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A Symptom Cluster Approach to Psychiatric Disorders Among Men Who Have Sex with Men and Have Experiences of Childhood Sexual Abuse: Impact on Sexual Health Knowledge and Sexual Risk Taking Behavior

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Objective: Gay, bisexual, and other men who have sex with men carry a disproportionate burden of new HIV infections in the United States. This same group is also particularly vulnerable to experiences of childhood trauma, including sexual abuse, and subsequently developing psychiatric disorders later in adulthood. This study examines how particular psychiatric disorders and their underlying symptom clusters impair sexual health knowledge and condom use self-efficacy, and also increase sexual risk-taking behavior.

Method: A total of 296 HIV-uninfected men who have recently had condomless sex with other men completed a baseline survey and psychodiagnostic interview. Among the measures included in this study were demographics, HIV/AIDS knowledge questionnaire, condom use self-efficacy, recent sexual behavior, and a psychodiagnostic assessment (the MINI and SCID) with a trained study clinician.

Results: Over two-thirds of the sample (67%) met diagnostic criteria for at least one of these major psychiatric disorders. A diagnosis of Major Depressive Disorder and its underlying cognitive / affective and physical symptom clusters were significantly related to decreased sexual health knowledge and lower condom use self-efficacy. A diagnosis of Generalized Anxiety Disorder was associated with sexual risk taking behavior. The underlying cognitive /affective and physical symptom clusters of Generalized Anxiety Disorder were associated with decreased sexual health knowledge.

Conclusion: These findings underscore the need for interventions that are flexible and capable of addressing multiple mental health issues, particularly for gay and bisexual men with developmental trauma histories. Improving the health and mental wellness of this group may ultimately counter new HIV infections.

Key Words: MSM, HIV, mental health, sexual health, childhood sexual abuse

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A Symptom Cluster Approach to Psychiatric Disorders Among Men Who Have Sex with Men and Have Experiences of Childhood Sexual Abuse: Impact on Sexual Health Knowledge and Sexual Risk Taking Behavior

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A Symptom Cluster Approach to Psychiatric Disorders Among Men Who Have Sex with Men and Have Experiences of Childhood Sexual Abuse: Impact on Sexual Health Knowledge and Sexual Risk Taking Behavior

While the transmission rate of human immunodeficiency virus (HIV) has remained stable in the broader population, HIV diagnosis rates have increased in gay, bisexual, and other men who have sex with men (MSM) over the past ten years (Centers for Disease Control [CDC], 2014). Despite the expansion of HIV prevention tools in recent years (e.g., risk reduction sexual practices, condoms, and pre-exposure prophylaxis [PrEP]), MSM accounted for an estimated 67% of total new infections in the United States in 2014 (CDC, 2014). If this trend were to continue, approximately one in six gay and bisexual men will be diagnosed with HIV in their lifetime (CDC, 2014). This underscores the need to refine and improve access and implementation of current HIV prevention interventions, particularly those with trauma histories and co-occurring psychiatric disorders.

Syndemic Health Conditions and Minority Stress

Gay, bisexual, and other MSM experience a disproportionate burden of psychosocial health problems compared to their heterosexual counterparts. Using population-based surveys, Cochran and Mays have demonstrated that sexual minority men are at increased risk for psychiatric disorders, including Major Depressive Disorder, Generalized Anxiety Disorder, and Post-Traumatic Stress Disorder (Cochran & Mays, 2000; Cochran & Mays, 2008; Mays & Cochran, 2001). The researchers found that gay and bisexual men were three times more likely to meet criteria for Major Depressive Disorder (31%) and 1.6 times more likely to meet criteria for

Generalized Anxiety Disorder (2.9%) than heterosexual men (Cochran, Sullivan, Mays, 2003). Additionally, they found that almost 20% of sexual minority men met criteria for two or more psychiatric disorders. Numerous studies have illustrated that these psychiatric disorders frequently co-occur with other significant psychosocial problems, such as childhood sexual abuse (CSA), intimate partner violence, and substance abuse, to produce 'syndemic' or simultaneous, overlapping epidemics surrounding gay, bisexual, and other MSM (Stall & Purcell, 2000; Stall, et al., 2003; Mimiaga, et al., 2009).

Evidence suggests that sexual minority status plays a significant role in the production of this syndemic health condition. This framework, originally developed by Meyer in 2003, posits that stress factors such as experiences of discrimination, internalized homophobia, sexual orientation concealment, and chronic expectations of gay-related rejection result in psychosocial syndemic health conditions (Hatzenbuehler, 2009; Meyer, 2003). Further, these minority stress factors have been directly associated with depressive and anxious symptomology in gay men (Feinstein, Goldfried, Davila, 2012). Subsequent research has highlighted how syndemic concerns present as additive risk for HIV risk behavior and transmission (Mustanski et al., 2007; Safren, Blashill, & O'Cleirigh, 2011; Sikkema et al., 2009).

Role of Childhood Sexual Abuse

Within the syndemic framework, CSA in particular has been identified as a risk factor for psychological impairment later in adulthood (Browne & Finkelhor, 1986; O'Cleirigh, Safren, & Mayer, 2012). It must be noted that MSM, compared to heterosexual men, experience disproportionate rates of CSA (Sweet & Welles, 2012). Most samples estimate that somewhere between 35 and 40% of MSM have experienced CSA (Doll et al., 1992; Lenderking et al., 1997;

Mimiaga et al., 2009). The association between CSA and HIV transmission risk in adulthood has been well documented (Lloyd & Operario, 2012; O'Leary et al., 2003). Furthermore, the linkage between CSA and adult sexual risk behavior has been identified along several pathways, such as depressive and anxious symptomatology and post-traumatic reactions (Kalichman et al., 2001; Miller, 1999; Morrill et al., 2001). Specifically among MSM, CSA has been associated with current Major Depressive Disorder, Post-Traumatic Stress Disorder, and sexual risk behavior (Bartholow et al., 1994; Boroughs et al., 2015; Kalichman, Gore-Felton, Benotsch, Cage, & Rompa, 2004). Addressing syndemic factors, such as CSA, has been argued to be an essential, yet complicating, element of HIV prevention interventions for MSM (Halkitis, 2010; O'Cleirigh, Safren, & Mayer, 2012).

Theoretical Models of Health Behavior

Decades of research have been devoted to the field and study of health behavior change. The Information, Motivation, and Behavior Skills (IMB) Model is among the most commonly-used frameworks for understanding sexual risk behavior and developing HIV prevention interventions (Fisher & Fisher, 1992; Fisher, Fisher, Williams, & Malloy, 1994). The model posits that HIV information and motivation work through behavioral skills to guide sexual risk reduction behavior. Individuals must possess accurate HIV-related information and prevention knowledge, and maintain adequate motivation, in order to subsequently utilize behavioral skills in multiple contexts to decrease HIV transmission potential. Results linking the components of the IMB Model to sexual risk have been mixed. For example, some studies have highlighted the importance of HIV-related information and knowledge with HIV transmission while others have found limited associations (Halkitis, Zade, Shrem, & Marmor, 2004; van der Snoek et al., 2006). Other research

has emphasized the importance of the motivation construct in the model (Carey & Lewis, 1999; Kalichman, Picciano, & Roffman, 2008).

Social Cognitive Theory is also useful in understanding health behavior change, particularly as it relates to self-efficacy constructs. This model, as it relates to sexual health, proposes that individuals engage in a cognitive process of weighing pros and cons of engaging in risk reduction behaviors, which influences an individual's self-efficacy (Bandura, 1994; Bandura, 2004). This model accounts for social norms and confidence in one's ability to practice risk reduction strategies, such as condom usage (Wulfert & Wan, 1993; Wulfert & Wan, 1995; Wulfert, Wan, & Backus, 1996). Safren and colleagues have suggested expanding this model to account for the influence of depression (i.e., negative bias of thoughts and beliefs) on the cognitive self-efficacy construct (2011).

As previously noted, MSM experience disproportionate rates of psychosocial health problems, including CSA and psychiatric disorders (Stall, et al., 2003). These conditions are likely to interfere with effective uptake of existing HIV preventions based in IMB Model and Social Cognitive Theory of behavior change (Safren, Reisner, Herrick, Mimiaga, & Stall, 2010). For example, in a sample of HIV-infected MSM, Major Depressive Disorder appears to moderate the degree to which Social Cognitive Theory predicts HIV transmission risk behavior (Safren et al., 2010). In this study, the self-efficacy construct of Social Cognitive Theory was not associated with HIV transmission risk behavior. Additionally, a secondary analysis conducted from Project EXPLORE (i.e., an intervention to reduce HIV risk behaviors among HIV-uninfected MSM) data highlighted how experiences of CSA may moderate the intervention's potential efficacy (Mimiaga et al., 2009). In sum, HIV prevention interventions would likely benefit from integrating treatment of common psychiatric and psychosocial problems experienced by MSM.

Sexual Health Knowledge and Self-efficacy

Theoretical models recognize that knowledge about disease transmission and self-protective behaviors is associated with health behavior change. HIV prevention interventions thus typically include an education component (Carey & Schroder, 2002; Fisher & Fisher, 1992; Kalichman, 1998). Knowledge assessment within interventions can be used in a variety of ways, including to provide corrective feedback, enhance risk awareness, and assess intervention effectiveness (Carey & Lewis, 1999). However, it has been noted that knowledge assessment and information enhancement would be insufficient for HIV prevention intervention because motivation for health behavior change is a critical construct (Kalichman, Picciano, & Roffman, 2008). Decisions that affect health, such as condom usage and other risk reduction behaviors, are dependent upon an individual's self-efficacy. Bandura proposed that self-efficacy mediates behavior, thereby influencing the initiation of health behavior change, the amount of effort expended, and sustainability during obstacles or barriers (Bandura, 1990). That is to say, "people will practice safer sex only to the degree that they believe they can protect themselves when needed" (Wulfert & Wan, 1993, p. 346).

Transdiagnostic Assessment and Treatment

There has been a significant, albeit slow, movement in the field of clinical psychology to incorporate a transdiagnostic approach to the assessment and treatment of psychiatric disorders (Barlow, Bullis, Comer & Ametaj, 2013). Despite efforts to shift towards a more dimensional classification of psychiatric disorders in the fifth edition of the *Diagnostic and Statistical Manual of Mental Disorders* (DSM-5), significant diagnostic comorbidity remains (American Psychiatric

Association, 2013; Brown & Barlow, 2009). It has been emphasized that developing separate treatments for differing psychosocial syndemic conditions is inefficient (Pachankis, 2015). One possibility is that addressing the common underlying symptom pathways may be a more effective model of treatment. Beyond the clinical implications, there are important research gains to this approach, as it fits well within the National Institute of Mental Health (NIMH) Strategic Plan of Research Domain Criteria (RDoC; NIMH, 2011). RDoC is a new framework proposed for studying the common underlying pathways "from genomics to self-report" of mental disorders (NIMH, 2011). Parts of RDoC are consistent with the goal of some clinical psychologists to develop a unified treatment protocol that address these common underlying mechanisms across disorders (Farchione et al., 2012).

Present Study

MSM with histories of CSA are particularly vulnerable to develop psychiatric disorders in adulthood that put them at increased risk for HIV acquisition. This study will provide a description of the sample with respect to background and socio-demographic characteristics. Aim 1: the proposed study will examine how psychiatric disorders Major Depressive Disorder (MDD), Generalized Anxiety Disorder (GAD), and Post-Traumatic Stress Disorder (PTSD) impacts sexual health knowledge, condom use self-efficacy, and sexual risk taking behavior. Aim 2: this study will also examine how the underlying symptom clusters of these disorders impact the same sexual health knowledge, condom use self-efficacy, and sexual risk taking behavior outcomes. These results may inform the refinement of existing interventions or the development of future interventions. Results could influence how patients or participants are diagnostically assessed at

baseline appointments and potentially provide useful transdiagnostic intervention targets for treatment.

Hypotheses 1:

1a) It is hypothesized that a MDD diagnosis will be significantly related to sexual health knowledge and condom-use self-efficacy. Specifically, MDD diagnosis will be associated with decreased sexual health knowledge and lower condom-use self-efficacy scores.

1b) It is hypothesized that a MDD diagnosis will exhibit a significant curvilinear relationship with condomless sexual intercourse acts (with casual partners and serodiscordant primary sexual partners). Specifically, moderate levels of depression will be associated with increased sexual risk taking, that is, increased condomless sexual intercourse acts.

1c) It is hypothesized that a GAD diagnosis will be significantly related to sexual health knowledge, condom-use self-efficacy, and condomless intercourse acts (with casual partners and serodiscordant primary sexual partners). Specifically, GAD diagnosis will be associated with decreased sexual health knowledge, lower condom-use self-efficacy scores, and increased condomless intercourse acts. This hypothesis will also be tested controlling for MDD.

1d) It is hypothesized that a PTSD diagnosis will be significantly related to sexual health knowledge, condom-use self-efficacy, and condomless intercourse acts (with casual partners and serodiscordant primary sexual partners). Specifically, PTSD diagnosis will be associated with decreased sexual health knowledge, lower condom-use self-efficacy

scores, and increased condomless intercourse acts. This hypothesis will also be tested controlling for MDD.

Hypotheses 2: These hypotheses will augment the analyses undertaken in Hypotheses 1 by examining the impact of the symptom clusters within each of the diagnostic categories on sexual health outcomes.

2a) The cognitive / affective symptoms and physical symptoms clusters of MDD will be examined separately to assess their relationship with sexual health knowledge, condom-use self-efficacy, and condomless intercourse acts (with casual partners and serodiscordant primary sexual partners). It is hypothesized that increased presence of MDD cognitive / affective symptoms will be associated with decreased sexual health knowledge, lower scores on condom-use self-efficacy, and increased condomless intercourse acts. Also, it is hypothesized that increased presence of MDD physical symptoms will be associated with decreased sexual health knowledge, lower scores on condom-use self-efficacy, and increased condomless intercourse acts.

2b) The affective / cognitive symptoms and physical symptoms of GAD will be examined separately to assess their relationship with sexual health knowledge, condom-use self-efficacy, and condomless intercourse acts (with casual partners and serodiscordant primary sexual partners). It is hypothesized that increased presence of GAD cognitive / affective symptoms will be associated with decreased sexual health knowledge, lower scores on condom-use self-efficacy, and increased condomless intercourse acts. Also, it is hypothesized that increased presence of GAD physical symptoms will be associated with

decreased sexual health knowledge, lower scores on condom-use self-efficacy, and increased condomless intercourse acts.

2c) The symptom clusters of PTSD (intrusions, avoidance, and hyperarousal) will be examined separately to assess their relationship with sexual health knowledge, condom-use self-efficacy, and condomless intercourse acts (with casual partners and serodiscordant primary sexual partners). It is hypothesized that increased presence of PTSD intrusive symptoms will be associated with decreased sexual health knowledge, lower scores on condom-use self-efficacy, and increased condomless intercourse acts. It is also hypothesized that increased presence of PTSD avoidance symptoms will be associated with decreased sexual health knowledge, lower scores on condom-use self-efficacy, and increased condomless intercourse acts. Finally, it is hypothesized that increased presence of PTSD hyperarousal symptoms will be associated with decreased sexual health knowledge, lower scores on condom-use self-efficacy, and increased condomless intercourse acts.

Methods

Participants

This study was part of a larger clinical trial that examined the efficacy of a novel Cognitive Processing Therapy for Sexual Risk Reduction intervention for MSM and a history of childhood sexual abuse (O'Cleirigh et al., 2018). Men were recruited to participate in a multi-site randomized controlled trial located in Boston, MA and Miami, FL. Recruitment for participants occurred via bar and nightclub outreach, community outreach, and targeted advertisements in print and on social media and smartphone apps. To be eligible for the trial, participants 1) identified as a biological

man who has sex with other men and was 18 years of age or older; 2) reported a history of CSA (i.e., sexual contact before age 13 with a person at least 5 years older or sexual contact between ages of 13 or 16 with a person 10 years older); 3) reported engaging in sexual risk taking behavior (i.e., at least one act of unprotected insertive or receptive anal or vaginal intercourse within the previous three months) and; 4) HIV-uninfected.

Procedure

For this study, data was obtained from the baseline assessment of a randomized clinical trial testing the efficacy of an intervention developed to reduce sexual risk taking behavior among MSM with a history of CSA. HIV-uninfected status was confirmed at the baseline appointment via a rapid HIV antibody screening test. Participants subsequently completed an electronic, self-report assessment battery of questionnaires on psychosocial functioning and sexual activity. Participants then met with a trained master's or doctoral-level clinician to complete a comprehensive psychosocial / psychodiagnostic interview. The baseline assessment visit lasted approximately two hours and participants earned $50 at the completion of the visit. Not relevant to this study, but following the baseline assessment, eligible participants then completed two weekly visits of sexual risk reduction counseling. At weekly visit three, participants were randomized to either the experimental treatment arm (i.e., adapted Cognitive Processing Therapy) or time-matched control arm (i.e., information-supportive psychotherapy). Participants could earn up to $500 for full study completion (i.e., $25 for ten weekly treatment visits and $50 at baseline, 3-month, 6-month, 9-month, and 12-month post baseline follow-up visits). All study procedures and measures received Institutional Review Board approval.

Measures

Psychosocial / Psychiatric Assessment

Demographics. Participants provided demographic information which included their age, race, ethnicity, sexual orientation, relationship status, education level, employment status, and income.

Depression Severity. Participants completed the Center for Epidemiological Studies-Depression scale (CES-D) a self-report, 20-item measure of depressive symptoms (Radloff, 1977). The CES-D assessed depressed mood in the previous week on a four-point scale that ranged from 0 "rarely or none of the time (less than one day)" to 3 "most or all of the time (five – seven days)." Higher scores on the scale indicated increased presence of depressive symptoms and severity. Based on the distribution of the sample, and in accordance with the findings of Kalichman, Rompa, and Cage (2000), participants who scored in the 0 to 16 range were considered to have no or "mild" depressive symptoms; participants who scored in the 17 to 27 range were considered to have "moderate" depression; and participants who scored in the 28 to 56 range were considered to have "severe" depression in this sample. The CES-D demonstrated high reliability in the sample with a Cronbach's alpha of 0.93.

Psychiatric diagnostics. The *Mini-International Neuropsychiatric Interview* (MINI) is a structured diagnostic interview administered by a trained clinician that has demonstrated good validity and reliability (Sheehan et al., 1998). The MINI was administered to assess for Major Depressive Disorder (MDD) and Generalized Anxiety Disorder (GAD) based on DSM-IV diagnostic criteria. Participants met criteria for Major Depressive Disorder based on the the presence of associated symptomatology two weeks prior to the baseline assessment. Generalized Anxiety Disorder was diagnosed based on the presence of diagnostic criteria in the preceding six

months. These symptomatology timeframes are consistent with the current DSM-5. The *Structured Clinical Interview for the DSM-IV Axis I Disorders* (SCID) was also administered via clinician interview to assess for Post-Traumatic Stress Disorder (PTSD) diagnosis (First, Spitzer, Gibbon, & Williams, 1997). This module of the SCID provides a more comprehensive assessment of PTSD symptom clusters (i.e., intrusive thoughts, avoidance, and hyper-arousal) than what is offered by the MINI. A PTSD diagnosis was evaluated by the presence of symptoms one month prior to baseline assessment. The MINI and SCID have demonstrated good psychometric properties and both are used extensively in clinical and research settings to render diagnoses based on the *Diagnostic and Statistical Manual of Mental Health Disorders, Fourth Edition*. (American Psychiatric Association, 2000; Lobbestael, Leurgans, & Arntz, 2011; Sheehan et al., 1997).

Whether participants met diagnostic criteria threshold for PTSD, MDD, and GAD was calculated based on the standardized scoring criteria of the MINI MDD and GAD modules (Sheehan et al., 1998) and the SCID PTSD module (First, Spitzer, Gibbon, & Williams, 1997). These dichotomous diagnostic measures were the variables used in the main analysis for hypotheses 1. For hypotheses 2, which examines the relationship of particular symptom clusters within each diagnostic category, the following variables were calculated consistent with precedents in the established literature (Anderson & Hope, 2008; Brown, Chorpita, & Barlow, 1998; Clark & Watson, 1991; Grisanzio et al., 2018; Joiner Jr et al., 1999; King, Leskin, King, & Weathers, 1998; Krueger, 1999; Sheehan et al., 1997; Williams et al., 2016):

Cognitive / affective symptoms of MDD: The total number of symptoms endorsed from the MINI assessment of MDD, which include A1 (i.e., Have you been consistently depressed or down, most of the day, nearly every day for the past two weeks?); A2 (i.e., In the past two weeks, have you been much less interested in most things or much less able to enjoy the things you used to

enjoy most of the time?); A3-e (i.e., Did you feel worthless or guilty almost every day?); A3-f (i.e., Did you have difficulty concentrating or making decisions almost every day?); and A3-g (i.e., Did you repeatedly consider hurting yourself, feel suicidal, or wish that you were dead?).

Physical symptoms of MDD: The total number of symptoms endorsed from the MINI assessment of MDD, which include A3-a (i.e., Was your appetite decreased or increased nearly every day? Did you weight decrease or increase without trying intentionally); A-3b (i.e., Did you have trouble sleeping nearly every night (difficulty falling asleep, waking up in the middle of the night, early morning wakening or sleeping excessively)?); A3-c (i.e., Did you talk or move more slowly than normal or were you fidgety, restless or having trouble sitting still almost every day?); and A3-d (i.e., Did you feel tired or without energy almost every day?).

Cognitive / affective symptoms of GAD: The total number of symptoms endorsed from the MINI assessment of GAD, which include L1-a (i.e., Have you worried excessively or been anxious about several things over the past 6 months?); L2 (i.e., Did you find it difficult to control the worries or do they interfere with your ability to focus on what you are doing?); L3-b (i.e., Feel tense?); and L3-e (i.e., Feel irritable?).

Physical Symptoms of GAD: The total number of symptoms endorsed from the MINI assessment of GAD, which include L3-a (i.e., Feel restless, keyed up or on edge?); L3-c (i.e., Feel tired, weak or exhausted easily?); L3-d (i.e., Have difficulty concentrating or find your mind going blank?); and L3-f (i.e., Have difficulty sleeping (difficulty falling asleep, waking up in the middle of the night, early morning wakening or sleeping excessively)?).

Intrusive Symptoms of PTSD: The total number of symptoms endorsed from the B symptom cluster of SCID PTSD assessment, which include B-1 (i.e., recurrent and intrusive distressing recollections of the event, including images, thoughts or perceptions); B-2 (i.e., recurrent

distressing dreams of the event); B-3 (i.e., acting or feeling as if the traumatic event were recurring (includes a sense of reliving the experience, illusions, hallucinations and dissociative flashback episodes, including those that occur on awakening or when intoxicated); B-4 (i.e., intense psychological distress at exposure to internal or external cues that symbolize or resemble an aspect of the traumatic event); and B-5 (i.e., physiological reactivity on exposure to internal or external cues that symbolize or resemble an aspect of the traumatic event).

Avoidance symptoms of PTSD: The total number of symptoms endorsed from the C symptom cluster of SCID PTSD assessment, which include C-1 (i.e., efforts to avoid thoughts, feeling, or conversations associated with the trauma); C-2 (i.e., efforts to avoid activities, places, or people that arouse recollections of the trauma); C-3 (i.e., inability to recall an important aspect of the trauma); C-4 (i.e., markedly diminished interest or participation in significant activities; C-5 (i.e., feeling of detachment or estrangement from others); C-6 (i.e., restricted range of affect (e.g., unable to have loving feelings)); and C-7 (i.e., sense of a foreshortened future (e.g., does not expect to have a career, marriage, children, or a normal life span)).

Hyperarousal Symptoms of PTSD: The total number of symptoms endorsed from the D symptom cluster of SCID PTSD assessment, which include D-1 (i.e., difficulty falling or staying asleep); D-2 (i.e., irritability or outbursts of anger); D-3 (i.e., difficulty concentrating); D-4 (i.e., hypervigilance); and D-5 (i.e., exaggerated startle response).

Sexual Health Knowledge and Self-Efficacy

HIV/AIDS Knowledge Questionnaire. Participants completed the 18-item measure to assess their knowledge and beliefs about HIV and STI transmission (Carey & Schroder, 2002). The scale was derived from Misovich and colleagues regarding beliefs about condoms, HIV, and

behavior change (1998) and has been successfully used with MSM-specific samples (Mimiaga et al., 2009). Participants responded either "False, True, or Don't Know" to questions such as "Oral sex is just as risky as anal or vaginal intercourse for transmitting HIV," "There is a cure for HIV," and "Having a sexually transmitted infection increases the likelihood of HIV transmission." The scale has been significantly associated with safer sex practices with several sexually active cohorts (Fisher, Fisher, Williams, & Malloy, 1992; Fisher, Fisher, & Shuper, 2014). This outcome variable was coded as total number of responses correct with higher scores indicating increased accurate sexual health knowledge. One question (i.e., question number 13, "having sex with an HIV-infected partner who has an undetectable viral load means you cannot get HIV from him.") was omitted from the count of total number of correct responses for all participants. While years of compelling research indicated that individuals with suppressed viral load were unlikely to transmit HIV infection (Cohen et al., 2011; Cohen et al., 2016; Quinn et al., 2000), it was not until September 2017 that the CDC formally recognized that "undetectable equals untransmittable" (CDC, 2017). The Cronbach's alpha in this sample was 0.73, which is consistent with other HIV-uninfected MSM samples (e.g., Newcomb & Mustanski, 2014).

Condom Use Self-Efficacy. Participants completed the Condom Use Self-Efficacy Scale (CUSES) to measure condom use and intentions to use condoms in the future (Wulfert, Safren, Brown, & Wan, 1999; Wulfert & Wan, 1993). "I intend to use condoms every time I have intercourse during the next 3 months" and "If you were to have sexual intercourse during the next 3 months, right now: how sure are you that you could resist sexual intercourse unless your partner agreed to using a condom" are examples of items on the questionnaire that are related to condom usage. Each item is scored on anchored Likert scales that could range from 1 "Strongly Agree" to 5 "Strongly Disagree" or range from 1 "Very Unsure" to 7 "Very Sure" depending on the specific

question. The scale has demonstrated satisfactory psychometric properties and is commonly used in HIV prevention studies (Koblin & EXPLORE Study Team, 2004; Wulfert, Safren, Brown, & Wan, 1999). Higher scores on this outcome variable indicate increased confidence in participant's ability to use condoms. The Cronbach's alpha for this measure in this sample was 0.85.

Sexual Risk Taking Behavior

Sexual Risk Assessment. To meet eligibility inclusion criteria for the baseline assessment of the trial, all participants reported at least one episode of insertive or receptive anal or vaginal intercourse without a condom in the previous three months with a sexual partner whose HIV status was unknown or not disclosed. Participants completed a comprehensive sexual history assessment of the previous three months via ACASI. The measure asked questions about the number of partners and number of condomless insertive and receptive anal and vaginal sexual acts with partners whose HIV serostatus was either known or unknown. *Sexual risk taking behavior* is defined as condomless insertive or reception anal or vaginal intercourse with any casual sexual partners and with primary serodiscordant sexual partners, accounting for PrEP use and adherence. That is, of the participants who were prescribed PrEP at baseline (n = 13), those who reported being at least 80% adherent to the medication (n = 11) were not considered to be engaged in high risk sexual behavior.

Data Analytic Plan

Prior to analysis, the data was cleaned and checked for computational or technical errors. All analyses were conducted using SPSS version 22.0. Frequency and descriptive analyses were completed to assess the distribution of study variables and describe the sample.

Covariates

In each of the regression models, the following covariates were selected a-priori based on their established relationships with sexual health outcomes (Goldstein, Burstyn, LeVasseur, & Welles, 2016; Hallfors, Iritani, Miller, & Bauer, 2007; Maulsby et al., 2014; Mizuno et al., 2012; Murray, McDonald, & Law, 2009; Mustanski, Newcomb, DuBois, Garcia, & Grov, 2011; Parsons, Lelutiu-Weinberger, Botsko, & Golub, 2013; Smith et al., 1999):

1) Age (continuous)
2) Race (categorized as Caucasian, African-American, and Other)
3) Ethnicity (categorized as Hispanic or Non-Hispanic)
4) Education (categorized as some or completed high school, some college, college graduate, and graduate school)

Primary Outcomes

To analytically examine sexual risk behavior (assessment of which is described above), two variables were created to account for the highly skewed distribution of this data: 1) A 4-category "quartiles" variable (coded as 0 = participants who reported zero to one high risk sexual encounter; 1 = two to three high risk episodes; 2 = four to seven high risk episodes; and 3 = eight or more high risk episodes) to more evenly distribute the continuous sexual risk measure in the sample (see Choi, Batchelder, Ehlinger, Safren, & O'Cleirigh, 2017). And 2) a dichotomous outcome variable indicating the absence or presence of higher sexual risk defined as 0 = no high risk sexual encounter in the past three months and greater than or equal to 80% PrEP adherent and 1 = unprotected sex with serodiscordant partner or unknown serostatus partner in the past three

months (see Batchelder et al., 2017). For the knowledge of sexual health measure, the variable used was the calculated total number of correct responses. For the condom use self-efficacy measure, the variable used was the total score.

For hypotheses 1 and 2, the primary analyses conducted were multiple linear regression models to test the associational relationships accounting for the covariates described above. For the hypotheses related to the dichotomous condomless intercourse outcome variable, logistic regression models were conducted. In step 1 on the regression models, the covariate age (continuous) and the categorical covariates education, race, and ethnicity were entered. In step 2 of the regression model, the predictor variable for the particular hypothesis was entered. The significance of the tested relationship was ascertained by conventional p-values (i.e., $p \leq .05$ for statistical significance), beta weights, and confidence intervals associated with the predictor in the presence of the covariates. The logistic regression models followed the same format reporting p-values, odds ratios, and confidence intervals.

For hypothesis 1b, the curvilinear relationship between MDD and condomless intercourse acts was examined by recoding MDD into terciles representing low, moderate, and high levels of depression. The variable was then recoded into 1 (designating moderate depression severity) and 0 (designating either low or high depression severity). This dichotomous variable was then used in the logistic regression models described above. For hypotheses 1c and 1d, these analyses were conducted again using the dichotomous MDD variable as an additional covariate.

For hypotheses 2, the same covariates were used as in hypotheses 1. The symptom cluster totals for each of hypotheses 2a – 2c were then entered as the predictor in the linear or logistic regression models. As the primary aim of hypotheses 2 was to examine the associational relationships between sexual health outcomes and more specific symptom clusters, the linear

relationships between the depression symptom clusters (and not the curvilinear relationships) were examined in hypothesis 2a. Similarly, MDD diagnosis was used as a covariate in hypotheses 2b and 2c.

Power Analysis

The primary power analysis for the larger trial was based on the acute sexual risk outcome post-treatment: condomless anal or vaginal sex with any casual partner or with a primary partner who is not known to be HIV-infected and is not taking or adherent to PrEP. The study was powered to detect a 20% difference (medium effect size) in the proportion of the sample reporting sexual risk behavior between groups (i.e., the experimental intervention and time-matched control) over the active-treatment phase of the study. With a two-tailed p-value of 0.05, group sample sizes of at least 100 participants per arm (i.e., at least 200 total participants) would give 84% power to detect a 20% or greater difference in the proportion of the sample reporting sexual risk using regression models and accounting for 15% attrition rate over the course of the study.

Results

Description of socio-demographic characteristics

A description of the study sample's socio-demographic information is presented on Table 1. Participants included a total of 296 biologically born men (i.e., reported having a penis) and most described their current gender identity as male (n = 289). Participants ranged in age from 18 to 67 years old, with a mean age of 37.95 (SD: 11.68). A majority of the sample identified their race as Caucasian / White (n = 203; 67%) and 22% identified as African American / Black (n = 66). Approximately one-third (30%) of the sample reported Hispanic / Latino as their primary ethnic identification (n = 87). A large majority of the sample (67%) identified their sexual orientation as gay / homosexual (n = 199) and another 21% identified as bisexual (n = 64). A

majority of the sample (58%; n = 174) described their relationship status as single / never married while 11% reported being in a committed relationship (i.e., not married and not living together; n = 31) or reported being in a domestic partnership (i.e., living with a committed partner; n = 29).

The sample was relatively well-educated with 73% of participants (n = 216) reporting some college education or more. Specifically, 5% reported some level of high school education (n = 14); 20% reported high school graduate or GED (n = 59); 36% reported some college / AA degree / technical school (n = 106); 18% reported college graduate (n = 53); 6% reported some graduate school education (n = 18); 11% reported master's degree (n = 33); and 2% reported doctorate / medical / law degree (n = 6). A majority of the sample (n = 216; 73%) reported being employed / received income from a job in previous 12 months. For annual income over the previous 12 months, 30% reported earning less than $10,000 (n = 88); 22% reported earning between $10,001 and $20,000 (n = 66); 18% reported earning between $20,001 and $40,000 (n = 53); and 28% reported earning more than $40,001 (n = 83).

Description of CSA experience

A summary of the sample's CSA experience is provided on Table 2. The mean age of the first time for any unwanted sexual encounter was 8.18 years (SD: 3.39). On a scale ranging from zero to thirty-plus incidents, the average number of CSA encounters was 12.74 (SD: 9.93). 85% of the sample reported a CSA experience prior to their 13th birthday (n = 252) and 60% reported a CSA experience after their 13th birthday (n = 176). 8% of participants (n = 23) reported one CSA experience in either time frame (i.e., before or after 13th birthday) and 38% (n = 111) reported multiple experiences in one of the time frames. Twelve percent of participants (n = 34) reported one experience in one time frame and one or more experiences in the other time frame. Thirty-eight percent of participants (n = 111) reported multiple CSA experiences in both time frames.

Slightly over half the sample (n = 166; 56%) reported CSA experience by an immediate family member, including parent, stepparent, guardian, or sibling. Thirty-eight participants (13%) reported unwanted or forced sexual experiences by their parent, stepparent, or guardian and 26 participants (9%) reported CSA experience by other adult living in their home (e.g., mother's boyfriend). Thirty-six participants (12%) reported a CSA experience by their brother and 91 participants (31%) reported sexual abuse by other family members. Forty-four participants (15%) reported sexual abuse by other teenagers. One hundred and thirty participants (44%) reported unwanted or forced sexual experiences by other known adult compared to 75 participants (25%) who reported abuse by an unknown adult.

Summary of mental health and substance use

A breakdown of MDD, GAD, and PTSD diagnostic presentations and comorbidities, assessed using the MINI and SCID, is presented on Table 3. In the full sample, 45% (n = 133) carried a diagnosis of PTSD; 30% (n = 89) carried a diagnosis of MDD; and 28% (n = 84) carried a diagnosis of GAD. For the psychiatric disorders of primary interest in this study (i.e., MDD, GAD, and PTSD), 11% of participants (n = 32) met diagnostic criteria for all three disorders. Nineteen percent of participants (n = 56) met diagnostic criteria for two of these disorders: 10% participants (n = 28) met criteria for PTSD and MDD, 7% of participants (n = 22) met criteria for PTSD and GAD, and 2% of participants (n = 6) met criteria for MDD and GAD. Thirty-three (n = 98) met diagnostic criteria for only one of these disorders: 17% participants (n = 51) met criteria for only PTSD, 8% participants (n = 24) met criteria for only GAD, and 8% of participants (n = 23) met criteria for only MDD. Notably, 33% (n = 97) did not meet diagnostic criteria for any three of these psychiatric disorders.

A summary of other mental health diagnoses, assessed using the MINI, is provided on Table 4. In terms of other mental health diagnoses, 8% of participants (n = 23) met diagnostic criteria for Dysthymia and 8% of participants (n = 22) met diagnostic criteria for Bipolar Disorder, Type 1. Using the MINI to assess for suicidality, 45% (n = 132) did not report any risk factors, 26% (n = 76) were considered low risk (i.e., 1-5 points / risk factors), 7% (n = 22) were at moderate risk (i.e., 6-9 points / risk factors), and 8% (n = 24) were at high risk (i.e., 10 or more points / risk factors) for suicide. Ten percent of the sample (n = 30) met diagnostic criteria for Panic Disorder, Current; 10% (n = 29) met criteria for Panic Disorder with Agoraphobia, Current; and 10% (n = 29) met criteria for Agoraphobia without History of Panic Disorder. Eighteen percent of participants (n = 52) met diagnostic criteria for Social Phobia, Current. Thirteen percent of the sample (n = 38) met criteria for Obsessive-Compulsive Disorder, Current.

Table 5 provides a summary of the participants' substance use history. Thirty-one percent of the sample (n = 93) met diagnostic criteria for Alcohol Use Disorder, Current and 6% (n = 17) met criteria for Substance Use Disorder, Current. Furthermore, in the previous 30 days of their baseline assessment, 76% of participants (n = 224) reported consuming any alcohol; 40% (n = 117) reported any marijuana use; 6% (n = 18) reported smoking crack; 19% (n = 55) reported snorting cocaine; 3% (n = 9) reported heroin use; 2% (n = 6) reported other injection drug; 12% (n = 36) reported any opiate use; 9% (n = 26) reported crystal meth use; 10% (n = 29) reported any amphetamine use; 13% (n = 37) reported any hallucinogen use; 16% (n = 47) reported any sedative / tranquilizers; and 25% (n = 74) reported any other drug use.

Summary of sexual behavior

A brief summary of the participants' sexual behavior is provided on Table 6. The average number of sexual partners of the sample in the previous three months of their baseline assessment

was 8.03 (SD: 7.64; Range: 1 – 60). The average number of condomless anal sex encounters with a casual or primary partner of unknown serostatus in the previous three months was 7.10 (SD: 10.67; Range 0 – 100). When accounting for PrEP use and adherence, the average number of risk encounters was 6.75 (SD: 10.54; Range 0 – 100).

Hypothesis 1:

Relationship between MDD and Sexual Health Knowledge

A summary of the regression analyses with MDD and each outcome variable is provided on Table 7. A multivariate linear regression analysis was conducted to examine the relationship between MDD diagnosis and sexual health knowledge, after controlling for the influence of age, race, ethnicity, and education. The covariates were entered at Step 1, explaining 11% of the variance in sexual health knowledge. After the entry of MDD diagnosis at Step 2, the total variance explained by the model as a whole was 13%, F (5, 270) = 7.75, $p < .001$. MDD explained an additional 2% of the variance in sexual health knowledge, $\Delta R^2 = 0.02$, F change (1, 270) = 5.85, $p < .05$. In the final model, MDD was statistically significant ($\beta = -0.14$, CI -1.61 – -0.17, $p < .05$) in predicting deficits in sexual health knowledge.

Relationship between MDD and Condom Use Self-Efficacy

A multivariate linear regression analysis was conducted to examine the relationship between MDD and condom use self-efficacy, after controlling for the influence of age, race, ethnicity, and education. The covariates were entered at Step 1, explaining 9% of the variance in condom use self-efficacy. After the entry of MDD diagnosis at Step 2, the total variance explained by the model as a whole was 13%, F (5, 263) = 8.07, $p < .001$. MDD explained an additional 4% of the variance in condom use self-efficacy, $\Delta R^2 = 0.04$, F change (1, 263) = 12.79, $p < .001$. In

the final model, MDD diagnosis was statistically significant (β = -3.58, CI -8.20 – -2.38, $p < .001$) for predicting lower condom use self-efficacy scores.

Relationship between MDD and Sexual Risk Taking Behavior

A multivariate linear regression analysis was conducted to examine the relationship between MDD and sexual risk taking behavior (data transformed into quartiles), after controlling for the influence of age, race, ethnicity, and education. In the final model, MDD diagnosis was not statistically significant (β = 0.52, CI -0.16 – 0.41, $p = .40$) in predicting sexual risk taking behavior.

To look at sexual risk taking behavior using a dichotomous sexual risk variable, a logistic regression analysis was conducted to examine the likelihood that a MDD diagnosis would increase sexual risk taking behavior. The model contained five independent variables (i.e., age, race, ethnicity, education, and MDD diagnosis). The full model containing all predictors was not statistically significant (β = 1.52, CI 0.60 – 3.57, $p = .42$) indicating that MDD diagnosis was not associated with engaging in high risk sexual behavior in this sample.

A multivariate linear regression analysis was conducted to examine the relationship between participants reporting a moderate level of depression and sexual risk taking behavior (data transformed into quartiles), after controlling for the influence of age, race, ethnicity, and education. In the final model, moderate level of depression was not statistically significant (β = 0.06, CI -0.15 – 0.43, $p = .36$) in predicting sexual risk taking behavior.

To look at sexual risk taking behavior using the dichotomous sexual risk variable, a logistic regression analysis was conducted to examine the likelihood that moderate levels of depression would increase sexual risk taking behavior. The model contained five independent variables (i.e., age, race, ethnicity, education, and moderate level of depression (i.e., dichotomous yes or no)). The full model containing all predictors was not statistically significant (β = 0.56, CI 0.25 – 1.26,

p = .16) indicating that moderate level of depression was not associated with engaging in high risk sexual behavior in this sample.

Relationship between GAD and Sexual Health Knowledge

A summary of the regression analyses with GAD and each outcome variable is provided on Table 8. A multivariate linear regression analysis was conducted to examine the relationship between GAD diagnosis and sexual health knowledge, after controlling for the influence of age, race, ethnicity, and education. In the final model, GAD diagnosis was not statistically significant (β = -0.09, CI -1.30 – 0.17, p = .13) in predicting sexual health knowledge. These results did not change statistical significance when controlling for comorbid MDD diagnosis (β = -0.06, CI -1.16 – 0.35, p = .29).

Relationship between GAD and Condom Use Self-Efficacy

A multivariate linear regression analysis was conducted to examine the relationship between GAD and condom use self-efficacy, after controlling for the influence of age, race, ethnicity, and education. In the final model, GAD diagnosis was not statistically significant (β = -0.04, CI -4.07 – 1.99, p = .50) in predicting condom use self-efficacy. These results were also not statistical significant when controlling for comorbid MDD diagnosis (β = 0.00, CI -3.05 – 3.06, p = 1.00).

Relationship between GAD and Sexual Risk Taking Behavior

A multivariate linear regression analysis was conducted to examine the relationship between GAD and sexual risk taking behavior (data transformed into quartiles), after controlling for the influence of age, race, ethnicity, and education. The covariates were entered at Step 1, explaining 4% of the variance in sexual risk taking behavior. After the entry of GAD diagnosis at Step 2, the total variance explained by the model as a whole was 6%, F (5, 262) = 3.10, p = .01.

GAD diagnosis explained additional 2% of the variance in sexual risk taking behavior, $\Delta R^2 = 0.02$ *F* change (1, 262) = 4.68, $p < .05$. In the final model, GAD diagnosis was statistically significant ($\beta = 0.13$, CI 0.03 – 0.60, $p < .05$) in predicting sexual risk taking behavior. However, when controlling for comorbid MDD diagnosis, GAD was not statistically significant in predicting sexual risk taking behavior, although it trended towards significance ($\beta = 0.12$, CI -0.01 – 0.60, $p = .06$).

To look at sexual risk taking behavior using the dichotomous sexual risk variable, a logistic regression analysis was conducted to examine the likelihood that a GAD diagnosis would increase sexual risk taking behavior. The model contained five independent variables (i.e., age, race, ethnicity, education, and GAD diagnosis). The full model containing all predictors was not statistically significant ($\beta = 1.71$, CI -0.66 – 4.46, $p = .27$) indicating that GAD was not associated with engaging in high risk sexual behavior in this sample. When controlling for MDD diagnosis, the model was also not statistically significant ($\beta = 1.62$, CI -0.61 – 4.32, $p = .34$).

Relationship between PTSD and Sexual Health Knowledge

A summary of the regression analyses with PTSD and each outcome variable is provided on Table 9. A multivariate linear regression analysis was conducted to examine the relationship between PTSD and sexual health knowledge, after controlling for the influence of age, race, ethnicity, and education. In the final model, PTSD diagnosis was not statistically significant ($\beta = -0.03$, CI -.085 – 0.50, $p = .62$) in predicting sexual health knowledge deficits. These results did not change statistical significance when controlling for comorbid MDD diagnosis ($\beta = 0.00$, CI -0.71 – 0.74, $p = .96$).

Relationship between PTSD and Condom Use Self-Efficacy

A multivariate linear regression analysis was conducted to examine the relationship between PTSD and condom use self-efficacy, after controlling for the influence of age, race, ethnicity, and education. In the final model, PTSD diagnosis was not statistically significant (β = -0.06, CI -4.35 – 1.53, p = .35) in predicting condom use self-efficacy. These results were also not statistical significant when controlling for comorbid MDD diagnosis (β = 0.02, CI -2.68 – 3.51, p = .79).

Relationship between PTSD and Sexual Risk Taking Behavior

A multivariate linear regression analysis was conducted to examine the relationship between PTSD and sexual risk taking behavior (data transformed into quartiles), after controlling for the influence of age, race, ethnicity, and education. In the final model, PTSD diagnosis was not statistically significant (β = 0.08, CI -0.09 – 0.46, p = .19) in predicting sexual risk taking behavior. When controlling for comorbid MDD diagnosis, PTSD was also not statistically significant in predicting sexual risk taking behavior (β = 0.07, CI -0.14 – 0.45, p = .30).

To look at sexual risk taking behavior using the dichotomous sexual risk variable, a logistic regression analysis was conducted to examine the likelihood that a PTSD diagnosis would increase sexual risk taking behavior. The model contained five independent variables (i.e., age, race, ethnicity, education, and PTSD diagnosis). The full model containing all predictors was not statistically significant (β = 0.77, CI 0.34 – 1.72, p = .52) indicating that PTSD was not associated with engaging in high risk sexual behavior in this sample. When controlling for MDD diagnosis, the model was also not statistically significant (β = 0.65, CI 0.28 – 1.53, p = .32).

<u>Hypothesis 2:</u>

Relationship between MDD Cognitive / Affective Symptoms and Sexual Health Knowledge

A summary of the regression analyses with MDD symptom clusters and each outcome variable is provided on Table 10. A multivariate linear regression analysis was conducted to examine the relationship between number of MDD cognitive / affective symptoms and sexual health knowledge, after controlling for the influence of age, race, ethnicity, and education. In the final model, number of MDD cognitive / affective symptoms was not statistically significant (β = -0.07, CI -0.62 – 0.25, p = .41) in predicting deficits in sexual health knowledge.

Relationship between MDD Cognitive / Affective Symptoms and Condom Use Self-Efficacy

A multivariate linear regression analysis was conducted to examine the relationship between number of MDD cognitive / affective symptoms and condom use self-efficacy, after controlling for the influence of age, race, ethnicity, and education. The covariates were entered at Step 1, explaining 14% of the variance in condom use self-efficacy. After the entry of MDD cognitive / affective symptoms at Step 2, the total variance explained by the model as a whole was 22%, F (5, 124) = 6.92, p < .001. MDD cognitive / affective symptoms explained an additional 8% of the variance in condom use self-efficacy, ΔR^2 = .08, F change (1, 124) = 12.62, p = .001. In the final model, number of MDD cognitive / affective symptoms was statistically significant (β = -0.29, CI -4.46 – -1.27, p = .001) for predicting lower condom use self-efficacy scores.

Relationship between MDD Cognitive / Affective Symptoms and Sexual Risk Taking Behavior

A multivariate linear regression analysis was conducted to examine the relationship between number of MDD cognitive / affective symptoms and sexual risk taking behavior (data transformed into quartiles), after controlling for the influence of age, race, ethnicity, and education. The covariates were entered at Step 1, explaining 7% of the variance in sexual risk taking behavior. After the entry of MDD cognitive / affective symptoms at Step 2, the total variance explained by the model as a whole was 7%, F (5, 120) = 3.00, p = .03. Number of MDD cognitive / affective

symptoms explained 3% of additional variance in sexual risk taking behavior, $\Delta R^2 = .03$ *F* change (1, 120) = 4.40, *p* = .04. In the final model, number of MDD cognitive / affective symptoms was statistically significant (β = 0.19, CI 0.01 – 0.33, *p* = .04) in predicting sexual risk taking behavior.

To look at sexual risk taking behavior using the dichotomous sexual risk variable, a logistic regression analysis was conducted to examine the likelihood that number of MDD cognitive / affective symptoms would increase sexual risk taking behavior. The model contained five independent variables (i.e., age, race, ethnicity, education, and number of MDD cognitive / affective symptoms). The full model containing all predictors was not statistically significant (β = 1.15, CI 0.65 – 2.04, *p* = .63) indicating that number of MDD cognitive / affective symptoms was not associated with engaging in high risk sexual behavior in this sample.

Relationship between MDD Physical Symptoms and Sexual Health Knowledge

A multivariate linear regression analysis was conducted to examine the relationship between number of MDD physical symptoms and sexual health knowledge, after controlling for the influence of age, race, ethnicity, and education. In the final model, MDD physical symptoms were not statistically significant (β = -0.08, CI -0.64 – 0.23, *p* = .35) in predicting deficits in sexual health knowledge.

Relationship between MDD Physical Symptoms and Condom Use Self-Efficacy

A multivariate linear regression analysis was conducted to examine the relationship between number of MDD physical symptoms and condom use self-efficacy, after controlling for the influence of age, race, ethnicity, and education. The covariates were entered at Step 1, explaining 14% of the variance in condom use self-efficacy. After the entry of MDD physical symptoms at Step 2, the total variance explained by the model as a whole was 19%, *F* (5, 123) = 5.63, *p* < .001. Number of MDD physical symptoms explained an additional 5% of the variance in

condom use self-efficacy, $\Delta R^2 = .05$, *F* change (1, 123) = 7.19, *p* = .008. In the final model, number of MDD physical symptoms was statistically significant (β = -0.22, CI -3.87 – -0.58, *p* = .008) for predicting lower condom use self-efficacy scores.

Relationship between MDD Physical Symptoms and Sexual Risk Taking Behavior

A multivariate linear regression analysis was conducted to examine the relationship between number of MDD physical symptoms and sexual risk taking behavior (data transformed into quartiles), after controlling for the influence of age, race, ethnicity, and education. In the final model, MDD physical symptoms were not statistically significant (β = 0.11, CI -0.06 – 0.26, *p* = .23) in predicting sexual risk taking behavior.

To look at sexual risk taking behavior using the dichotomous sexual risk variable, a logistic regression analysis was conducted to examine the likelihood that number of MDD physical symptoms would increase sexual risk taking behavior. The model contained five independent variables (i.e., age, race, ethnicity, education, and number of MDD physical symptoms). The full model containing all predictors was not statistically significant (β = 1.34, CI 0.80 – 2.25, *p* = .27) indicating that number of MDD physical symptoms was not associated with engaging in high risk sexual behavior in this sample.

Relationship between GAD Cognitive / Affective Symptoms and Sexual Health Knowledge

A summary of the regression analyses with GAD symptom clusters and each outcome variable is provided on Table 11. A multivariate linear regression analysis was conducted to examine the relationship between number of GAD cognitive / affective symptoms and sexual health knowledge, after controlling for the influence of age, race, ethnicity, and education. The covariates were entered at Step 1, explaining 14% of the variance in sexual health knowledge. After the entry of GAD cognitive / affective symptoms at Step 2, the total variance explained by

the model as a whole was about 20%, F (5, 67) = 3.25, p = .01. GAD cognitive / affective symptoms explained an additional 5% of the variance in sexual health knowledge, ΔR^2 = .05, F change (1, 67) = 4.49, p = .04. In the final model, number of GAD cognitive / affective symptoms was statistically significant (β = -0.24, CI -2.22 – -0.07, p = .04) for predicting deficits in sexual health knowledge. This relationship was also examined controlling for MDD diagnosis. Results still trended towards statistical significance but were short of conventional p-value cutoffs (β = -0.20, CI -2.05 – 0.14, p = .09).

Relationship between GAD Cognitive / Affective Symptoms and Condom Use Self-Efficacy

A multivariate linear regression analysis was conducted to examine the relationship between number of GAD cognitive / affective symptoms and condom use self-efficacy, after controlling for the influence of age, race, ethnicity, and education. In the final model, number of GAD cognitive / affective symptoms was not statistically significant (β = 0.24, CI -3.79 – 4.63, p = .84) in predicting lower condom use self-efficacy scores. Statistical significance did not change when controlling for MDD diagnosis (β = 0.10, CI -2.36 – 5.95, p = .39).

Relationship between GAD Cognitive / Affective Symptoms and Sexual Risk Taking Behavior

A multivariate linear regression analysis was conducted to examine the relationship between number of GAD cognitive / affective symptoms and sexual risk taking behavior (data transformed into quartiles), after controlling for the influence of age, race, ethnicity, and education. In the final model, number of GAD cognitive / affective symptoms was not statistically significant (β = -0.05, CI -0.48 – 0.31, p = .68) in predicting sexual risk taking behavior. Statistical significance did not change when controlling for MDD diagnosis (β = -0.10, CI -0.56 – 0.25, p = .45).

To examine sexual risk taking behavior using the dichotomous sexual risk variable, a logistic regression analysis was conducted to examine the likelihood that number of GAD cognitive / affective symptoms would increase sexual risk taking behavior. The model contained five independent variables (i.e., age, race, ethnicity, education, and number of GAD cognitive / affective symptoms). The full model containing all predictors was not statistically significant (β = 0.00, CI 0.00 – ., p = .998) indicating that number of GAD cognitive / affective symptoms was not associated with engaging in high risk sexual behavior in this sample. These results did not change statistical significance when controlling for MDD diagnosis (β = 0.00, CI 0.00 – ., p = .998).

Relationship between GAD Physical Symptoms and Sexual Health Knowledge

A multivariate linear regression analysis was conducted to examine the relationship between number of GAD physical symptoms and sexual health knowledge, after controlling for the influence of age, race, ethnicity, and education. The covariates were entered at Step 1, explaining 14% of the variance in sexual health knowledge. After the entry of GAD physical symptoms at Step 2, the total variance explained by the model as a whole was 20%, F (5, 65) = 3.27, p = .01. GAD physical symptoms explained an additional 6% of the variance in sexual health knowledge, ΔR^2 = .06, F change (1, 65) = 4.98, p = .03. In the final model, number of GAD physical symptoms was statistically significant (β = -0.25, CI -1.96 – -0.11, p = .03) for predicting deficits in sexual health knowledge. This relationship was also examined controlling for MDD diagnosis. Results still trended towards statistical significance but were short of conventional p-value cutoffs (β = -0.21, CI -1.80 – 0.07, p = .07).

Relationship between GAD Physical Symptoms and Condom Use Self-Efficacy

A multivariate linear regression analysis was conducted to examine the relationship between number of GAD physical symptoms and condom use self-efficacy, after controlling for

the influence of age, race, ethnicity, and education. In the final model, number of GAD physical symptoms was not statistically significant (β = 0.24, CI -3.79 – 4.63, *p* = .84) in predicting lower condom use self-efficacy scores. Statistical significance did not change when controlling for MDD diagnosis (β = 0.10, CI -2.36 – 5.95, *p* = .39).

Relationship between GAD Physical Symptoms and Sexual Risk Taking Behavior

A multivariate linear regression analysis was conducted to examine the relationship between number of GAD physical symptoms and sexual risk taking behavior (data transformed into quartiles), after controlling for the influence of age, race, ethnicity, and education. In the final model, GAD physical symptoms were not statistically significant (β = 0.07, CI -0.25 – 0.45, *p* = .57) in predicting sexual risk taking behavior. Statistical significance did not change when controlling for MDD diagnosis (β = 0.04, CI -0.30 – 0.42, *p* = .74).

To examine sexual risk taking behavior using the dichotomous sexual risk variable, a logistic regression analysis was conducted to examine the likelihood that number of GAD physical symptoms would increase sexual risk taking behavior. The model contained five independent variables (i.e., age, race, ethnicity, education, and number of GAD physical symptoms). The full model containing all predictors was statistically significant, χ^2 (5, N = 71) = 11.78, *p* = .02, indicating that number GAD physical symptoms (β = 8.25, CI 1.37 – 49.62, *p* = .02). was associated with engaging in high risk sexual behavior in this sample. When controlling for MDD diagnosis, the model remained statistically significant χ^2 (6, N = 70) = 15.24, *p* = .05, indicating that GAD physical symptoms (β = 14.26, CI 0.96 – 212.79, *p* = .05) was associated with sexual risk taking in this sample, independent of comorbid MDD diagnosis.

Relationship between PTSD Intrusive Symptoms and Sexual Health Knowledge

A summary of the regression analyses with PTSD symptom clusters and each outcome variable is provided on Table 12. A multivariate linear regression analysis was conducted to examine the relationship between number of PTSD intrusive symptoms and sexual health knowledge, after controlling for the influence of age, race, ethnicity, and education. The covariates were entered at Step 1, explaining 11% of the variance in sexual health knowledge. Entry of PTSD intrusive symptoms at Step 2 approached statistical significance to explain an additional 1% of the variance in sexual health knowledge, $\Delta R^2 = .01$, F change (1, 272) = 3.48, $p = .06$. In the final model, number of PTSD intrusive symptoms was close to statistical significance (β = -0.11, CI -0.41 – 0.01, $p = .06$) for predicting deficits in sexual health knowledge. This relationship was also examined controlling for MDD diagnosis. Results trended further away from statistical significance (β = -0.09, CI -0.40 – 0.05, $p = .12$).

Relationship between PTSD Intrusive Symptoms and Condom Use Self-Efficacy

A multivariate linear regression analysis was conducted to examine the relationship between number of PTSD intrusive symptoms and condom use self-efficacy, after controlling for the influence of age, race, ethnicity, and education. In the final model, number of PTSD intrusive symptoms was not statistically significant (β = -0.08, CI -1.46 – 0.29, $p = .19$) in predicting lower condom use self-efficacy scores. Statistical significance did not change when controlling for MDD diagnosis (β = -0.03, CI -1.18 – 0.67, $p = .59$).

Relationship between PTSD Intrusive Symptoms and Sexual Risk Taking Behavior

A multivariate linear regression analysis was conducted to examine the relationship between number of PTSD intrusive symptoms and sexual risk taking behavior (data transformed into quartiles), after controlling for the influence of age, race, ethnicity, and education. In the final model, number of PTSD intrusive symptoms was not statistically significant (β = 0.05, CI -0.05 –

0.12, p = .38) in predicting sexual risk taking behavior. Statistical significance did not change when controlling for MDD diagnosis (β = 0.05, CI -0.06 – 0.12, p = .46).

To look at sexual risk taking behavior using the dichotomous sexual risk variable, a logistic regression analysis was conducted to examine the likelihood that number of PTSD intrusive symptoms would increase sexual risk taking behavior. The model contained five independent variables (i.e., age, race, ethnicity, education, and number of PTSD intrusive symptoms). In the final model, number of PTSD intrusive symptoms was not significantly (β = 1.12, CI 0.85 – 1.43, p = .45) associated with engaging in high risk sexual behavior in this sample. These results did not change statistical significance when controlling for MDD diagnosis (β = 1.06, CI 0.81 – 1.39, p = .66).

Relationship between PTSD Avoidance Symptoms and Sexual Health Knowledge

A multivariate linear regression analysis was conducted to examine the relationship between number of PTSD avoidance symptoms and sexual health knowledge, after controlling for the influence of age, race, ethnicity, and education. In the final model, number of PTSD avoidance symptoms was not statistically significant (β = -0.03, CI -0.21 – 0.12, p = .58) in predicting decreased sexual health knowledge in this sample. These results did not change statistical significance when controlling for MDD diagnosis (β = 0.01, CI -0.17 – 0.19, p = .91).

Relationship between PTSD Avoidance Symptoms and Condom Use Self-Efficacy

A multivariate linear regression analysis was conducted to examine the relationship between number of PTSD avoidance symptoms and condom use self-efficacy, after controlling for the influence of age, race, ethnicity, and education. In the final model, number of PTSD avoidance symptoms was not statistically significant (β = -0.10, CI -1.26 – 0.08, p = .08) in predicting lower

condom use self-efficacy scores. Statistical significance did not change when controlling for MDD diagnosis (β = -0.04, CI -0.94 – 0.52, *p* = .56).

Relationship between PTSD Avoidance Symptoms and Sexual Risk Taking Behavior

A multivariate linear regression analysis was conducted to examine the relationship between number of PTSD avoidance symptoms and sexual risk taking behavior (data transformed into quartiles), after controlling for the influence of age, race, ethnicity, and education. In the final model, number of PTSD avoidance symptoms was not statistically significant (β = 0.05, CI -0.04 – 0.09, *p* = .46) in predicting sexual risk taking behavior. Statistical significance did not change when controlling for MDD diagnosis (β = 0.03, CI -0.06 – 0.08, *p* = .70).

To look at sexual risk taking behavior using the dichotomous sexual risk variable, a logistic regression analysis was conducted to examine the likelihood that number of PTSD avoidance symptoms would increase sexual risk taking behavior. The model contained five independent variables (i.e., age, race, ethnicity, education, and number of PTSD avoidance symptoms). The full model containing all predictors was not statistically significant (β = 1.08, CI 0.88 – 1.32, *p* = .46) indicating that number of PTSD avoidance symptoms was not associated with engaging in high risk sexual behavior in this sample. These results did not change statistical significance when controlling for MDD diagnosis (β = 1.05, CI 0.85 – 1.30, *p* = .66).

Relationship between PTSD Hyperarousal Symptoms and Sexual Health Knowledge

A multivariate linear regression analysis was conducted to examine the relationship between number of PTSD hyperarousal symptoms and sexual health knowledge, after controlling for the influence of age, race, ethnicity, and education. In the final model, number of PTSD hyperarousal symptoms was not statistically significant (β = -0.06, CI -0.32 – 0.10, *p* = .30) in

predicting decreased sexual health knowledge. These results did not change statistical significance when controlling for MDD diagnosis (β = -0.02, CI -0.27 – 0.20, *p* = .77).

Relationship between PTSD Hyperarousal Symptoms and Condom Use Self-Efficacy

A multivariate linear regression analysis was conducted to examine the relationship between number of PTSD hyperarousal symptoms and condom use self-efficacy, after controlling for the influence of age, race, ethnicity, and education. In the final model, number of PTSD hyperarousal symptoms was not statistically significant (β = -0.09, CI -1.53 – 0.19, *p* = .13) in predicting lower condom use self-efficacy scores. Statistical significance did not change when controlling for MDD diagnosis (β = -0.01, CI -1.02 – 0.89, *p* = .89).

Relationship between PTSD Hyperarousal Symptoms and Sexual Risk Taking Behavior

A multivariate linear regression analysis was conducted to examine the relationship between number of PTSD hyperarousal symptoms and sexual risk taking behavior (data transformed into quartiles), after controlling for the influence of age, race, ethnicity, and education. In the final model, number of PTSD hyperarousal symptoms was not statistically significant (β = 0.05, CI -0.05 – 0.12, *p* = .41) in predicting sexual risk taking behavior. Statistical significance did not change when controlling for MDD diagnosis (β = 0.04, CI -0.07 – 0.12, *p* = .59).

To look at sexual risk taking behavior using the dichotomous sexual risk variable, a logistic regression analysis was conducted to examine the likelihood that number of PTSD hyperarousal symptoms would increase sexual risk taking behavior. The model contained five independent variables (i.e., age, race, ethnicity, education, and number of PTSD hyperarousal symptoms). The full model containing all predictors was not statistically significant (β = 1.20, CI 0.93 – 1.54, *p* = .16) indicating that number of PTSD hyperarousal symptoms was not associated with engaging in

high risk sexual behavior in this sample. These results did not change statistical significance when controlling for MDD diagnosis (β = 1.16, CI 0.88 – 1.53, *p* = .30).

Discussion

The present study explored the relationship between psychiatric disorders (i.e., Major Depressive Disorder (MDD), Generalized Anxiety Disorder (GAD), and Post-Traumatic Stress Disorder (PTSD)), sexual health knowledge, condom use self-efficacy, and sexual risk taking behavior in a sample of traumatized gay and bisexual men. The current analyses aimed to expand the previous literature, by examining the relationship between specific psychiatric symptom clusters of psychiatric disorders and their relationship with sexual health knowledge, condom use self-efficacy, and sexual risk taking behavior. Sexual risk was defined as condomless anal or vaginal sex with any casual partner or with a primary partner who is known to be HIV-infected and is not taking or adherent to PrEP. In regards to assessing "risk" with causal sexual partners, it is difficulty to definitively discern serostatus; therefore, any condomless sex is labeled "risky."

Summary of Results

The sample was comprised of 296 biologically born men who have sex with other men, the majority of whom identify as either gay or bisexual (i.e., 89% of the sample reported their sexual orientation as either gay or bisexual). The sample was predominately white (67%) and well-educated (73% reported some college education or more). Despite these domains of relative privilege, the sample was also highly impaired and experienced significant adversity; for example, every participant reported an experience of childhood sexual abuse (mean age of a first unwanted sexual encounter was 8.18 years). Nearly half of the participants met diagnostic criteria for PTSD

(n = 133) and many carried diagnoses of MDD (n = 89), GAD (n = 84), and other combinations of mental health and substance use disorders. All men were sexually active to be included in the study, and the average number of condomless anal sex acts with a casual or primary partner of unknown serostatus in the previous three months was 7.10.

It was hypothesized that a MDD diagnosis would be significantly related to sexual health knowledge and condom-use self-efficacy. Specifically, MDD diagnosis would be associated with decreased sexual health knowledge and lower condom-use self-efficacy scores. Results showed that MDD diagnosis predicted statistically significant lower scores scores on both sexual health knowledge and condom use self-efficacy measures. It was also hypothesized that moderate levels of depression would be associated with increased sexual risk taking, that is, increased condomless sexual intercourse acts. These results were not statistically significant. Furthermore, MDD diagnosis more broadly (i.e., not looking at severity of depressive symptoms) was not significantly associated with sexual risk taking behavior in this sample.

It was hypothesized that a GAD diagnosis would be significantly related to sexual health knowledge, condom use self-efficacy, and condomless intercourse acts (with casual partners and serodiscordant primary sexual partners). Specifically, it was hypothesized that GAD diagnosis would be associated with decreased sexual health knowledge, lower condom-use self-efficacy scores, and increased condomless intercourse acts. Results revealed that GAD diagnosis was significantly associated with sexual risk taking behavior in this sample. However, GAD diagnosis was not statistically related to deficits in sexual health knowledge or condom use self-efficacy scores. These results did not change when controlling for MDD.

It was hypothesized that a PTSD diagnosis would be significantly related to sexual health knowledge, condom use self-efficacy, and condomless intercourse acts (with casual partners and

serodiscordant primary sexual partners). Specifically, it was hypothesized that PTSD diagnosis would be associated with decreased sexual health knowledge, lower condom-use self-efficacy scores, and increased condomless intercourse acts. None of these hypotheses demonstrated a statistically significant relationship between PTSD diagnosis and outcome variables. Furthermore, these results did not change when controlling for MDD.

It was hypothesized that increased presence of MDD cognitive / affective symptoms and increased presence of MDD physical symptoms would be associated with decreased sexual health knowledge, lower scores on condom use self-efficacy, and increased condomless intercourse acts. Results showed that both the cognitive / affective and physical symptom clusters of MDD were statistically related to lower scores on the condom use self-efficacy measure. Additionally, the cognitive / affective symptom cluster was statistically related to sexual risk taking behavior.

It was hypothesized that increased presence of GAD cognitive / affective symptoms and GAD physical symptoms would be associated with decreased sexual health knowledge, lower scores on condom use self-efficacy, and increased condomless intercourse acts. Results showed that both GAD cognitive / affective and physical symptom clusters were significantly related to decreased scores on the sexual health knowledge measure. Additionally, the GAD physical symptoms cluster was significantly associate with sexual risk taking behavior in this sample.

Finally, it was hypothesized that increased report of PTSD symptom clusters (i.e., intrusions, avoidance, and hyperarousal symptom clusters) would each be associated with decreased sexual health knowledge, lower scores on condom use self-efficacy, and increased condomless intercourse acts. None of these hypotheses demonstrated a statistically significant relationship between PTSD symptom clusters and outcome variables. Furthermore, these results did not change when controlling for MDD.

Interpretation of Findings

MDD diagnosis, as evaluated by the MINI, was inversely related with the measure of sexual health knowledge. This implies that depression impairs accurate HIV risk knowledge or is associated with an inability to access or recall such knowledge when it is needed. The IMB model established the relevance of information (i.e., knowledge) as a causal pathway to HIV risk behavior change (Fisher & Fisher, 1992). Furthermore, the IMB model provides a theoretical framework that links information with motivation to help facilitate meaningful behavioral change, in this case, preventing HIV acquisition. Notably, motivational deficits are commonly observed in samples of individuals with depressive symptoms (Fowles, 1994; Treadway, Bossaller, Shelton, & Zald, 2012). The findings in this study support an expansion of IMB models to account for mental health vulnerabilities (e.g., among gay and bisexual men with CSA histories). As such, STI and HIV prevention programing that target gay and bisexual men with trauma histories should consider the impact of current mood disorders and men's ability to access and use sexual health knowledge.

MDD diagnosis, severity of cognitive / affective symptoms, and severity of physical symptoms were all inversely associated with the condom use self-efficacy measure. Depression impacts gay and bisexual men with a trauma history self-efficacy of using condoms. Individuals with depressive symptoms commonly report lower self-efficacy across various behaviors than those individuals without depressive symptoms (Bandura, 1998; Sacco et al., 2005). In this sample, the highest standard error estimate was with cognitive / affective symptoms of depression (β = -0.29) versus physical symptoms (β = -0.22) and MDD diagnosis (β = -0.21). This is logical, as the condom use self-efficacy measure is a cognitive measure that evaluates individuals' appraisals, confidence, and certainty about condom usage. Depression, in essence, impacts how individuals

think about or evaluate themselves, others, and the world and thus has an impact on the cognitions about self-efficacy. This may be an important pathway (i.e., cognitive) by which depression exerts influence on the sexual health of gay and bisexual men. In fact, Social Cognitive models have been used to explain health risk behaviors, such as sexual transmission of HIV, with self-efficacy being a central factor (Bandura, 1994; Wulfert, Safren, Brown, & Wan, 1999). This present finding is consistent with other recent research that has demonstrated how depression, and particularly cognitive / affective features of depression, compromises condom use self-efficacy and is associated with greater HIV transmission risk behavior in men who have sex with men (Safren et al., 2010). Again, these findings support an expansion of Social Cognitive models to account for the effects of psychiatric disorders.

The cognitive / affective symptom cluster of depression was significantly related to the sexual risk taking behavior quartiles variable while physical symptoms of depression were not associated with the same outcome measure. Also in this sample, participants with moderate levels of depression did not show associated higher levels of sexual risk taking behavior, which stands in contrast to previous research (Koblin et al., 2006; O'Cleirigh et al., 2013). One hypothesis is that depressive symptoms may impair a person's ability to engage in self-care and increase sexual behavior (Allgower, Wardle, & Steptoe, 2001). It has been noted that individuals with severe depressive symptomatology are more likely to endorse debilitating "neurovegetative" (i.e., physical symptoms of depression) such as fatigue, sleep disturbance, and psychomotor retardation. These symptoms interfere with active behavior more generally, including sexual behavior, and as such reduce opportunity for sexual encounters or risk. Furthermore, studies have shown that depressive symptoms are linked to lower sex drive and lower levels of testosterone in middle-aged men more generally (Hintikka et al., 2009). Therefore, the finding in this sample that only the

cognitive / affective symptoms of depression was associated with higher level of sexual risk, versus those endorsing more physical symptoms of depression, is consistent with the theory that physical symptoms of depression almost paradoxically serve as a transmission risk protective factor (Mustanski et al., 2011; O'Cleirigh et al., 2013).

It is important to recall that this study looked at the clinical diagnosis of GAD and did not use more common and brief self-report measures (e.g., the State-Trait Anxiety Inventory (STAI); the GAD-7; and the Hospital Anxiety and Depression Scale (HADS)) which approximate anxiety. In this sample, GAD at the diagnostic level was associated with sexual risk taking behavior. This finding fits with previous research that hypothesizes some gay and bisexual men may potentially use sex as means for coping with anxiety more broadly (Bancroft et al., 2003; O'Cleirigh et al., 2013; Rosario, Schrimshaw, & Hunter 2006).

In this sample 28% met diagnostic criteria for GAD, and follow-up analyses were conducted with these participants to examine associations between cognitive / affective symptoms and physical symptoms with sexual health knowledge and sexual risk taking behavior outcomes. Current diagnosis of GAD was not associated with impairment in sexual health knowledge, indicating that sexual health knowledge impairments were not statistically significant different between participants with and without GAD. However, in the symptom-level analyses of those with GAD diagnosis, both severity of cognitive / affective symptoms and physical symptoms were associated with impaired sexual health knowledge. This suggests that among those with clinically significant GAD, the severity of the disorder impairs ability to accurately access or identify sexual health information and knowledge. Furthermore, among the 28% of participants who have a diagnosis of GAD, severity if of physical symptoms was associated with the dichotomous sexual risk outcome. This finding adds to previous literature that demonstrated physical symptoms of

anxiety are associated with individuals reporting higher levels of distress (Henningsen, Zimmermann, & Sattel, 2003), and anxiety more broadly interferes with self-efficacy regarding safer sex negotiation (Hart et al., 2008). Risky sexual behavior may therefore be used as a strategy to manage or avoid anxious affect (O'Cleirigh & Safren, 2007; O'Cleirigh et al., 2013).

Neither diagnosis of PTSD nor any of the PTSD symptom clusters (i.e., intrusive symptoms, avoidance symptoms, and hyperarousal symptoms) were significantly associated with the sexual health knowledge or sexual risk behavior outcomes. A trend towards significance was observed for an inverse relationship between increased intrusive symptoms and sexual health knowledge deficits (p = .06). Also a trend towards significance was observed for an inverse relationship between increased avoidance symptoms and decreased condom use self-efficacy scores (p = .08). The literature is somewhat mixed regarding the relationship between PTSD and sexual risk behavior in gay and bisexual men (Crepaz & Marks, 2001; Reisner, Mimiaga, Safren, & Mayer, 2009). One potential explanation for the lack of findings here is the relative paucity of research at the PTSD diagnostic level and sexual risk behavior with gay and bisexual men. Much of the established research does not use diagnostic measures and relies on the report of traumatic experiences using measures such as the PTSD Checklist (PCL) and the Post-Traumatic Cognitions Inventory (PTCI). Trauma researchers, such as Terrance Keane, have written about the difficulty distinguishing PTSD from other diagnostic categories, particularly from MDD and GAD (Keane, Taylor, & Penk, 1997). Additionally, there is an extensive body of literature that highlights the complexity of early and multiple traumas (Cook et al., 2017; Herman, 1992) Indeed, the relationship between traumatic experiences and increased sexual risk taking behavior in gay and bisexual men has been documented extensively (Jinich et al., 1998; Mimiaga et al., 2009; Paul, Catania, Pollack, & Stall, 2001). Therefore, the absence of significant findings with PTSD and

sexual health and risk outcomes may be a characteristic of this sample. That is, everyone in the sample had a history of CSA which could result in a restricted range of both trauma symptom severity and PTSD symptom severity in association with sexual health knowledge and self-efficacy. Furthermore, the majority of the sample reported more than one episode of sexual risk behavior at baseline, thus restricting or skewing the range of the sexual risk taking behavior variable. As such, this may not be an ideal sample to examine the relationships between PTSD, associated symptom clusters, sexual knowledge, and sexual risk behavior, which may account for the discrepancy between these findings and those in the published literature.

Limitations

The findings of this study should be considered in conjunction with a few limitations. First, the cross sectional nature of these analyses allows for the reporting associational findings and are not predictive. Therefore, these results do not specify causality or directionality. Second, data was collected via self-report measures and consequently is vulnerable to social desirability demands or bias towards favorable answers. For example, participants may have under-reported risky sexual behavior or psychiatric symptoms. Ideally the use of electronic data collection helped to minimize this bias. Third, the sample was recruited through outreach and community initiatives in Boston and Miami, and thus, may not be national representative sample of MSM with CSA histories. Additionally, since the sample is comprised of MSM with CSA and recent sexual risk for HIV, these results may not generalize to entire population of gay and bisexual men. As previously noted, the sample made up largely of people who experienced sexual trauma in childhood and/or adolescence which may have interfered with the ability to identify relationships between PTSD and sexual health outcomes. Finally, these analyses were of individual psychiatric diagnoses and

symptom clusters with associated sexual health knowledge, efficacy, and behavioral risk outcomes. The syndemics body of literature examines mental health diagnoses in combination with other risk indicators, including CSA (Mimiaga et al., 205; Stall et al., 2003). Table 3 provides a summary of the overlap in the psychiatric diagnosis of particular interest in this study. The syndemics literature demonstrates an additive effect to increase HIV risk potential with the addition of each mental health or psychosocial issue combining to increase overall risk and compromise sexual health (Stall et al., 2003).

Conclusion

Despite these limitations, the present findings may have implications for models of health behavior change; for example, an expansion of the Information Motivation and Behavior model and Self-efficacy models (based in Social Cognitive Theory) to account for the influence of psychiatric disorders. These results combined with previous literature demonstrate the ways in which psychiatric mood disorders and symptoms impair sexual health knowledge, condom use self-efficacy, and sexual risk taking behavior. Particularly in this sample, Major Depressive Disorder and its cognitive / affective and physical symptom clusters impair sexual health knowledge and condom use self-efficacy. Popular models of health behavior change should adapt to account for the influence of depressive symptoms. These findings should also encourage providers to do routine assessment and referral in community health settings that address the mental health and psychosocial needs specific to gay and bisexual men, particularly those with a sexual trauma history. Furthermore, these results reinforce the movement toward treatments that are flexible and interventions that are capable of addressing multiple mental health issues that may present as syndemic and co-occurring. There is a critical need for effective and empirically

supportive interventions for traumatized gay and bisexual men. Fortunately, there are a few promising interventions on the horizon which have demonstrated preliminary efficacy; for example, the THRIVE & ESTEEM interventions (O'Cleirigh et al, 2018; Pachankis, Hatzenbuehler, Rendina, Safren, & Parsons, 2015). The impact of these efforts should increase public health by improving the health and wellness of gay and bisexual men with sexual trauma histories and ultimately offset new HIV infections among this vulnerable group.

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Table 1. Descriptive statistics of socio-demographic characteristics, full sample (N = 296).

Characteristic	**n (%)**
Age (M ± SD, range)	37.95 ± 22.68, 18-67
Gender	
Male self-identified	289 (98%)
Race	
Caucasian / White	203 (78%)
African American / Black	66 (22%)
Asian	9 (3%)
American Indigenous / Alaska Native	7 (2%)
Native Hawaiian / Other Pacific Islander	2 (<1%)
Unknown or Not Reported	6 (2%)
Sexual Orientation	
Gay / Homosexual	199 (67%)
Bisexual	64 (22%)
Not Sure	14 (5%)
Straight / Heterosexual	7 (2%)
Other	6 (2%)
Relationship Status	
Single / Never Married	148 (75%)
Committed Relationship (not married; not cohabitating)	31 (11%)
Domestic Partnership (cohabitating with partner)	29 (10%)
Divorced	18 (6%)
Married	16 (5%)
Separated	11 (4%)
Other	10 (3%)
Education Level (highest completed)	
Some High School	14 (5%)
High School Graduate / GED	59 (20%)
Some College / AA Degree / Technical School	106 (36%)
College Graduate	53 (18%)
Some Graduate School	18 (6%)
Masters Degree	33 (11%)
Doctorate / Medical Degree / Law Degree	6 (2%)
Employment (previous 12 months)	
Received income from job	216 (73%)
Unemployment benefits	26 (9%)
Income (previous 12 months)	
Less than $10,000	88 (30%)
$10,001 - $20,000	66 (22%)
$20,001 - $40,000	53 (18%)
More than $40,001	83 (28%)

Table 2. Summary childhood sexual abuse experience (N = 296).

	n (M)	**% (SD)**
Age of the first time for any unwanted sexual encounter	(8.18)	(3.39)
Number of CSA encounters (range: 0 – 30+)	(12.74)	(9.93)
CSA prior to 13th birthday	252	85%
CSA after 13th birthday	176	60%
Only one CSA experience before or after 13th birthday	23	8%
Multiple CSA experiences before or after 13th birthday	111	38%
One CSA experience before or after 13th birthday and multiple other CSA in other time frame	34	12%
Multiple CSA experiences before and after 13th birthday	111	38%
CSA perpetrated by an immediate family member (i.e., parent/guardian, sibling)	166	56%
CSA perpetrated by parent, stepparent, or guardian	38	13%
CSA perpetrated by other adult living in home (e.g., mother's boyfriend)	26	9%
CSA perpetrated by brother	36	12%
CSA perpetrated by other family member	91	31%
CSA perpetrated by other teenagers	44	15%
Unwanted or forced sexual experience by other known adult	130	44%
Unwanted or forced sexual experience by unknown adult	75	25%

M = mean; SD = standard deviation; CSA = childhood sexual abuse

Table 3. MDD, GAD, and PTSD diagnostic presentations and comorbidities. (N = 296).

	n	**%**
Met diagnostic criteria for MDD, GAD, and PTSD	32	11%
Met diagnostic criteria for two of MDD, GAD, or PTSD	56	19%
Met diagnostic criteria for MDD and PTSD	28	10%
Met diagnostic criteria for MDD and GAD	6	2%
Met diagnostic criteria for GAD and PTSD	22	7%
Met diagnostic criteria for only one of MDD, GAD, or PTSD	98	33%
Only met diagnostic criteria for MDD (no comorbid diagnoses)	23	8%
Only met diagnostic criteria for GAD (no comorbid diagnoses)	24	8%
Only met diagnostic criteria for PTSD (no comorbid diagnoses)	51	17%
Did not meet diagnostic criteria for any of MDD, GAD, or PTSD	97	33%
Met diagnostic criteria for MDD	89	30%
Met diagnostic criteria for GAD	84	28%
Met diagnostic criteria for PTSD	133	45%

Table 4. Summary of other mental health diagnoses (N = 296).

	n	**%**
Met diagnostic criteria for Dysthymia (i.e., Persistent Depressive Disorder)	23	8%
Met diagnostic criteria for Bipolar Disorder, Type 1	22	8%
Suicidality risk (assessed via MINI)		
Did not report risk factors	132	45%
Low risk (i.e., 1 – 5 points / risk factors)	76	26%
Moderate risk (i.e., 6 – 9 points / risk factors)	22	7%
High risk (i.e., 10 or more points / risk factors)	24	8%
Met diagnostic criteria for Panic Disorder, Current	30	10%
Met diagnostic criteria for Panic Disorder with Agoraphobia, Current	29	10%
Met diagnostic criteria for Agoraphobia without history of Panic Disorder	29	10%
Met diagnostic criteria for Social Phobia, Current	52	18%
Met diagnostic criteria for Obsessive-Compulsive Disorder, Current	38	13%

Table 5. Summary of substance use histories (N = 296).

	n	%
Met diagnostic criteria for Alcohol Use Disorder, Current	93	31%
Met diagnostic criteria for Substance Use Disorder, Current	17	6%
In previous 30 days of baseline assessment…		
Reported consuming alcohol	224	76%
Reported marijuana use	117	40%
Reported smoking crack	18	6%
Reported snorting cocaine	55	19%
Reported heroin use	9	3%
Reported other injection drug	6	2%
Reported any opiate use	36	12%
Reported crystal meth use	26	9%
Reported any amphetamine use	29	10%
Reported any hallucinogen use	37	13%
Reported any sedative / tranquilizer use	47	16%
Reported any other drug use	74	25%

Table 6. Summary of sexual behavior in previous 3 months of baseline assessment (N = 296).

	M	SD	Range
Number of sexual partners	8.03	7.64	1 – 60
Number of condomless anal sex acts with casual or primary partner of unknown serostatus	7.10	10.67	1 – 100
Number of condomless anal sex acts with casual or primary partner of unknown serostatus, accounting for PrEP use and adherence	6.75	10.54	1 – 100

Table 7. Summary of regression models of Major Depressive Disorder and associated outcome variables.

Outcome Variable	***B***	***SE (B)***	***β***	***p***	***95% CI***
Sexual Health Knowledge	-0.89	0.37	-0.14	$p = .02$	-1.61 – -0.17
Condom Use Self-Efficacy	-5.23	1.48	-0.21	$p < .001$	-8.20 – 2.38
Sexual Risk Taking Behavior (quartiles)	0.12	0.15	0.52	$p = .40$	-0.16 – 0.41
Sexual Risk Taking Behavior (dichotomous)	0.37	0.46	1.52	$p = .42$	0.60 – 3.57
Participants with moderate MDD					
Sexual Risk Taking Behavior (quartiles)	0.14	0.15	0.06	$p = .36$	-0.15 – 0.43
Sexual Risk Taking Behavior (dichotomous)	-0.59	0.82	0.56	$p = .16$	0.25 – 1.26

All models controlled for age, race, ethnicity, and education.

SE = standard error, CI = confidence interval, MDD = Major Depressive Disorder

Table 8. Summary of regression models of Generalized Anxiety Disorder and associated outcome variables.

Outcome Variable	***B***	***SE (B)***	***β***	***p***	***95% CI***
Sexual Health Knowledge	-0.56	0.37	-0.09	$p = .13$	-1.30 – 0.17
Sexual Health Knowledge, control for MDD	-0.40	0.38	-0.06	$p = .29$	-1.16 – 0.35
Condom Use Self-Efficacy	-1.04	1.54	-0.04	$p = .50$	-4.07 – 1.99
Condom Use Self-Efficacy, control for MDD	0.001	1.55	0.00	$p = 1.00$	-3.05 – 3.06
Sexual Risk Taking Behavior (quartiles)	0.32	0.15	0.13	$p = .03$	0.03 – 0.60
Sexual Risk Taking Behavior (quartiles), control for MDD	0.29	0.15	0.12	$p = .06$	-0.01 – 0.58
Sexual Risk Taking Behavior (dichotomous)	0.54	0.49	1.71	$p = .27$	-0.66 – 4.46
Sexual Risk Taking Behavior (dichotomous), control for MDD	2.88	0.81	1.62	$p = .34$	-0.61 – 4.32

All models controlled for age, race, ethnicity, and education.

SE = standard error, CI = confidence interval, MDD = Major Depressive Disorder

Table 9. Summary of regression models of Post Traumatic Stress Disorder and associated outcome variables.

Outcome Variable	***B***	***SE (B)***	***β***	***p***	***95% CI***
Sexual Health Knowledge	-0.17	0.35	-0.03	$p = .62$	-0.85 – 0.50
Sexual Health Knowledge, control for MDD	0.02	0.37	0.00	$p = .96$	-0.71 – 0.74
Condom Use Self-Efficacy	-1.41	1.50	-0.06	$p = .35$	-4.35 – 1.53
Condom Use Self-Efficacy, control for MDD	0.41	1.57	0.02	$p = .79$	-2.68 – 3.51
Sexual Risk Taking Behavior (quartiles)	0.18	0.14	0.08	$p = .19$	-0.09 – 0.46
Sexual Risk Taking Behavior (quartiles), control for MDD	0.16	0.15	0.07	$p = .30$	-0.14 – 0.45
Sexual Risk Taking Behavior (dichotomous)	-0.27	0.41	0.77	$p = .52$	0.34 – 1.72
Sexual Risk Taking Behavior (dichotomous), control for MDD	-0.43	0.44	0.65	$p = .32$	0.28 – 1.53

All models controlled for age, race, ethnicity, and education.

SE = standard error, CI = confidence interval, MDD = Major Depressive Disorder

Table 10. Summary of regression models of Major Depressive Disorder symptom clusters and associated outcome variables.

Outcome Variables with Cognitive / Affective Symptoms	***B***	***SE (B)***	***β***	***p***	***95% CI***
Sexual Health Knowledge	-0.18	0.22	-0.07	$p = .41$	-0.62 – 0.25
Condom Use Self-Efficacy	-2.86	0.81	-0.29	$p = .001$	-4.46 – -1.27
Sexual Risk Taking Behavior (quartiles)	0.17	0.08	0.19	$p = .04$	0.01 – 0.33
Sexual Risk Taking Behavior (dichotomous)	0.14	0.29	1.15	$p = .625$	0.65 – 2.04
Outcome Variables with Physical Symptoms	***B***	***SE (B)***	***β***	***p***	***95% CI***
Sexual Health Knowledge	-0.20	0.22	-0.08	$p = .35$	-0.64 – 0.23
Condom Use Self-Efficacy	-2.23	0.83	-0.22	$p = .008$	-3.87 – -0.58
Sexual Risk Taking Behavior (quartiles)	0.10	0.08	0.11	$p = .23$	-0.06 – 0.26
Sexual Risk Taking Behavior (dichotomous)	0.29	0.27	1.34	$p = .27$	0.80 – 2.25

All models controlled for age, race, ethnicity, and education.

SE = standard error, CI = confidence interval

Table 11. Summary of regression models of Generalized Anxiety Disorder symptom clusters and associated outcome variables.

Outcome Variables with Cognitive / Affective Symptoms	***B***	***SE (B)***	***β***	***p***	***95% CI***
Sexual Health Knowledge	-1.15	0.54	-0.24	$p = .04$	-2.22 – -0.07
Sexual Health Knowledge, control for MDD	-0.96	0.55	-0.20	$p = .09$	-2.05 – 0.14
Condom Use Self-Efficacy	0.42	2.11	0.24	$p = .84$	-3.79 – 4.63
Condom Use Self-Efficacy, control for MDD	1.79	2.08	0.10	$p = .39$	-2.36 – 5.95
Sexual Risk Taking Behavior (quartiles)	-0.08	0.20	-0.05	$p = .68$	-0.48 – 0.31
Sexual Risk Taking Behavior (quartiles), control for MDD	-0.16	0.20	-0.10	$p = .45$	-0.56 – 0.25
Sexual Risk Taking Behavior (dichotomous)	-17.22	6673.48	0.000	$p = .998$	0.000 – .
Sexual Risk Taking Behavior (dichotomous), control for MDD	-17.54	6140.96	0.000	$p = .998$	0.000 – .
Outcome Variables with Physical Symptoms	***B***	***SE (B)***	***β***	***p***	***95% CI***
Sexual Health Knowledge	-1.03	0.46	-0.25	$p = .03$	-1.96 – -0.11
Sexual Health Knowledge, control for MDD	-0.86	0.47	-0.21	$p = .07$	-1.80 – 0.07
Condom Use Self-Efficacy	-0.70	1.80	-0.05	$p = .70$	-4.28 – 2.89
Condom Use Self-Efficacy, control for MDD	0.27	1.80	0.02	$p = .88$	-3.33 – 3.87
Sexual Risk Taking Behavior (quartiles)	0.10	0.18	0.07	$p = .57$	-0.25 – 0.45
Sexual Risk Taking Behavior (quartiles), control for MDD	0.06	0.18	0.04	$p = .74$	-0.30 – 0.42
Sexual Risk Taking Behavior (dichotomous)	2.11	0.92	8.25	$p = .02$	1.37 – 49.62
Sexual Risk Taking Behavior (dichotomous), control for MDD	2.66	1.38	14.26	$p = .05$	0.96 – 212.79

All models controlled for age, race, ethnicity, and education.
SE = standard error, CI = confidence interval, MDD = Major Depressive Disorder

Table 12. Summary of regression models of Post-Traumatic Stress Disorder symptom clusters and associated outcome variables.

Outcome Variables with Intrusive Symptoms	***B***	***SE (B)***	***β***	***p***	***95% CI***
Sexual Health Knowledge	-0.20	0.11	-0.11	$p = .06$	-0.41 – 0.01
Sexual Health Knowledge, control for MDD	-0.18	0.11	-0.09	$p = .12$	-0.40 – 0.05
Condom Use Self-Efficacy	-0.58	0.44	-0.08	$p = .19$	-1.46 – 0.29
Condom Use Self-Efficacy, control for MDD	-0.25	0.47	-0.03	$p = .59$	-1.18 – 0.67
Sexual Risk Taking Behavior (quartiles)	0.04	0.04	0.05	$p = .38$	-0.05 – 0.12
Sexual Risk Taking Behavior (quartiles), control for MDD	0.03	0.05	0.05	$p = .46$	-0.06 – 0.12
Sexual Risk Taking Behavior (dichotomous)	0.10	0.13	1.12	$p = .45$	0.85 – 1.43
Sexual Risk Taking Behavior (dichotomous), control for MDD	0.06	0.14	1.06	$p = .66$	0.81 – 1.39
Outcome Variables with Avoidance Symptoms	***B***	***SE (B)***	***β***	***p***	***95% CI***
Sexual Health Knowledge	-0.05	0.08	-0.03	$p = .58$	-0.21 – 0.12
Sexual Health Knowledge, control for MDD	0.01	0.09	0.01	$p = .91$	-0.17 – 0.19
Condom Use Self-Efficacy	-0.59	0.34	-0.10	$p = .08$	-1.26 – 0.08
Condom Use Self-Efficacy, control for MDD	-0.21	0.37	-0.04	$p = .56$	-0.94 – 0.52
Sexual Risk Taking Behavior (quartiles)	0.02	0.03	0.05	$p = .46$	-0.04 – 0.09
Sexual Risk Taking Behavior (quartiles), control for MDD	0.01	0.04	0.03	$p = .70$	-0.06 – 0.08
Sexual Risk Taking Behavior (dichotomous)	0.08	0.10	1.08	$p = .46$	0.88 – 1.32
Sexual Risk Taking Behavior (dichotomous), control for MDD	0.05	0.11	1.05	$p = .66$	0.85 – 1.30
Outcome Variables with Hyperarousal Symptoms	***B***	***SE (B)***	***β***	***p***	***95% CI***
Sexual Health Knowledge	-0.11	0.11	-0.06	$p = .30$	-0.32 – 0.10
Sexual Health Knowledge, control for MDD	-0.03	0.12	-0.02	$p = .77$	-0.27 – 0.20
Condom Use Self-Efficacy	-0.67	0.44	-0.09	$p = .13$	-1.53 – 0.19
Condom Use Self-Efficacy, control for MDD	-0.07	0.48	-0.01	$p = .89$	-1.02 – 0.89
Sexual Risk Taking Behavior (quartiles)	0.03	0.04	0.05	$p = .41$	-0.05 – 0.12
Sexual Risk Taking Behavior (quartiles), control for MDD	0.03	0.05	0.04	$p = .59$	-0.07 – 0.12
Sexual Risk Taking Behavior (dichotomous)	0.18	0.13	1.20	$p = .16$	0.93 – 1.54
Sexual Risk Taking Behavior (dichotomous), control for MDD	0.15	0.14	1.16	$p = .30$	0.88 – 1.53

All models controlled for age, race, ethnicity, and education.
SE = standard error, CI = confidence interval, MDD = Major Depressive Disorder