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Effects of Trauma and PTSD on Self-Reported Physical Functioning in Sexual Minority Women

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Abstract

Objective—Sexual minority women (lesbians, bisexual women, and women who partner with women) experience high rates of trauma exposure, are more likely to develop posttraumatic stress disorder (PTSD), and have high rates of physical health problems compared to heterosexual women. The present study tested whether PTSD may be the mechanism through which trauma exposure affects self-reported physical functioning in this population.

Methods—In a sample of 857 sexual minority women, we examined the association between trauma exposure and worsening physical functioning (measured using the 12-item Short Form Health Survey) 2 years later, whether PTSD mediated this relationship, and if so, which PTSD symptom clusters best accounted for this mediation.

Results—Results showed that more criterion A traumatic events experienced (based on DSM IV) predicted greater decline in physical functioning 2-years later, and PTSD symptoms mediated this relationship, explaining 73% of the total effect. The arousal/reactivity symptom cluster was the only significant mediator, explaining 68% of the total effect.

Conclusions—Results show that PTSD, and arousal/reactivity symptoms in particular, may be the mechanism through which traumatic events negatively impact self-reported physical functioning. These findings provide further evidence that, for this at risk population, treating PTSD as soon as possible after onset may improve long term physical functioning.

Keywords

PTSD; physical functioning; arousal; reactivity; sexual minority women

Sexual minority women (lesbians, bisexual women, and women who partner with women) are identified by the Institute of Medicine as a “health disparities” population (Institute of Medicine, 2011). The most widely accepted explanatory theory is that this increased vulnerability is due to the experience of minority stress, or the impact of both internal and

external aspects of the chronic social stress (e.g., harassment, discrimination) associated with being part of a marginalized community (Hatzenbuehler, 2009; Meyer, 2003). Sexual minority women have higher rates of certain types of trauma exposure, such as child maltreatment, intimate partner violence, and sexual victimization, relative to heterosexual women and gay and bisexual men (Katz-Wise & Hyde, 2012; Roberts, Austin, Corliss, Vandermorris, & Koenen, 2010; Rothman, Exner, & Baughman, 2011). Both high rates of trauma exposure and the impact of minority stress have been associated with higher risk of developing Posttraumatic Stress Disorder (PTSD) among sexual minority women (Balsam, Rothblum, & Beauchaine, 2005; Gilman et al., 2001; Katz-Wise & Hyde, 2012; Roberts et al., 2010). Relative to their heterosexual counterparts, sexual minority women also experience a greater variety of health conditions and limitations (Cochran & Mays, 2007; Sandfort, Bakker, Schellevis, & Vanwesenbeeck, 2006), such as higher rates of obesity, breast cancer, and risk factors for cervical cancer (Boehmer, Bowen, & Bauer, 2007; Case et al., 2004; Fredriksen-Goldsen, Kim, Barkan, Muraco, & Hoy-Ellis, 2013). In general population studies of presumed heterosexual samples, exposure to traumatic events has been associated with increased risk for a range of negative physical health outcomes including chest pain, heart failure, respiratory issues, and other health concerns (Resnick, Acierno, & Kilpatrick, 1997; Spitzer et al., 2009; Walker, Newman, & Koss, 2004) although this relationship has not been explored among sexual minority women specifically.

One mechanism by which trauma exposure may affect physical health is through the development and maintenance of PTSD (Schnurr & Green, 2004). PTSD has been associated with greater general health complaints and a number of negative physical health outcomes (Boscarino, 2004; Pacella, Hruska, & Delahanty, 2013). Moreover, different PTSD symptom clusters (e.g., intrusions/re-experiencing, avoidance/numbing, and arousal/reactivity) may uniquely impact physical health. For example, among United States veterans who served in Iraq and Afghanistan, PTSD re-experiencing symptoms uniquely predicted reduced physical health functioning and higher experience of bodily pain whereas hyperarousal symptoms uniquely predicted lower feelings of energy/vitality (Asnaani, Reddy, & Shea, 2014). In a study of female Vietnam era veterans, hyperarousal symptoms uniquely predicted health complaints beyond the other PTSD symptom clusters (Kimerling, Clum, & Wolfe, 2000). In a sample of women with chronic PTSD, the re-experiencing cluster of PTSD was associated with higher self-reported physical health symptoms (Zoellner, Goodwin, & Foa, 2000). Understanding which symptoms of PTSD predict worse physical health and functioning may help reveal the underlying biological mechanisms through which PTSD impacts physical health. For example, prolonged activation of stress response systems (O'Donovan, Slavich, Epel, & Neylan, 2013; Roy-Byrne et al., 2008) and poor health behaviors (Zen, Whooley, Zhao, & Cohen, 2012) have been proposed as mechanisms of the link between anxiety disorders or PTSD and diseases of aging and may map on to alterations in arousal and avoidance behavior respectively.

A number of prior studies have examined whether it is trauma exposure or PTSD symptoms that are most strongly related to poor physical health. While one study found the number of lifetime traumatic events individuals experience accounted for the relationship between PTSD symptoms and chronic medical conditions (e.g., arthritis or stroke; Sledjeski, Speisman, & Dierker, 2008), other research supports the view that PTSD, as opposed to

exposure to traumatic events alone, is more closely associated with poor health functioning and outcomes (Asnaani et al., 2014; O'Toole & Catts, 2008; Schnurr & Spiro, 1999). Thus, PTSD symptoms may directly impact individuals' physical health more so than exposure to a traumatic event. With the exception of Schnurr & Spiro (1999), who examined the longitudinal effects of overall PTSD symptom severity on self-reported physical health status in a sample of older male military Veterans, prior analyses have been cross sectional thereby limiting the ability to estimate temporal precedence of predictors and mediators to more fully understand the effect of trauma exposure and PTSD on physical health outcomes. Although Schnurr and Spiro (1999) examined trauma exposure and PTSD symptom severity at one time point and health outcomes at a later time point, they did not control for health outcomes at the first time point, and were therefore unable to make rigorous inferences about the causal relationships implied by the mediation model.

To date, much of the research examining the relationship between trauma exposure, PTSD, and physical health has been conducted with male and female veteran populations (Boscarino, 2004, 2008; Frayne et al., 2011; Kimerling et al., 2000; Kubzansky, Koenen, Spiro, Vokonas, & Sparrow, 2007; Schnurr, Spiro, & Paris, 2000). Although a much more limited literature to date, similar results have been found in civilian women and men with PTSD predicting increased health problems and complaints (Bedard-Gilligan, Crounce, Lehavot, Blayney, & Kaysen, 2014; Kaysen et al., 2008; Kimerling, 2004). Given the context of minority stress, coupled with the high prevalence of trauma exposure, PTSD, and physical health problems among sexual minority women, understanding the relationship between trauma exposure, PTSD, and physical functioning in this population may be particularly important for strategic interventions related to both mental and physical health.

The current study aimed to examine the relationship between sexual minority women's self-reported trauma exposure, PTSD symptoms, and physical functioning. Three research aims were evaluated in a sample of sexual minority women. To replicate previous research, we first examined whether self-reported criterion A traumatic event exposure was significantly associated with worsening self-reported physical functioning over time. Second, we tested whether overall PTSD symptom severity mediated the relationship between trauma exposure and worsening physical functioning. Finally, we tested the three symptom clusters of PTSD (intrusion, avoidance/numbing, and arousal/reactivity) based on the Diagnostic and Statistical Manual IV (DSM-IV; American Psychiatric Association, 2000) as mediators of the relationship between trauma exposure and worsening physical functioning. Our sample was comprised of young adults who self-reported their physical functioning using the 12-item Short Form Health Survey. Thus, the focus of the current analyses was on perceived physical functioning challenges occurring early in life (i.e. before health problems become chronic).

Method

Participants and Procedure

Data analyzed in the current study were collected as part of a larger study on high risk drinking in emerging adult at-risk women. A Federal Certificate of Confidentiality was obtained for the study and all study procedures were approved by the University of

Washington's Institutional Review Board. One thousand eighty three lesbian and bisexual women between the ages of 18 and 26 ($M = 20.88$, $SD = 2.11$) were recruited nationally using online advertisements on Facebook and Craigslist. In this sample, 40.5% identified as lesbian and 59.5% as bisexual. The ethnic distribution of the sample was 76% White, 13% African American, 4% Asian, 4% multiracial, and 3% other or no response. Twelve percent identified as Hispanic/Latina. Of the 444 participants who provided income information, 27% had an income less than \$10,000, 35% between \$10,000 and \$30,000, and 38% over \$30,000. Women who clicked on the on-line study advertisement were given an online consent form for the screening measure and following consent were administered a 5-minute screening measure. This measure was completed by 4,119 potential participants. Eligibility criteria were as follows: residing in the United States, access to valid email address, between the ages of 18 and 25, and self-identified as lesbian or bisexual at the time of initial assessment. Participants who met these eligibility criteria ($n = 1,877$) were sent a link to the baseline assessment. Once a participant logged into the baseline survey, they were shown a full consent form for the larger longitudinal study. Those who consented and completed the baseline assessment ($n = 1,083$) were then followed over time and asked to complete repeat assessments at 12, 24, and 36 months following the initial assessment. Participants received \$25 for the baseline assessment and \$30 for follow-up assessments. For additional details on study methods, see Rhew et al (2017), Wilson et al. (2016), and Litt et al. (2015).

Because the version of the SF-12 measure collected at baseline differed from the version collected at 12, 24, and 36 months and the two versions could not be reconciled, we were unable to use the baseline data in the mediation model. In addition, downstream health effects of PTSD symptoms due to chronically elevated autonomic arousal likely accumulate slowly over time. We therefore chose to maximize the amount of time between the measurement of the purported mediator and the change in physical functioning by examining change in health between 12 and 36 months (2 year period) as opposed to 24 and 36 months. Thus, the current analyses used data from the 12- and 36-month time points only, which we have termed Assessment 1 and 2-year follow-up (FU) respectively in the current manuscript. The sample used for the current analysis included all participants assessed at either of these two time points ($n = 857$). Participants in this sample were between 18 and 25 years old (mean = 20.89), and 41.4% identified as lesbian and 58.6% as bisexual. The ethnic distribution of the sample was 80% White, 11% African American, 3% Asian, 4% multiracial, and 2% other or no response. Eleven percent identified as Hispanic/Latina. Of the 353 participants who provided income information, 27% had an income less than \$10,000, 33% between \$10,000 and \$30,000, and 40% over \$30,000. The sample analyzed did not significantly differ from the full sample on these demographics ($ps \geq .112$).

Measures

Traumatic Life Events Questionnaire—This 23-item measure (Kubany et al., 2000) assesses exposure to a broad set of potential traumatic events. Consistent with the DSM-IV criteria, for each item, participants are asked whether they experienced intense fear, helplessness, or horror. For the current analysis, we used a count of the total number of items endorsed for which participants also reported feeling fear, helplessness, or horror. The measure shows good temporal stability for the reporting of trauma exposure over time and is

highly correlated with other self-report and clinician administered measures of trauma exposure (Kubany et al., 2000).

PTSD Checklist Specific for DSM IV (PCL-S)—This 17-item self-report measure (Blanchard, Jones-Alexander, Buckley, & Forneris, 1996) assesses severity of PTSD symptoms based on the DSM-IV criteria. Participants indicate how much they have been bothered by each symptom on a scale ranging from 1 (not at all) to 5 (extremely) in regards to their “worst traumatic event” identified on the Traumatic Life Events Questionnaire. The items were used to generate three subscales including intrusive, avoidance, and arousal/reactivity symptoms, that map onto the symptom clusters of PTSD (criteria B, C, and D respectively) in DSM-IV. Higher scores indicate more severe PTSD. Sample items include, “repeated, disturbing memories, thoughts, or images of the stressful experience,” and “avoided activities or situations because they remind you of the stressful experience.” The measure has strong diagnostic efficiency, and high convergent validity ($r = .93$) (Blanchard et al., 1996). In the current sample, $\alpha = .95$. In the current study, we used a modified version of the measure that includes three additional items that assess new criteria included in DSM-V.

Short Form Health Survey 12 – Physical Health Subscale—The SF-12 (Ware, Kosinski, & Keller, 1996) is a shortened version of the SF-36 – a measure of physical and mental health functioning that has been widely used and validated. The measure is comprised of eight subscales, which are used to calculate physical and mental health composite summary scales. The scale scores are population normed and have a mean of 50 and a standard deviation of 10. The current study examined only the physical component of the scale. Multiple calculation methods exist for this measure, and for the current study, we used the oblique item weights derived through confirmatory factor analysis from Farivar et al (2007). This scoring method treats physical and mental health as oblique constructs, meaning that the scoring does not force physical and mental health to be uncorrelated. The orthogonal method, on the other hand, artificially removes the correlation between the physical and mental health items. Because physical and mental health are actually correlated (which is the focus of the present manuscript), the more commonly used orthogonal scoring method can distort the measurement. This is particularly true for clinical samples and when there is an interest in examining the association between physical and mental health (Niles et al., 2013).

Data Analysis

Missing Data—To reduce participant burden, secondary outcome measures were administered to only two-thirds of the total sample. The Traumatic Life Events Questionnaire and PCL-S were primary outcomes and were administered to the entire sample. However the SF-12 was a secondary outcome. For secondary outcome measures, participants were divided into three equal sized groups and secondary measures were divided into thirds that were approximately the same length. Each group of participants received a random selection of two-thirds of the secondary measures. Thus, only two-thirds of the sample completed the SF-12. Sample sizes for the SF-12 at Assessment 1 and 2-year FU were 503 and 465 respectively. Sample sizes for the Traumatic Life Events

Questionnaire and PCL-S at Assessment 1 were 806 and 765 respectively. We used a maximum likelihood (ML) estimation approach to include all participants with at least one of these measures available, and thus 857 total participants were analyzed. ML effectively handles missing data and has advantages over multiple imputation including greater efficiency, reproducible results, fewer decision points, and parsimony (Allison, 2012).

Mediation Models—All three research questions were assessed using path analysis structural equation modeling in Stata 13. In all three models, Physical Health Scale score at 2-year FU was the dependent variable and Physical Health Scale score at Assessment 1 was included as a covariate. For research question 1, the predictor was number of criterion A events experienced prior to Assessment 1. For research question 2, criterion A events at Assessment 1 was the predictor (X) and PCL-S at Assessment 1 was the mediator (M). The model is displayed in Figure 1. For research question 3, criterion A events at Assessment 1 was the predictor (X) and each of the three symptom clusters at Assessment 1 were included simultaneously as three mediators in the model (M_1 , M_2 , M_3). We examined age, race, and income as potential covariates in the mediation models, and results were unchanged. Thus, final models do not include these covariates.

Mediation models followed a modified longitudinal mediation approach (Cole & Maxwell, 2003) in which the initial value of the dependent variable Y is used as a covariate. However, because our predictor variable (number of criterion A events) was a retrospective report of past events, and our mediator variable (PCL-S) assesses present symptoms of PTSD, we included measures of these variables at the same time point (Assessment 1) rather than using three separate time points for variables X, M, and Y. Full longitudinal mediation models using three separate timepoints assess whether the predictor X correlates with *change* in the mediator M. Because trauma exposure and subsequent PTSD symptom development (typical onset time is three months) most likely occurred prior to our measurement of these constructs, and the causal association is well established, we were uninterested in whether trauma exposure in the past predicted a change in PTSD symptoms between our two study timepoints. Thus, a model testing past trauma exposure and current PTSD symptoms at the same timepoint was more statistically and conceptually appropriate to test our research question. Significance of indirect effects was determined used percentile bootstrapped confidence intervals with 2000 repetitions according to the guidelines of Hayes and Scharkow (2013).

Results

Descriptive Statistics and Correlations

Means, standard deviations, and ranges of all variables included in the mediation models are displayed in Table 1 and correlations among variables are shown in Table 2.

Trauma Exposure, PTSD Symptoms, and Physical Functioning

Number of criterion A events experienced at Assessment 1 was significantly associated with decreased physical functioning at 2-year FU controlling for physical functioning at Assessment 1 ($b = -.45$, 95% confidence interval = $-.76$ to $-.15$). Thus, each additional

criterion A event experienced predicted a one half point lower physical functioning score. To test our assertion that effects of trauma exposure develop slowly over time, we assessed whether trauma exposure at Assessment 1 significantly predicted worsening self-reported physical functioning at 1-year FU, and it did not ($p = .255$).

As shown in Figure 1, number of criterion A events experienced at Assessment 1 significantly predicted higher PCL-S scores at Assessment 1 ($b = 2.82$, 95% CI = 2.43 to 3.22), and higher PCL-S scores at Assessment 1 significantly predicted poorer Physical Health Scale scores at 2-year FU ($b = -.12$, 95% CI = $-.18$ to $-.07$). The indirect effect was also significant ($b = -.35$, Percentile 95% CI = $-.53$ to $-.19$), and 73% of the total effect was mediated by PCL-S scores. When PCL-S scores were included in the model, the direct effect of number of criterion A events at Assessment 1 predicting Physical Health Scale scores at 2-year FU dropped from $-.48$ to $-.13$ and was no longer significant (95% CI = $-.46$ to $.20$).

As shown in Figure 2, number of criterion A events experienced prior to Assessment 1 significantly predicted higher severity in all three PCL-S symptom clusters at Assessment 1 (intrusion $b = .90$, 95% CI = $.77$ to 1.03 ; avoidance $b = 1.12$, 95% CI = $.95$ to 1.29 ; arousal/reactivity $b = .79$, 95% CI = $.66$ to $.93$). Of the three symptom clusters, only arousal/reactivity significantly predicted worsening Physical Health Scale scores at 2-year FU ($b = -.39$, 95% CI = $-.62$ to $-.16$). Each of the three indirect effects was tested for significance. Only arousal/reactivity was a significant mediator of criterion A event exposure on worsening Physical Health Scale scores ($b = -.31$, Percentile 95% CI = $-.51$ to $-.11$), and 68% of the total effect was mediated through arousal/reactivity. When the three symptom clusters were included in the model, the direct effect of criterion A event exposure at Assessment 1 and Physical Health Scale scores at 2-year FU dropped from $-.45$ to $-.12$ and was no longer significant (95% CI = $-.45$ to $.21$). Analyses were also conducted using the four symptom clusters of PTSD based on DSM 5 criteria, and results were largely the same. Specifically, arousal/reactivity was the only significant mediator of the association between trauma exposure and worsening physical functioning ($b = -.40$, Percentile 95% CI = $-.65$ to $-.17$).

Discussion

The goal of the current study was to examine symptoms of PTSD as mediators of the association between exposure to traumatic events and poor self-reported physical functioning among sexual minority women in a longitudinal study. First, we found that the more criterion A traumatic events a person was exposed to anytime prior to Assessment 1, the greater decline they had in physical functioning between Assessment 1 and the 2-year FU. Second, we showed that PTSD symptom severity measured at Assessment 1 significantly mediated the effect of trauma exposure on worsening physical functioning with a large effect size. Finally, we identified that the arousal/reactivity symptom cluster of PTSD was the only symptom cluster that significantly mediated the relationship.

Our finding that exposure to traumatic events predicted worsening self-reported physical functioning over time is consistent with a large body of literature showing links between trauma exposure, PTSD and poor physical health (Boscarino, 2004, 2004; Frayne et al.,

2011; Pacella et al., 2013; Schnurr et al., 2000; Sledjeski et al., 2008; Spitzer et al., 2009). Our study however is the first to examine this research question in a sample of sexual minority women. Because this group of women typically reports far higher rates of trauma exposure compared to heterosexual women (Balsam, Rothblum, & Beauchaine, 2005), it is particularly pressing to examine the long term effects this exposure may have among sexual minority women. In addition, sexual minority women typically have poorer physical health compared to heterosexual women (Cochran & Mays, 2007). Our findings provide evidence for trauma exposure as one likely contributor to these health disparities.

We were also able to show that PTSD symptom severity, and particularly severity of arousal/reactivity, was a key mechanism of the link between trauma exposure and worsening self-reported physical health. This finding is particularly valuable as it identifies one mechanism by which trauma exposure “gets under the skin.” This finding is consistent with theories proposing that exaggerated neurobiological sensitivity to threat leads to prolonged activation of biological stress systems (e.g. inflammatory system), which may thus increase the risk of developing diseases of aging such as cardiovascular, autoimmune, and neurodegenerative diseases (O’Donovan et al., 2013). This finding also complements a prior study that showed a link between threat sensitivity symptoms of PTSD and poor immune functioning (O’Donovan et al., 2017). Together, these studies suggest that targeting arousal/reactivity symptoms in particular might be preventative of more chronic physical health conditions, as measured by self-report perceptions of health and more objective measures of physical health. If it is not trauma exposure that negatively impacts physical functioning, but rather specific symptoms of PTSD, interventions that reduce these symptoms may result in improved physical functioning. In fact, there is some evidence in a sample of adults with mixed anxiety disorders including PTSD, that self-reported physical functioning is improved after individuals undergo cognitive behavioral therapy targeting the primary anxiety disorder (Niles et al., 2013). Another study found that perceptions of physical health improved following cognitive behavioral treatments for PTSD in an all-female sample (Galovski, Monson, Bruce, & Resick, 2009). Future studies examining interventions for individuals with PTSD should include measures of physical functioning to identify specific intervention approaches that are likely to improve physical health outcomes.

Finally, these findings have important implications for sexual minority women in relation to poorer physical and mental health (Cochran & Mays, 2007; Sandfort et al., 2006). In general this is an understudied population. Over the past 20 years, only 0.1% of the articles published in Medline examined lesbian, gay, bisexual, or transgendered health (Coulter, Kenst, Bowen, & Scout, 2014). The Institute of Medicine stated that these gaps in the literature were such that fundamental research on health, prevention, and interventions among sexual minorities were either lacking altogether or were extremely sparse (Graham et al., 2011). Given the overall lack of research, it is not surprising that few research studies have examined mechanisms by which stressors may confer physical and mental health disparities within sexual minority women (Hatzenbuehler, Keyes, & Hasin, 2009; Hatzenbuehler, McLaughlin, Keyes, & Hasin, 2010). Although our findings support the role of hyperarousal associated with trauma exposure as one potential avenue for understanding health concerns among young sexual minority women, there are other potential factors that should be explored. Prior studies have shown that emotion dysregulation mediates between

stressful life events and mental health outcomes among sexual minority adolescents (McLaughlin & Hatzenbuehler, 2009) and rumination between experiences of discrimination and psychological distress (Hatzenbuehler, Nolen-Hoeksema, & Dovidio, 2009), although these studies did not in turn look at how this affected physical health. Further research should examine more complex mediational models where we can better test whether it is the psychological distress like hyperarousal that is exacerbating physical health concerns, or whether there are psychological processes that underlie both the psychological and physical health disparities found among sexual minorities.

Despite many strengths, the current study has a number of important limitations. Firstly, all variables were measured via self-report. Although the assessment of self-reported trauma exposure via the Traumatic Life Events Questionnaire does not differ from a clinician administered assessment of trauma exposure (Kubany et al., 2000) we do not know how well self-reported physical functioning captures more objective measures of physical health such as diagnoses of medical illness or health care utilization. Future work would benefit from including additional measures of physical health including laboratory-based measures (e.g. immune function, telomere length, or hypothalamic pituitary adrenal axis activation) or physician reported medical conditions. Although a key strength of the study is the longitudinal design, participants were recruited between the ages of 18 and 26 and were followed for only three years. Because physical functioning deficits tend to emerge as individuals age, our ability to detect effects of trauma exposure on poor physical functioning were likely limited by overall good health in a young sample. Given the limitations in statistical power posed by low variability in this young healthy sample, it is even more notable that we were able to detect that trauma exposure negatively impacts physical functioning over a short period of time. Finally, our sample was comprised of women who identified as Lesbian or bisexual when entering the study. Thus, we were unable to test our model in a comparison sample of heterosexual women, which should be a direction for future research to determine if the relationships shown here also apply to heterosexual women or are unique to sexual minority women.

In conclusion, the current project is the first to examine links between trauma exposure and worsening self-reported physical functioning in a sample of sexual minority women. In addition, it is also the first study to show that PTSD symptoms, particularly arousal and reactivity, mediate this relationship longitudinally. These findings provide strong evidence for arousal and reactivity as a key explanatory factor in how trauma exposure worsens physical functioning and provide further evidence that addressing PTSD through effective therapies as soon as possible after onset may lead to improvements that extend far beyond PTSD symptom reduction to improved long term physical health.

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References

- Allison, P. SAS Global Forum. 2012. Handling missing data by maximum likelihood.
- American Psychiatric Association. Diagnostic and statistical manual of mental disorders. 4. Washington, DC: American Psychiatric Association; 2000. text revision
- Asnaani A, Reddy MK, Shea MT. The impact of PTSD symptoms on physical and mental health functioning in returning veterans. *Journal of Anxiety Disorders*. 2014; 28(3):310–317. <https://doi.org/10.1016/j.janxdis.2014.01.005>. [PubMed: 24647406]
- Balsam KF, Rothblum ED, Beauchaine TP. Victimization over the life span: A comparison of lesbian, gay, bisexual, and heterosexual siblings. *Journal of Consulting and Clinical Psychology*. 2005; 73(3):477–487. <https://doi.org/10.1037/0022-006X.73.3.477>. [PubMed: 15982145]
- Bedard-Gilligan M, Cronce JM, Lehavot K, Blayney JA, Kaysen D. The relationship between assault and physical health complaints in a sample of female drinkers: Roles of avoidant coping and alcohol use. *Journal of Interpersonal Violence*. 2014; 29(8):1359–1379. <https://doi.org/10.1177/0886260513507139>. [PubMed: 24288191]
- Blanchard EB, Jones-Alexander J, Buckley TC, Forneris CA. Psychometric properties of the PTSD checklist (PCL). *Behaviour Research and Therapy*. 1996; 34(8):669–673. [https://doi.org/10.1016/0005-7967\(96\)00033-2](https://doi.org/10.1016/0005-7967(96)00033-2). [PubMed: 8870294]
- Boehmer U, Bowen DJ, Bauer GR. Overweight and obesity in sexual-minority women: Evidence from population-based data. *American Journal of Public Health*. 2007; 97(6):1134–1140. <https://doi.org/10.2105/AJPH.2006.088419>. [PubMed: 17463369]
- Boscarino JA. Posttraumatic stress disorder and physical illness: Results from clinical and epidemiologic studies. *Annals of the New York Academy of Sciences*. 2004; 1032:141–153. <https://doi.org/10.1196/annals.1314.011>. [PubMed: 15677401]
- Boscarino JA. A prospective study of PTSD and early-age heart disease mortality among Vietnam veterans: Implications for surveillance and prevention. *Psychosomatic Medicine*. 2008; 70(6):668–676. <https://doi.org/10.1097/PSY.0b013e31817bccaf>. [PubMed: 18596248]
- Case P, Austin SB, Hunter DJ, Manson JE, Malspeis S, Willett WC, Spiegelman D. Sexual orientation, health risk factors, and physical functioning in the Nurses' Health Study II. *Journal of Women's Health* (2002). 2004; 13(9):1033–1047. <https://doi.org/10.1089/jwh.2004.13.1033>.
- Cochran SD, Mays VM. Physical health complaints among lesbians, gay men, and bisexual and homosexually experienced heterosexual individuals: Results from the california quality of life survey. *American Journal of Public Health*. 2007; 97(11):2048–2055. <https://doi.org/10.2105/AJPH.2006.087254>. [PubMed: 17463371]
- Cole DA, Maxwell SE. Testing mediational models with longitudinal data: Questions and tips in the use of structural equation modeling. *Journal of Abnormal Psychology*. 2003; 112(4):558–577. <https://doi.org/http://dx.doi.org/10.1037/0021-843X.112.4.558>. [PubMed: 14674869]
- Coulter RWS, Kenst KS, Bowen DJ, Scout. Research funded by the National Institutes of Health on the health of lesbian, gay, bisexual, and transgender populations. *American Journal of Public Health*. 2014; 104(2):e105–112. <https://doi.org/10.2105/AJPH.2013.301501>. [PubMed: 24328665]
- Farivar SS, Cunningham WE, Hays RD. Correlated physical and mental health summary scores for the SF-36 and SF-12 Health Survey, V.I. Health and Quality of Life Outcomes. 2007; 5:54. <https://doi.org/10.1186/1477-7525-5-54>. [PubMed: 17825096]
- Frayne SM, Chiu VY, Iqbal S, Berg EA, Laungani KJ, Cronkite RC, ... Kimerling R. Medical care needs of returning veterans with PTSD: Their other burden. *Journal of General Internal Medicine*. 2011; 26(1):33–39. <https://doi.org/10.1007/s11606-010-1497-4>. [PubMed: 20853066]
- Fredriksen-Goldsen KI, Kim HJ, Barkan SE, Muraco A, Hoy-Ellis CP. Health disparities among lesbian, gay, and bisexual older adults: Results from a population-based study. *American Journal of Public Health*. 2013; 103(10):1802–1809. <https://doi.org/10.2105/AJPH.2012.301110>. [PubMed: 23763391]
- Galovski TE, Monson C, Bruce SE, Resick PA. Does cognitive-behavioral therapy for PTSD improve perceived health and sleep impairment? *Journal of Traumatic Stress*. 2009; 22(3):197–204. <https://doi.org/10.1002/jts.20418>. [PubMed: 19466746]

- Gilman SE, Cochran SD, Mays VM, Hughes M, Ostrow D, Kessler RC. Risk of psychiatric disorders among individuals reporting same-sex sexual partners in the National Comorbidity Survey. *American Journal of Public Health*. 2001; 91(6):933–939. [PubMed: 11392937]
- Graham, R., Berkowitz, B., Blum, R., Bockting, W., Bradford, J., de Vries, B., ... Makadon, H. *The Health of Lesbian, Gay, Bisexual, and Transgender People: Building a Foundation for Better Understanding*. Washington, DC: Institute of Medicine; 2011.
- Hatzenbuehler ML, Keyes KM, Hasin DS. State-level policies and psychiatric morbidity in lesbian, gay, and bisexual populations. *American Journal of Public Health*. 2009; 99(12):2275–2281. <https://doi.org/10.2105/AJPH.2008.153510>. [PubMed: 19833997]
- Hatzenbuehler ML, McLaughlin KA, Keyes KM, Hasin DS. The impact of institutional discrimination on psychiatric disorders in lesbian, gay, and bisexual populations: A prospective study. *American Journal of Public Health*. 2010; 100(3):452–459. <https://doi.org/10.2105/AJPH.2009.168815>. [PubMed: 20075314]
- Hatzenbuehler ML, Nolen-Hoeksema S, Dovidio J. How does stigma “get under the skin”? *Psychological Science*. 2009; 20(10):1282–1289. <https://doi.org/10.1111/j.1467-9280.2009.02441.x>. [PubMed: 19765237]
- Hayes, AF., Scharkow, M. The relative trustworthiness of inferential tests of the indirect effect in statistical mediation analysis: Does method really matter?. *Psychological Science*. 2013. 0956797613480187. <https://doi.org/10.1177/0956797613480187>
- Institute of Medicine. *The health of lesbian, gay, bisexual, and transgender people: Building a foundation for better understanding*. Washington, D.C: The National Academies Press; 2011.
- Katz-Wise SL, Hyde JS. Victimization experiences of lesbian, gay, and bisexual individuals: A meta-analysis. *Journal of Sex Research*. 2012; 49(2–3):142–167. <https://doi.org/10.1080/00224499.2011.637247>. [PubMed: 22380586]
- Kaysen D, Pantalone DW, Chawla N, Lindgren KP, Clum GA, Lee C, Resick PA. Posttraumatic stress disorder, alcohol use, and physical health concerns. *Journal of Behavioral Medicine*. 2008; 31(2): 115–125. <https://doi.org/10.1007/s10865-007-9140-5>. [PubMed: 18095150]
- Kimerling R. An investigation of sex differences in nonpsychiatric morbidity associated with posttraumatic stress disorder. *Journal of the American Medical Women’s Association* (1972). 2004; 59(1):43–47.
- Kimerling R, Clum GA, Wolfe J. Relationships among trauma exposure, chronic posttraumatic stress disorder symptoms, and self-reported health in women: Replication and extension. *Journal of Traumatic Stress*. 2000; 13(1):115–128. <https://doi.org/10.1023/A:1007729116133>. [PubMed: 10761178]
- Kubany ES, Haynes SN, Leisen MB, Owens JA, Kaplan AS, Watson SB, Burns K. Development and preliminary validation of a brief broad-spectrum measure of trauma exposure: The Traumatic Life Events Questionnaire. *Psychological Assessment*. 2000; 12(2):210–224. [PubMed: 10887767]
- Kubzansky LD, Koenen KC, Spiro A, Vokonas PS, Sparrow D. Prospective study of posttraumatic stress disorder symptoms and coronary heart disease in the Normative Aging Study. *Archives of General Psychiatry*. 2007; 64(1):109–116. <https://doi.org/10.1001/archpsyc.64.1.109>. [PubMed: 17199060]
- Litt DM, Lewis MA, Rhew IC, Hodge KA, Kaysen DL. Reciprocal relationships over time between descriptive norms and alcohol use in young adult sexual minority women. *Psychology of Addictive Behaviors: Journal of the Society of Psychologists in Addictive Behaviors*. 2015; 29(4): 885–893. <https://doi.org/10.1037/adb0000122>. [PubMed: 26478944]
- McLaughlin KA, Hatzenbuehler ML. Mechanisms linking stressful life events and mental health problems in a prospective, community-based sample of adolescents. *The Journal of Adolescent Health*. 2009; 44(2):153–160. <https://doi.org/10.1016/j.jadohealth.2008.06.019>. [PubMed: 19167664]
- Niles AN, Sherbourne CD, Roy-Byrne PP, Stein MB, Sullivan G, Bystritsky A, Craske MG. Anxiety treatment improves physical functioning with oblique scoring of the SF-12 Short Form Health Survey. *General Hospital Psychiatry*. 2013; 35(3):291–296. <https://doi.org/10.1016/j.genhosppsych.2012.12.004>. [PubMed: 23332608]

- O'Donovan A, Ahmadian AJ, Neylan TC, Pacult MA, Edmondson D, Cohen BE. Current posttraumatic stress disorder and exaggerated threat sensitivity associated with elevated inflammation in the Mind Your Heart Study. *Brain, Behavior, and Immunity*. 2017; 60:198–205. <https://doi.org/10.1016/j.bbi.2016.10.014>.
- O'Donovan A, Slavich GM, Epel ES, Neylan TC. Exaggerated neurobiological sensitivity to threat as a mechanism linking anxiety with increased risk for diseases of aging. *Neuroscience and Biobehavioral Reviews*. 2013; 37(1):96–108. <https://doi.org/10.1016/j.neubiorev.2012.10.013>. [PubMed: 23127296]
- O'Toole BI, Catts SV. Trauma, PTSD, and physical health: An epidemiological study of Australian Vietnam veterans. *Journal of Psychosomatic Research*. 2008; 64(1):33–40. <https://doi.org/10.1016/j.jpsychores.2007.07.006>. [PubMed: 18157997]
- Pacella ML, Hruska B, Delahanty DL. The physical health consequences of PTSD and PTSD symptoms: A meta-analytic review. *Journal of Anxiety Disorders*. 2013; 27(1):33–46. <https://doi.org/10.1016/j.janxdis.2012.08.004>. [PubMed: 23247200]
- Resnick HS, Acierno RE, Kilpatrick DG. Health impact of interpersonal violence 2: Medical and mental health outcomes. *Behavioral Medicine*. 1997; 23(2):65–78. [PubMed: 9309346]
- Rhew, IC., Stappenbeck, CA., Bedard-Gilligan, M., Hughes, T., Kaysen, D. Effects of Sexual Assault on Alcohol Use and Consequences Among Young Adult Sexual Minority Women. *Journal of Consulting and Clinical Psychology*. 2017. <https://doi.org/10.1037/ccp0000202>
- Roberts AL, Austin SB, Corliss HL, Vander Morris AK, Koenen KC. Pervasive trauma exposure among US sexual orientation minority adults and risk of posttraumatic stress disorder. *American Journal of Public Health*. 2010; 100(12):2433–2441. <https://doi.org/10.2105/AJPH.2009.168971>. [PubMed: 20395586]
- Rothman EF, Exner D, Baughman A. The prevalence of sexual assault against people who identify as Gay, Lesbian or Bisexual in the United States: A systematic review. *Trauma, Violence & Abuse*. 2011; 12(2):55–66. <https://doi.org/10.1177/1524838010390707>.
- Roy-Byrne PP, Davidson KW, Kessler RC, Asmundson GJG, Goodwin RD, Kubzansky L, ... Laden SK. Anxiety disorders and comorbid medical illness. *General Hospital Psychiatry*. 2008; 30(3): 208–225. [PubMed: 18433653]
- Sandfort TGM, Bakker F, Schellevis FG, Vanwesenbeeck I. Sexual orientation and mental and physical health status: Findings from a dutch population survey. *American Journal of Public Health*. 2006; 96(6):1119–1125. <https://doi.org/10.2105/AJPH.2004.058891>. [PubMed: 16670235]
- Schnurr PP, Green BL. Understanding relationships among trauma, post-traumatic stress disorder, and health outcomes. *Advances in Mind-Body Medicine*. 2004; 20(1):18–29. [PubMed: 15068106]
- Schnurr PP, Spiro A. Combat exposure, posttraumatic stress disorder symptoms, and health behaviors as predictors of self-reported physical health in older veterans. *The Journal of Nervous and Mental Disease*. 1999; 187(6):353–359. [PubMed: 10379722]
- Schnurr PP, Spiro A, Paris AH. Physician-diagnosed medical disorders in relation to PTSD symptoms in older male military veterans. *Health Psychology*. 2000; 19(1):91–97. [PubMed: 10711592]
- Sledjeski EM, Speisman B, Dierker LC. Does number of lifetime traumas explain the relationship between PTSD and chronic medical conditions? Answers from the National Comorbidity Survey-Replication (NCS-R). *Journal of Behavioral Medicine*. 2008; 31(4):341–349. <https://doi.org/10.1007/s10865-008-9158-3>. [PubMed: 18553129]
- Spitzer C, Barnow S, Völzke H, John U, Freyberger HJ, Grabe HJ. Trauma, posttraumatic stress disorder, and physical illness: Findings from the general population. *Psychosomatic Medicine*. 2009; 71(9):1012–1017. <https://doi.org/10.1097/PSY.0b013e3181bc76b5>. [PubMed: 19834051]
- Walker, EA., Newman, E., Koss, MP. Costs and health care utilization associated with traumatic experiences. In: Schnurr, PP., Green, BL., editors. *Trauma and health: Physical health consequences of exposure to extreme stress*. Washington, DC, US: American Psychological Association; 2004. p. 43–69.
- Ware JE, Kosinski M, Keller SD. A 12-Item Short-Form Health Survey: Construction of scales and preliminary tests of reliability and validity. *Medical Care*. 1996; 34(3):220. [PubMed: 8628042]

- Wilson SM, Gilmore AK, Rhew IC, Hodge KA, Kaysen DL. Minority stress is longitudinally associated with alcohol-related problems among sexual minority women. *Addictive Behaviors*. 2016; 61:80–83. <https://doi.org/10.1016/j.addbeh.2016.05.017>. [PubMed: 27249806]
- Zen AL, Whooley MA, Zhao S, Cohen BE. Post-traumatic stress disorder is associated with poor health behaviors: Findings from the Heart and Soul Study. *Health Psychology*. 2012; 31(2):194–201. <https://doi.org/10.1037/a0025989>. [PubMed: 22023435]
- Zoellner LA, Goodwin ML, Foa EB. PTSD severity and health perceptions in female victims of sexual assault. *Journal of Traumatic Stress*. 2000; 13(4):635–649. <https://doi.org/10.1023/A:1007810200460>. [PubMed: 11109236]

Figure 1.

Figure 2.

Table 1

Descriptive statistics of variables included in the mediation model

	Mean (SD) Range
Number of Criterion A Events 12-Months (n = 806)	1.89 (2.51) 0 – 15
PTSD Checklist 12-Months (n = 795)	34.76 (16.02) 20–100
Intrusion	10.50 (5.26) 5 – 25
Avoidance	14.18 (6.79) 7 – 35
Arousal/reactivity	10.03 (5.29) 5 – 25
Physical Health Scale 12-Months (n = 503)	47.77 (8.14) 20.97 – 61.16
Physical Health Scale 36-Months (n = 465)	47.74 (8.28) 23.85 – 61.00

Table 2

Correlations among variables examined in mediation models

	Crit A	PCL	Intrusion	Avoidance	Arousal/re	PHS- 1
PCL	.44					
Intrusion	.43	.90				
Avoidance	.42	.96	.80			
Arousal/react	.38	.90	.69	.81		
PHS-Assess 1	-.26	-.45	-.37	-.43	-.43	
PHS-2 Year	-.24	-.41	-.36	-.36	-.41	.61

Notes. All correlations were significant at $p < .001$. Crit A = Criterion A; PCL = PTSD Checklist; Arousal/react = Arousal/reactivity symptom cluster; PHS = Physical Health Subscale; Assess 1 = Assessment 1; 2 Year = 2 year follow-up