders. Borderline personality disorder and major depressive disorder are particularly relevant because they frequently co-occur with PTSD (Pagura et al., 2010).

Given the high prevalence of trauma exposure and psychiatric disorders among people living with HIV, the potential mediators of suicidal attempts/ideation need to be identified in order to implement effective interventions.

The primary aim of the present study was to examine co-morbid psychiatric conditions among racially/ethnically diverse HIV-infected men and women that reported one of the following: no trauma exposure, trauma without developing PTSD, or trauma exposure that resulted in PTSD. The secondary aim of the study was to evaluate the association between psychopathology and suicide attempts. We hypothesized that participants with PTSD would have a higher psychiatric burden than those without PTSD, and that trauma exposure would be associated with attempted suicide. In addition, we sought to examine the association between persistent psychiatric disorders among trauma exposed participants and neurological symptoms and level of disability.

2. Method

2.1. Participants

Data used in the current study are from the Manhattan HIV Brain Bank (MHBB) (U01MH083501); an ongoing prospective cohort study that includes comprehensive neurologic, psychiatric, and neuromedical evaluations. Baseline data were used in the current study. The MHBB study is approved by the local institutional review board and informed consent was provided by all participants. The primary enrollment criterion for the MHBB is consent to postmortem organ donation. Additional inclusion criteria were designed to recruit patients with advanced HIV disease (e.g., CD4 count less than 50 cells/ μ L, opportunistic infections) or other intractable medical conditions. Detailed information regarding study design and enrollment criteria can be found in a previously published study (Morgello et al., 2004). Participants were excluded from the present study if they did not complete psychiatric assessments. A total of 316 participants were divided into three groups reporting (a) no trauma exposure (No TE; $n=165$), (b) trauma exposure without PTSD (TE, no PTSD; $n=80$), or (c) PTSD ($n=71$).

2.2. Measures

2.2.1. Psychiatric evaluation—The Psychiatric Research Interview for Substance and Mental Disorders (PRISM; version 1.9B), a semi-structured diagnostic interview, was used to identify the presence or absence of past and current psychiatric disorders, including substance abuse/dependence, based on DSM-IV criteria (Hasin et al., 1996). As part of the PTSD module in the PRISM, trauma exposure is queried by asking if the respondent had ever experienced specific traumatic experiences outlined by the DSM-IV (APA, 2000). Potentially traumatic events were coded as trauma exposure if the participant endorsed experiencing extreme fear, helplessness, or horror in response to the event. If more than one trauma was reported, the participant was asked which experience bothered them the most. The presence or absence of PTSD was then determined in accordance with DSM-IV (APA, 2000) criteria. In the PRISM, suicidal behavior was assessed within the borderline personality disorder module with questions that asked if the participant had ever: (1) told someone they were going to commit suicide, or (2) attempted suicide. Only participants that

reported one or more suicide attempts were classified into the attempted suicide category. The substance abuse/dependence disorder modules assessed for: sedatives, opiates, cocaine, stimulants (other than cocaine), cannabis, hallucinogens, alcohol, and any other drug. In addition, the following substance-induced mental disorders were assessed: MDD, mania, panic, cyclothymia, dysthymia, psychotic symptoms, and GAD. Trained staff conducted the interviews and a clinical psychologist verified all data for diagnostic accuracy. In addition, each case was reviewed during weekly conferences for quality assurance.

2.2.2. Neurological symptoms—Assessment of neurological symptoms was conducted as part of a comprehensive neuromedical examination by trained staff. Participants were instructed to rate the presence and severity of each symptom as follows: 0 (normal; as good as it has always been), 1 (minimal), 2 (mild), 3 (moderate), or 4 (severe). The following 12 symptoms were assessed: attention, concentration, memory, speech, apathy, gait, hand coordination, tremor, weakness, pain, headache, and bladder control. A total neurological symptom score was calculated by summing each symptom severity rating. This 12-item scale showed good internal consistency (Cronbach's $\alpha=0.81$). The first four items on this scale have been used in a previous study as a brief assessment of cognitive symptoms (Fellows et al., 2013).

2.2.3. Functional status—Functional status was assessed with the Karnofsky rating scale. Scores on the Karnofsky scale range from 100 (normal) to 0 (dead). The Karnofsky rating scale has been shown to correlate with HIV-associated neurocognitive disorder (Gandhi et al., 2011).

2.3. Data analysis

Descriptive statistics were used to determine socio-demographic characteristics of the sample. For analytic purposes, participants were assigned to one of three groups: no reported trauma exposure; trauma exposed with no lifetime history of PTSD; trauma exposed with PTSD. Past and current psychiatric disorders, including PTSD, were collapsed into a single variable for each disorder assessed to create a "lifetime" variable. Multiple logistic regression analyses were calculated adjusting for socio-demographic factors (i.e., age, sex, education, and race/ethnicity), with trauma group (no trauma exposure/trauma exposed, no PTSD/trauma exposed, PTSD) as the independent variable and each of the other psychiatric disorders assessed individually as dependent variables. Differences in trauma types (i.e., being diagnosed with a life-threatening illness, sexual assault, physical assault, witnessed, accident, natural disaster, active military combat, and being very upset about hearing that any of these traumatic events happened to a close family member or friend [i.e., confronted with someone else's trauma]) between the trauma-exposed groups with and without PTSD were compared with unadjusted chi-square tests. Finally, a logistic regression model, adjusted for sociodemographic variables, was tested to identify associations between trauma exposure, psychopathology, and suicide attempts. In order to reduce the possibility of borderline personality disorder falsely inflating the model, only cases that met diagnostic criteria for borderline personality disorder without inclusion of the suicidal behavior symptom were retained in the suicide attempt regression analyses. For the same reason, the suicide attempt criterion for major depressive disorder was examined to determine if the

exclusion of this criterion would preclude a diagnosis of MDD. Two participants with borderline personality disorder no longer met criteria after the exclusion of the suicide variable. All of the participants with major depressive disorder met full criteria even after the suicide criterion was removed. Due to the relatively low frequency of specific substance-induced mental disorders (0.3–6.3%) these disturbances were combined into one variable. For the same reason, social phobia (4.1%) and specific phobia (5.7%) were collapsed into a single variable. Overall psychiatric burden was determined by the total number of lifetime Axis I and II disorders. Variables selected for inclusion in the regression analyses were based on a combination of previous research and factors significantly associated with trauma exposure in the current study.

To further examine the effects of persistent psychiatric symptomatology on neurological symptoms, trauma exposed individuals were divided into three groups: resilient (no current or past diagnosis), recovered (only past diagnosis), or current diagnosis. Nonparametric Kruskal–Wallis tests were used for non-normally distributed data.

3. Results

3.1. Participants

Participant characteristics are presented in Table 1. Average current age and age of reported HIV infection were similar between all three groups. The group that reported no trauma exposure had a significantly lower proportion of females compared to the trauma exposed group that developed PTSD (23.6% vs. 56.3%), $\chi^2(1, n=236)=23.84, p<0.001, OR=0.240$, 95% CI [0.133–0.433] and the trauma exposed group that did not develop PTSD (40.0%), $\chi^2(1, n=245)=7.01, p=0.008, OR=0.464$, 95% CI [0.262–0.824]. With regard to immunovirologic indicators, the group that reported no trauma was more likely to have CD4 cell counts below 200 cells per mm^3 than trauma-exposed individuals with PTSD, $\chi^2=9.24, p=0.002, OR=0.405$, 95% CI [0.225–0.731] or without PTSD, $\chi^2=11.88, p=0.001, OR=0.372$, 95% CI [0.210–0.658], but the percentage of individuals with detectable plasma HIV load (>49 copies/ml) were similar between all three groups. There were no significant differences in marital status between groups.

3.2. Prevalence

The prevalence of reported trauma exposure in the entire sample was 47.8% (151/316). One quarter (25.3%; 80/316) of participants reported trauma exposure without PTSD; whereas 22.5% (71/316) met criteria for PTSD. Among individuals that reported experiencing a traumatic event ($n=151$) nearly half (47.0%) developed PTSD. Fig. 1 presents trauma types between the trauma-exposed groups. Of note, these trauma types are not mutually exclusive: the number of trauma types was not significantly different between the trauma exposed groups that did not develop PTSD ($M=1.93, SD=0.85$) and the PTSD group ($M=2.11, SD=0.84$), $t(149)=1.85, p=0.176$. In this HIV-infected cohort, being diagnosed with a life-threatening illness was the most commonly experienced trauma. Among all trauma types, sexual assault was the only trauma type that was significantly associated with PTSD. Individuals that reported at least one sexual assault trauma reported experiencing more trauma types ($M=3.00, SD=1.47$) than those that did not report sexual trauma ($M=1.84$,

$SD=1.09$), $t(149)=-5.56$, $p<0.001$. Among those who reported trauma exposure, 23.4% reported only being diagnosed with a life-threatening illness, 33.8% only non-illness trauma, and 42.8% both life-threatening diagnoses and other trauma.

3.3. Co-morbid psychopathology

Table 2 presents odds ratios from the multiple regression analyses, adjusted for sociodemographic variables (i.e., sex, age, education, and race/ethnicity) that were used to identify the associations between trauma exposure and co-occurring psychiatric disorders. Individuals that reported trauma exposure without lifetime PTSD were less likely to have lifetime MDD compared to the group that did not report any trauma exposure (30.0% vs. 63.6%, $OR=0.23$, $p<0.001$, 95% CI [0.13–0.42]. Participants with PTSD were more likely than the group without trauma exposure to have borderline personality (18.3% vs. 4.8%, $OR=3.73$, $p=0.009$, 95% CI [1.39–10.04], antisocial personality (19.7% vs. 8.5%, $OR=2.69$, $p=0.026$, 95% CI [1.13–6.42], and phobia disorders (16.9% vs. 5.5%, $OR=3.11$, $p=0.023$, 95% CI [1.17–8.26]. Compared to those without a history of trauma, panic disorder was more prevalent among both trauma-exposed individuals with PTSD (9.9% vs. 2.4%, $OR=4.04$, $p=0.040$, 95% CI [1.06–15.33] and those without PTSD (8.8% vs. 2.4%, $OR=3.73$, $p=0.049$, 95% CI [1.01–18.85]. Additionally, substance-induced mental disorders were more common among trauma-exposed individuals with PTSD (18.3% vs. 9.7%, $OR=2.38$, $p=0.040$, 95% CI [1.04–5.46], and those without PTSD (18.8% vs. 9.7%, $OR=2.36$, $p=0.032$, 95% CI [1.08–5.15]. The most common co-morbid conditions associated with PTSD were substance abuse/dependence (85.9%), MDD (69.0%), and antisocial personality disorder (19.7%). Among those that were trauma exposed but did not develop PTSD, substance abuse/dependence (77.5%), MDD (30.0%), and any substance-induced mental disorder (18.8%) were most common. The most frequent disorders among those that reported no trauma exposure were substance abuse/dependence (83.0%), MDD (63.6%), and dysthymia (12.1%). Those with PTSD were more likely to have three or more co-morbid psychiatric diagnoses, in addition to PTSD, than the trauma exposed group without PTSD (12.5% vs. 25.4%), χ^2 (1, $n=151$)=4.11, $p=0.043$, $OR=2.38$, 95% CI [1.02–5.57] and the group that reported no trauma exposure (8.5% vs. 24.5%), χ^2 (1, $n=236$)=12.05, $p=0.001$, $OR=3.66$, 95% CI [1.70–7.87]. In addition, excluding participants whose only reported trauma was a life-threatening diagnosis did not change the main effects in any of the analyses.

To further examine the association between trauma exposure and psychiatric co-morbidity, the main analyses were re-run comparing the PTSD group to the TE, no PTSD group. Given the sex differences between groups, a sex by trauma exposure group (TE, no PTSD=0; PTSD=1) interaction term was included in these models in order to identify the extent to which sex moderates co-morbidity. Results revealed that those with PTSD were significantly more likely than the TE, no PTSD group to also meet diagnostic criteria for MDD, $OR=5.24$, 95% CI [2.54–10.83], $p<0.001$. Compared to the TE, no PTSD group, there was a trend for those with PTSD to meet criteria for specific phobia, $OR=3.09$, 95% CI [0.98–9.72], $p=0.054$, and antisocial personality disorder, $OR=2.8$, 95% CI [0.971–8.08], $p=0.057$. Although there was not a main effect of trauma group on borderline personality disorder, $OR=1.89$, 95% CI [0.678–5.30], $p=0.222$, there was a significant sex by trauma

group interaction, such that males with PTSD were more likely than females with PTSD to meet criteria for BPD, $OR=13.53$, 95% CI [1.08–169.10], $p=0.043$. No other significant main or interaction effects were found (all p -values > 0.222). Moreover, results did not differ when individuals who reported being diagnosed with a life-threatening illness as their only trauma were excluded from the analyses.

3.4. Suicide attempts

A series of multiple regression analyses were conducted to examine the contribution of different variables to suicide attempts. Initially, all variables that were associated with trauma exposure in the current study (i.e., MDD, panic disorder, phobia disorder, antisocial personality disorder, borderline personality disorder, and any substance-induced disorder), in addition to factors associated with suicidal behavior based on prior research (i.e., generalized anxiety disorder, substance abuse/dependence) were considered for inclusion. Sociodemographic variables (age, sex, education, and race/ethnicity) were entered in the first block, trauma exposure status (No TE/TE, No PTSD/TE, PTSD) in the second block, and in the third block, psychiatric variables considered for inclusion were independently entered. Only variables that significantly contributed to the initial models were included in the final models. Table 3 presents results for factors associated with suicide attempt. In the first model, both trauma-exposed groups were significantly more likely to have attempted suicide than the no trauma exposure reference group. The inclusion of MDD into the second model increased the odds ratio for the trauma-exposed group without PTSD. Borderline personality disorder in the third model attenuated the significant association between PTSD and suicide attempt to a non-significant trend ($p=0.067$). In model 4, substance-induced mental disorders were significantly associated with increased odds of suicide attempt, but the significant effect of trauma exposure on suicide attempts remained. The final model indicated that the trauma-exposed group without PTSD was significantly more likely to attempt suicide than the no trauma exposure group, but the association between PTSD and suicide attempts was not significant. In addition, MDD, borderline personality disorder, and any substance-induced mental disorder were all independently associated with increased odds of suicide attempt, beyond the effects of trauma exposure and PTSD. Additional analyses comparing trauma exposed groups (TE, no PTSD vs. PTSD), revealed no significant differences in suicide attempts (all p -values > 0.05).

3.5. Neurological symptoms and functional status

Results from the Kruskal–Wallis tests revealed significant main effects of group on neurological symptoms, $\chi^2(2)=17.2$, $p<0.001$, and Karnofsky score, $\chi^2(2)=12.1$, $p=0.002$. Means and standard deviations are presented in Table 4. Post-hoc Mann–Whitney U tests revealed that the current diagnosis group had significantly higher neurological symptom severity scores than the resilient ($U=795$, $p=0.002$) and recovered groups ($U=2660.5$, $p=0.001$). The resilient group had significantly higher Karnofsky scores than both the current diagnosis ($U=173.5$, $p=0.003$) and recovered groups ($U=97$, $p=0.003$).

4. Discussion

Although the association between PTSD and certain other psychiatric disorders has been established, less is known about the psychiatric burden of individuals that experience a trauma but do not develop PTSD. An unexpected result from the current study was that trauma exposure alone was not associated with an increased risk of MDD or substance use disorders. In fact, participants that reported trauma exposure but did not develop PTSD were less likely to have lifetime MDD than those that reported no trauma exposure. Although the generally high prevalence of MDD and substance use disorders in this sample may mitigate the lack of association between these factors and trauma exposure, the cause of the reduced odds of these disorders in the trauma-exposed group without PTSD is unclear. It is possible that this group had more effective coping strategies that led to resilience for other psychiatric disorders, in addition to PTSD. Perhaps by selecting this group based on the single criterion of trauma exposure without discernible residual psychiatric aftereffects isolated individuals with greater psychological, biological, and/or social resources to cope with adverse life events. Given that this is the first study to specifically examine the association between trauma-exposed people living with HIV that do not develop PTSD and a broad range of psychiatric disorders and suicide attempts, more research is needed to identify factors that may contribute to resilience.

The association between persistent psychiatric symptomatology and neurological symptoms has important implications. In our sample, the presence of a current psychiatric diagnosis among trauma-exposed participants was associated with increased neurological symptoms. These findings suggest that psychiatric conditions may contribute to patient report of neurological symptoms. In addition, lower Karnofsky ratings among participants with a current psychiatric diagnosis suggest that these individuals may exhibit greater levels of disability. The results from the current study are consistent with prior research that demonstrates an association between psychopathological resilience among trauma-exposed women and better health-related quality of life (Rusch et al., 2015). Therefore, assessing for psychiatric disorders during routine medical visits may help contextualize reported neurological symptoms and functional abilities among HIV-infected individuals, and offer opportunity for targeted interventions.

Initially, trauma exposure in both groups was associated with increased odds of suicide attempt, but after controlling for borderline personality disorder, the significant association with PTSD was not sustained. Whereas both MDD and substance-induced psychiatric disorders were independently associated with increased odds of suicide attempt, these conditions did not negate the significant effect of trauma exposure with or without PTSD. This suggests that borderline personality disorder may have a critical role in suicide attempts associated with PTSD, whereas MDD and substance-induced psychiatric disorders have unique effects that may exacerbate the association between PTSD and suicide attempts. Many investigations have established an association between PTSD and suicide attempts (e.g., Wilcox et al., 2009; Handley et al., 2012; Nepon et al., 2010; Kessler et al., 1999; Wunderlich et al., 1998), but have not examined the potential mediatory role of borderline personality disorder. This is particularly important because impulsivity and recurrent suicide attempts are DSM-IV (APA, 2000) diagnostic criteria for borderline personality disorder.

In addition, there is evidence that PTSD and borderline personality disorder frequently co-occur and are often precipitated by childhood trauma (Pietrzak et al., 2012; Golier et al., 2003; Zanarini et al., 1998). Indeed, the shared etiology of these disorders and the overlap in symptomatology suggests that aberrant personality traits may result from maladaptive responses to trauma. It has been suggested that some trauma-exposed individuals with borderline personality disorder be subsumed under a diagnosis of ‘complex’ PTSD (McLean and Gallop, 2003). Despite shared phenomenological constructs, the fact that not all individuals with borderline personality disorder endorse a history of trauma exposure supports the retention of these disorders as distinct classifications (Golier et al., 2003). Perhaps personality disorders pursuant to trauma exposure represent a distinct psychiatric phenotype. However, it is important to note that in the current study, even after controlling for borderline personality disorder, MDD, and substance-induced disorders, trauma exposure without PTSD was significantly associated with suicide attempts in all of the models tested. This contrasts with previous research in the general population that has found that trauma exposure without PTSD is not associated with an increased risk of suicide attempt (Wilcox et al., 2009). The difference between the findings of the current study and previous research may be related to the way in which trauma is defined. The operational definition of trauma exposure used in other studies is unclear.

In the current study only individuals that endorsed experiencing extreme fear, helplessness, or horror following a potentially traumatic event were classified into the trauma-exposed group. For example, although all of the participants in this study have been diagnosed with a potentially life-threatening illness (i.e., HIV), not all of the participants endorsed this experience as traumatic. Of note, the *Diagnostic and Statistical Manual of Mental Disorders* (5th ed.; *DSM-5*; American Psychiatric Association, 2013) diagnostic criteria no longer requires the response to the traumatic event to involve “intense fear, helplessness, or horror.” Therefore, the way in which trauma exposure is defined in future research may change. Thus, intrinsic to the diagnostic interview utilized in the current study, participants classified as trauma-exposed may represent a subgroup of individuals that are more emotionally reactive to potentially traumatic events.

Given that this study comprises adults with advanced HIV disease living in an urban area, the results of this study may not generalize to other populations. In addition, the results of the present study indicate an association, but not a causal pathway, between trauma exposure and other psychopathology. The age of onset for psychiatric disturbances could not be identified with our instrument because age of trauma exposure is only collected for individuals that met criteria for PTSD. As such it is unclear whether the mediatory effect of borderline personality disorder between PTSD and suicide attempt in the current study is a developmental consequence of trauma exposure or a factor that preceded trauma exposure. Also, given that past and current disorders were classified into a “lifetime” variable the sequence of psychiatric disturbances could not be tracked. Moreover, although participants could report several different types of trauma, the number of exposures to each trauma type was not collected. It is possible that exposure to certain trauma types result in PTSD because some traumas are more likely to occur over longer periods of time, such as childhood sexual abuse, which may produce more severe developmental disturbances. This concept is

supported by previous research that reported earlier onset abuse is associated with higher rates of PTSD and borderline personality disorder compared to later onset abuse (McLean and Gallop, 2003).

The results of this study indicate that trauma exposure, particularly among HIV-infected individuals that develop PTSD, is associated with substantial psychiatric co-morbidity. Trauma-exposed participants that did not develop PTSD displayed a more circumscribed increase in co-morbid pathologies, being more likely to have panic disorder and any substance-induced disorder compared to individuals without trauma exposure. However, trauma-exposed individuals without PTSD were less likely to have MDD. Factors associated with the variable pattern of psychiatric disturbances among trauma-exposed individuals with and without PTSD require further study, with particular attention given to examining potential mechanisms for coping or resilience. Additionally, future studies examining the potential moderation effect of race/ethnicity on trauma exposure and psychiatric co-morbidity may be useful for identifying at risk populations. Prospective studies may help identify the developmental trajectories of trauma exposure, psychiatric disturbances, and suicide attempts among people living with HIV.

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References

- Badiee J, Moore DJ, Atkinson JH, Vaida F, Gerard M, Duarte NA, Franklin D, Gouaux B, McCutchan JA, Heaton RK, McArthur J, Morgello S, Simpson D, Collier A, Marra CM, Gelman B, Clifford D, Grant I. Lifetime suicidal ideation and attempt are common among HIV+ individuals. *J Affect Disord.* 2012; 136:993–999. <http://dx.doi.org/10.1016/j.jad.2011.06.044>. [PubMed: 21784531]
- Beidas RS, Birkett M, Newcomb ME, Mustanski B. Do psychiatric disorders moderate the relationship between psychological distress and sexual risk-taking behaviors in young men who have sex with men? A longitudinal perspective. *AIDS Patient Care STDs.* 2012; 26:366–374. <http://dx.doi.org/10.1089/apc.2011.0418>. 10.1089/apc.2011.0418 [PubMed: 22680282]
- Belik SL, Cox BJ, Stein MB, Asmundson GJ, Sareen J. Traumatic events and suicidal behavior: results from a national mental health survey. *J Nerv Ment Dis.* 2007; 195:342–349. <http://dx.doi.org/10.1097/01.nmd.0b013e318060a869>. [PubMed: 17435485]
- Boarts JM, Buckley-Fischer BA, Armelie AP, Bogart LM, Delahanty DL. The impact of HIV diagnosis-related vs. non-diagnosis related trauma on PTSD, depression, medication adherence, and HIV disease markers. *J Evid-Based Soc Work.* 2009; 6:4–16. <http://dx.doi.org/10.1080/15433710802633247>. [PubMed: 19199133]
- Bolton JM, Robinson J. Population-attributable fractions of axis I and axis II mental disorders for suicide attempts: Findings from a representative sample of the adult, noninstitutionalized US population. *Am J Public Health.* 2010; 100:2473–2480. <http://dx.doi.org/10.2105/AJPH.2010.192252>. [PubMed: 21068419]
- Breslau N. The epidemiology of trauma, PTSD, and other posttrauma disorders. *Trauma Violence Abus.* 2009; 10:198–210. <http://dx.doi.org/10.1177/1524838009334448>.
- Brewin CR, Andrews B, Valentine JD. Meta-analysis of risk factors for posttraumatic stress disorder in trauma-exposed adults. *J Consult Clin Psychol.* 2000; 68:748–766. [PubMed: 11068961]
- Carrico AW, Johnson MO, Morin SF, Remien RH, Charlebois ED, Steward WT, Chesney MA. NIMH Healthy Living Project Team. Correlates of suicidal ideation among HIV-positive persons. *AIDS (Lond Engl).* 2007; 21:1199–1203. <http://dx.doi.org/10.1097/QAD.0b013e3181532c96>.

- Cogle JR, Resnick H, Kilpatrick DG. PTSD, depression, and their co-morbidity in relation to suicidality: cross-sectional and prospective analyses of a national probability sample of women. *Depression Anxiety*. 2009; 26:1151–1157. <http://dx.doi.org/10.1002/da.20621>. [PubMed: 19842171]
- Fellows RP, Byrd DA, Morgello S. Major depressive disorder, cognitive symptoms, and neuropsychological performance among ethnically diverse HIV+ men and women. *J Int Neuropsychol Soc : JINS*. 2013; 19(2):216–225. <http://dx.doi.org/10.1017/S1355617712001245>. [PubMed: 23290446]
- Gandhi NS, Skolasky RL, Peters KB, Moxley RT IV, Creighton J, Roosa HV, Selnes OA, McArthur J, Sacktor N. A comparison of performance-based measures of function in HIV-associated neurocognitive disorders. *J Neurovirol*. 2011; 17(2):159–165. [PubMed: 21437751]
- Golier JA, Yehuda R, Bierer LM, Mitropoulou V, New AS, Schmeidler J, Silverman JM, Siever LJ. The relationship of borderline personality disorder to posttraumatic stress disorder and traumatic events. *Am J Psychiatry*. 2003; 160:2018–2024. [PubMed: 14594750]
- Handley TE, Inder KJ, Kay-Lambkin FJ, Stain HJ, Fitzgerald M, Lewin TJ, Attia JR, Kelly BJ. Contributors to suicidality in rural communities: beyond the effects of depression. *BMC Psychiatry*. 2012; 12:105. <http://dx.doi.org/10.1186/1471-244X-12-105>. [PubMed: 22873772]
- Hasin DS, Trautman KD, Miele GM, Samet S, Smith M, Endicott J. Psychiatric research interview for substance and mental disorders (PRISM): Reliability for substance abusers. *Am J Psychiatry*. 1996; 153:1195–1201. [PubMed: 8780425]
- Kessler RC, Borges G, Walters EE. Prevalence of and risk factors for lifetime suicide attempts in the national comorbidity survey. *Arch Gen Psychiatry*. 1999; 56:617–626. [PubMed: 10401507]
- Kessler RC, Sonnega A, Bromet E, Hughes M, Nelson CB. Posttraumatic stress disorder in the national comorbidity survey. *Arch Gen Psychiatry*. 1995; 52:1048–1060. [PubMed: 7492257]
- Leserman J. Role of depression, stress, and trauma in HIV disease progression. *Psychosom Med*. 2008; 70:539–545. <http://dx.doi.org/10.1097/PSY.0b013e3181777a5f>. [PubMed: 18519880]
- Leserman J, Pence BW, Whetten K, Mugavero MJ, Thielman NM, Swartz MS, Stangl D. Relation of lifetime trauma and depressive symptoms to mortality in HIV. *Am J Psychiatry*. 2007; 164:1707–1713. <http://dx.doi.org/10.1176/appi.ajp.2007.06111775>. [PubMed: 17974936]
- Machtinger EL, Wilson TC, Haberer JE, Weiss DS. Psychological trauma and PTSD in HIV-positive women: a meta-analysis. *AIDS Behav*. 2012; 16:2091–2100. <http://dx.doi.org/10.1007/s10461-011-0127-4>. 10.1007/s10461-1011 [PubMed: 22249954]
- MacMillan HL, Fleming JE, Streiner DL, Lin E, Boyle MH, Jamieson E, Duku DK, Walsh CA, Wong MY, Beardslee WR. Childhood abuse and lifetime psychopathology in a community sample. *Am J Psychiatry*. 2001; 158:1878–1883. [PubMed: 11691695]
- Marshall BD, Prescott MR, Liberzon I, Tamburrino MB, Calabrese JR, Galea S. Posttraumatic stress disorder, depression, and HIV risk behavior among ohio army national guard soldiers. *J Trauma Stress*. 2013; 26:64–70. <http://dx.doi.org/10.1002/jts.21777>. 10.1002/jts.21777 [PubMed: 23417876]
- Martinez J, Hosek SG, Carleton RA. Screening and assessing violence and mental health disorders in a cohort of inner city HIV-positive youth between 1998 and 2006. *AIDS Patient Care STDs*. 2009; 23:469–475. <http://dx.doi.org/10.1089/apc.2008.0178>. [PubMed: 19519231]
- McLean LM, Gallop R. Implications of childhood sexual abuse for adult borderline personality disorder and complex posttraumatic stress disorder. *Am J Psychiatry*. 2003; 160:369–371. [PubMed: 12562587]
- Morgello S, Estanislao L, Simpson D, Geraci A, DiRocco A, Gerits P, Ryan E, Yakoushina T, Khan S, Mahboob R, Naseer M, Dorfman D, Sharp V. Manhattan HIV Brain Bank. HIV-associated distal sensory polyneuropathy in the era of highly active antiretroviral therapy: The manhattan HIV brain bank. *Arch Neurol*. 2004; 61:546–551. <http://dx.doi.org/10.1001/archneur.61.4.546>. [PubMed: 15096404]
- Mugavero MJ, Pence BW, Whetten K, Leserman J, Swartz M, Stangl D, Thielman NM. Predictors of AIDS-related morbidity and mortality in a southern U. cohort AIDS Patient Care STDs. 2007; 21:681–690. <http://dx.doi.org/10.1089/apc.2006.0167>. [PubMed: 17919095]

- Mugavero MJ, Raper JL, Reif S, Whetten K, Leserman J, Thielman NM, Pence BW. Overload: the Impact of incident stressful events on antiretroviral medication adherence and virologic failure in a longitudinal, multi-site HIV cohort study. *Psychosomatic medicine*. 2009; 71:920–926. <http://dx.doi.org/10.1097/PSY.0b013e3181bfe8d2>. [PubMed: 19875634]
- Nepon J, Belik SL, Bolton J, Sareen J. The relationship between anxiety disorders and suicide attempts: Findings from the national epidemiologic survey on alcohol and related conditions. *Depression Anxiety*. 2010; 27:791–798. <http://dx.doi.org/10.1002/da.20674>. [PubMed: 20217852]
- Oquendo M, Brent DA, Birmaher B, Greenhill L, Kolko D, Stanley B, Zelazny J, Burke AK, Firinciogullari S, Ellis SP, Mann JJ. Posttraumatic stress disorder comorbid with major depression: factors mediating the association with suicidal behavior. *Am J Psychiatry*. 2005; 162:560–566. <http://dx.doi.org/10.1176/appi.ajp.162.3.560>. [PubMed: 15741474]
- Pagura J, Stein MB, Bolton JM, Cox BJ, Grant B, Sareen J. Comorbidity of borderline personality disorder and posttraumatic stress disorder in the U.S. population. *J Psychiatry Res*. 2010; 44:1190–1198. <http://dx.doi.org/10.1016/j.jpsychires.2010.04.016>.
- Pietrzak RH, Goldstein RB, Southwick SM, Grant BF. Psychiatric comorbidity of full and partial posttraumatic stress disorder among older adults in the united states: results from wave 2 of the national epidemiologic survey on alcohol and related conditions. *Am J Geriatr Psychiatry: Off J Am Assoc Geriatr Psychiatry*. 2012; 20:380–390. <http://dx.doi.org/10.1097/JGP.0b013e31820d92e7>.
- Pence BW, Mugavero MJ, Carter TJ, Leserman J, Thielman NM, Raper JL, Proeschold-Bell RJ, Reif S, Whetten K. Childhood trauma and health outcomes in HIV-infected patients: An exploration of causal pathways. *Journal of Acquired Immune Deficiency Syndromes*. 2012; 59:409–416. <http://dx.doi.org/10.1097/QAI.0b013e31824150bb>. [PubMed: 22107822]
- Reed PL, Anthony JC, Breslau N. Incidence of drug problems in young adults exposed to trauma and posttraumatic stress disorder: do early life experiences and predispositions matter? *Arch. Gen Psychiatry*. 2007; 64:1435–1442. <http://dx.doi.org/10.1001/archpsyc.64.12.1435>.
- Rusch HL, Shvil E, Szanton SL, Neria Y, Gill JM. Determinants of psychological resistance and recovery among women exposed to assaultive trauma. *Brain and behavior*. 2015:5.
- Sandweiss DA, Slymen DJ, Leardmann CA, Smith B, White MR, Boyko EJ, Hooper TI, Gackstetter GD, Amoroso PJ, Smith TC. Millennium Cohort Study Team. Preinjury psychiatric status, injury severity, and post-deployment posttraumatic stress disorder. *Arch Gen Psychiatry*. 2011; 68:496–504. <http://dx.doi.org/10.1001/archgenpsychiatry.2011.44>. [PubMed: 21536979]
- Simoni JM, Ng MT. Trauma, coping, and depression among women with HIV/AIDS in new york city. *AIDS Care*. 2000; 12:567–580. <http://dx.doi.org/10.1080/095401200750003752>. [PubMed: 11218543]
- Spies G, Afifi TO, Archibald SL, Fennema-Notestine C, Sareen J, Seedat S. Mental health outcomes in HIV and childhood maltreatment: a systematic review. *Syst Rev*. 2012; 1:30. <http://dx.doi.org/10.1186/2046-4053-1-30>. [PubMed: 22742536]
- Storr CL, Ialongo NS, Anthony JC, Breslau N. Childhood antecedents of exposure to traumatic events and posttraumatic stress disorder. *Am J Psychiatry*. 2007; 164:119–125. <http://dx.doi.org/10.1176/appi.ajp.164.1.119>. [PubMed: 17202553]
- Whetten K, Leserman J, Lowe K, Stangl D, Thielman N, Swartz M, Hanisch L, Van Scoyoc L. Prevalence of childhood sexual abuse and physical trauma in an HIV-positive sample from the deep south. *Am J Public Health*. 2006; 96:1028–1030. <http://dx.doi.org/10.2105/AJPH.2005.063263>. [PubMed: 16670226]
- Whetten, K.; Reif, S.; Toth, M.; Jain, E.; Leserman, J.; Pence, BW. Relationship between trauma and high-risk behavior among HIV-positive men who do not have sex with men (MDSM). *AIDS Care*. 2012. <http://dx.doi.org/10.1080/09540121.2012.712665>
- Wilcox HC, Storr CL, Breslau N. Posttraumatic stress disorder and suicide attempts in a community sample of urban american young adults. *Arch Gen Psychiatry*. 2009; 66:305–311. <http://dx.doi.org/10.1001/archgenpsychiatry.2008.557>. [PubMed: 19255380]
- Wunderlich U, Bronisch T, Wittchen HU. Comorbidity patterns in adolescents and young adults with suicide attempts. *Eur Arch Psychiatry Clin Neurosci*. 1998; 248:87–95. [PubMed: 9684918]

Zanarini MC, Frankenburg FR, Dubo ED, Sickel AE, Trikha A, Levin A, Reynolds V. Axis I comorbidity of borderline personality disorder. *Am J Psychiatry*. 1998; 155:1733–1739. [PubMed: 9842784]

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Fig. 1.

Rates of trauma types by PTSD status ($n=151$). Participants who reported sexual assault as a psychological trauma were significantly more likely to meet criteria for PTSD. *** $p<0.001$.

Table 1

Participant characteristics.

	No TE (<i>n</i> =165) % or <i>M</i> (<i>SD</i>)	TE, No PTSD (<i>n</i> =80) % or <i>M</i> (<i>SD</i>)	TE, PTSD (<i>n</i> =71) % or <i>M</i> (<i>SD</i>)	<i>p</i> -Value
Age (years)	44.8 (7.4)	46.3 (7.3)	44.5 (8.2)	0.268
Age at HIV dx (years)	34.9 (8.2)	33.8 (8.8)	34.1 (8.2)	0.511
Sex (% female)	23.6	40.0	56.3	0.001
Race/ethnicity				0.634
Non-Hispanic black	49.1	42.5	46.5	
Hispanic/latino	26.1	30.0	33.8	
Non-Hispanic white	24.8	27.5	19.7	
Education				0.026
<12 years	42.4	36.3	45.1	
12–15 years	43.0	35.0	45.1	
16 or more	14.5	28.8	9.9	
Marital status				0.137
Married/cohabitating	10.3	22.5	23.9	
Divorced/separated	25.5	21.3	22.5	
Widowed	7.3	6.3	7.0	
Never married	57.0	50.0	46.5	
Abs CD4, % 200 cells/mm ³ (<i>n</i> =292)	66.7	42.7	44.8	0.001
Plasma HIV load, % detectable (<i>n</i> =291)	74.0	61.8	66.7	0.153

Note. TE=trauma exposure; dx=diagnosis.

Table 2

Odds ratios for trauma exposure and co-morbid psychopathology.

	N	%	OR	CI 95%	p
MDD					
No TE	105	63.6	[Reference]		
TE, No PTSD	24	30.0	0.23	0.13–0.42	0.000
TE, PTSD	49	69.0	1.17	0.63–2.18	0.626
Dysthymia					
No TE	20	12.1	[Reference]		
TE, No PTSD	9	11.3	0.75	0.31–1.81	0.525
TE, PTSD	11	15.5	1.04	0.44–2.42	0.936
GAD					
No TE	16	9.7	[Reference]		
TE, No PTSD	3	3.8	0.29	0.08–1.11	0.070
TE, PTSD	3	4.2	0.27	0.06–1.06	0.060
Panic disorder					
No TE	4	2.4	[Reference]		
TE, No PTSD	7	8.8	3.73	1.01–13.85	0.049
TE, PTSD	7	9.9	4.04	1.06–15.33	0.040
Phobia disorder					
No TE	9	5.5	[Reference]		
TE, No PTSD	5	6.3	1.00	0.31–3.24	0.995
TE, PTSD	12	16.9	3.11	1.17–8.26	0.023
Antisocial personality					
No TE	14	8.5	[Reference]		
TE, No PTSD	6	7.5	0.99	0.35–2.77	0.976
TE, PTSD	14	19.7	2.69	1.13–6.42	0.026
Borderline					
No TE	8	4.8	[Reference]		
TE, No PTSD	7	8.8	1.93	0.65–5.74	0.238
TE, PTSD	13	18.3	3.73	1.39–10.04	0.009

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	N	%	OR	CI 95%	p
SI disorder					
No TE	16	9.7	[Reference]		
TE, No PTSD	15	18.8	2.36	1.08–5.15	0.032
TE, PTSD	13	18.3	2.38	1.04–5.46	0.040
Substance use					
No TE	137	83.0	[Reference]		
TE, No PTSD	62	77.5	1.03	0.49–2.16	0.938
TE, PTSD	61	85.9	1.59	0.68–3.75	0.286

Note. All models adjusted for age, sex, education, and race/ethnicity. MDD=major depressive disorder. TE=trauma exposure; PTSD=posttraumatic stress disorder; GAD=generalized anxiety disorder; SI=substance induced. Percentages represent disorder prevalence within each group.

Table 3

Association between trauma exposure, PTSD, and lifetime suicide attempt.

Predictor	OR	95% CI		p
Model 1				
No TE		[Reference]		
TE, No PTSD	5.47	1.95	15.35	0.001
TE, PTSD	3.78	1.26	11.36	0.018
Model 2				
No TE		[Reference]		
TE, No PTSD	7.91	2.63	23.74	0.000
TE, PTSD	3.68	1.22	11.10	0.021
Major depressive disorder	2.86	1.13	7.25	0.027
Model 3				
No TE		[Reference]		
TE, No PTSD	5.07	1.77	14.50	0.002
TE, PTSD	2.92	0.93	9.13	0.066
Borderline personality	4.85	1.74	13.55	0.003
Model 4				
No TE		[Reference]		
TE, No PTSD	5.45	1.89	15.69	0.002
TE, PTSD	3.51	1.15	10.74	0.027
Substance-induced disorder	3.40	1.34	8.60	0.010
Model 5				
No TE		[Reference]		
TE, No PTSD	7.80	2.50	24.29	0.000
TE, PTSD	2.73	0.85	8.75	0.091
Major depressive disorder	3.80	1.41	10.23	0.008
Borderline personality	3.80	1.30	11.09	0.015
Substance-induced disorder	3.56	1.26	10.09	0.017

Note. All models adjusted for age, sex, education, and race/ethnicity. TE=trauma exposure; PTSD=posttraumatic stress disorder.

Table 4

Neurological symptoms and functional status.

	Resilient <i>M (SD)</i>	Recovered <i>M (SD)</i>	Current <i>M (SD)</i>	<i>p</i>
HIV duration	11.91 (4.99)	12.77 (4.37)	11.72 (5.13)	0.330
Neurological symptoms	3.73 (4.24)	6.07 (4.78)	10.91 (8.1)	0.000
Karnofsky	86.4 (12.1)	70.2 (16.7)	68.2 (17.2)	0.002