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Alcohol Use and Trauma Exposure among Male and Female Veterans Before, During, and After Military Service

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Abstract

The present study examined lifespan and combat-related trauma exposure as predictors of alcohol use among male and female veterans. Posttraumatic stress and depressive symptoms were examined as mediators of the effects of trauma exposure on alcohol use. Data were examined from 1825 (1450 male, 375 female) veterans and active duty service members who took part in a multi-site research study conducted through the Department of Veterans Affairs Mid-Atlantic Mental Illness Research, Education and Clinical Centers (VISN 6 MIRECC). For both men and women, depressive symptoms significantly mediated the effects of non-combat trauma exposure experienced before, during and after the military, as well as combat- exposure, on alcohol use. With posttraumatic stress symptoms, the models for men and women differed. For men, the effects of non-combat trauma exposure during and after military service, and combat exposure, on alcohol use were mediated by PTSD symptoms; however, for women, PTSD symptoms did not mediate these relationships. Findings are discussed in the context of potential gender differences in response to trauma such as use of alcohol to cope with traumatic events.

Keywords

alcohol misuse; trauma; PTSD; depression

Alcohol Use and Trauma Exposure among Male and Female Veterans Before, During, and After Military Service

With over 2.4 million veterans having deployed to war-zones in the last decade (Department of Veterans Affairs, 2012), and evidence of increases in alcohol use among military personnel in recent years (Institute of Medicine [IOM], 2012) there is a clear need to understand the contribution of trauma and depression-related symptoms to the development of alcohol problems (e.g., Grant et al., 2004; Hawkins et al., 2010; Jacobsen et al., 2001). Previous research has demonstrated strong links between trauma exposure across the lifespan, combat exposure during military service, posttraumatic stress symptoms, depression symptoms, and alcohol use (e.g., Kehle et al., 2011; Kulka et al., 1990; Maguen et al., 2008). These prior works indicate men and women have slightly different experiences with each of these factors suggesting the pathways to developing alcohol problems may differ by gender. The current study was undertaken to examine the pathways by which trauma exposure across the lifespan and depressive symptoms affect the use of alcohol among male and female veterans.

Alcohol Use among Military Personnel and Veterans

One of the most frequent methods of assessing alcohol use among veterans who served during the Iraq and Afghanistan era conflicts in support of Operation Enduring Freedom and Operation Iraqi Freedom (OEF/OIF) is by examining overall AUDIT scores. Based on AUDIT total scores of 8 or higher, estimates of those with probable alcohol misuse among OEF/OIF veterans range from 12% to 40% (Bray et al., 2009; Burnett-Zeigler et al., 2011;

Calhoun et al., 2008). While some studies have used AUDIT cut-off scores to categorize participants as alcohol misusers, others have used continuous AUDIT scores (i.e., Evans et al., 2010; Foran et al., 2012; Mulligan et al., 2012). As might be expected, AUDIT scores for those seeking treatment are higher than for a non-treatment seeking population. Among Australian military members entering treatment for alcohol use, the average AUDIT score was 14.4 (SD = 10.62), whereas Foran et al. (2010) found an average AUDIT score of 3.96 (SD = 4.27) in a large representative sample of active duty personnel.

Trauma Exposure, PTSD Symptoms, Depressive Symptoms, and Alcohol Use

Recent research has shown that posttraumatic stress symptoms (PTSS) and depressive symptoms are associated with traumas occurring before (Clancy et al., 2006; Maguen et al., 2008), during (e.g., Jacobson et al., 2008; Ramchand et al., 2011; Rona et al., 2009; Vogt et al., 2011; Wells et al., 2010), and after military service (Clancy et al., 2006; Solomon et al., 2008; Stein et al., 2005). Moreover, both childhood abuse history (Rosen & Martin, 1998) and mental health symptoms prior to deployment (Jacobson et al., 2008) are associated with alcohol use and alcohol-related problems. Thus, it is possible that the totality of lifetime trauma experiences, including military-related, contribute to alcohol use among veterans.

It is also important to recognize that trauma- and depression-related disorders are often co-morbid, which may put veterans at increased risk for alcohol use. In a study evaluating self-report measures of alcohol, PTSD and depression of 119 Army National Guard soldiers, the conditional probability of being categorized as having an alcohol use disorder was 7% for those without PTSD or depression, 16.7% for those with PTSD, 22.6% for those with depression, and 43.8% for those with PTSD and depression (Marshall et al., 2012).

A number of models, such as the “life change model” or “vulnerability perspective” contend that repeated stressful life events exhaust future coping resources and increase vulnerability to subsequent negative experiences such as those that accompany war-zone deployment (e.g., Hobfoll, 1989; Holmes & Masuda, 1974). Research with veterans (Kehle et al., 2011) has shown that alcohol use may serve as a mechanism to cope with stress and negative affective states (i.e., the self-medication hypothesis; Dixon et al., 2009; Ullman et al., 2006). Although it appears that PTSS and depressive symptoms are associated with alcohol use among veterans, it is unknown whether this relationship is equivalent for men and women.

Gender and Alcohol Use

Men are more likely to drink alcohol and the rate of alcohol abuse or dependence is approximately twice as high for males as females (Substance Abuse and Mental Health Services Administration [SAMHSA], 2010). In contrast, women are more likely to develop PTSS (see Tolin & Foa, 2006) and depression (Kessler, McGonagle, Swartz, Blazer, & Nelson, 1993). There is contradictory evidence concerning whether combat exposure has a stronger association with mental health symptoms for female compared to male veterans. Some studies indicate combat exposure has stronger association with PTSD/PTSS (e.g., Irish et al., 2010; Skopp et al., 2011; Smith et al. 2008) and depression (e.g., Tanielian & Jaycox 2008) for women; however, in a seminal study of veterans serving in Iraq or Afghanistan, Vogt and colleagues (2011) demonstrated that women were as resilient as men

to combat-related stressors. Nevertheless, gender differences in rates of substance use and mental health diagnoses suggest it is important to recognize that women and men may perceive (e.g., Irish et al., 2010) and/or may respond to (Tolin & Foa, 2006) trauma differently. Thus, the relative contribution of risk factors for alcohol use among trauma-exposed men and women may differ.

The purpose of the present study is to examine how trauma exposure, PTSS, and depression symptoms, are related to alcohol use among veterans and military service members, and whether there are gender differences in these relationships. Given statistical advantages to using continuous scores and concern that that dichotomization may result in incorrect categorization (see MacCallum, Zhang, Preacher, & Rucker, 2002), our primary questions assessed how continuous measures of trauma exposure, PTSS, and depression symptoms, were associated with continuous AUDIT scores. First, we hypothesized non-combat related traumatic experiences before, during, and after military service, and combat exposure would each have direct effects on PTSS, depressive symptoms, and alcohol use (direct effects model). Second, we hypothesized that PTSS and depressive symptoms would mediate the relationship between trauma exposure and alcohol use. Finally, we explored whether these relationships operate similarly or differently for men and women (multi-group model).

Method

Participants and Procedure

Secondary analyses were conducted using data from the Mid-Atlantic Mental Illness Research, Education, and Clinical Center (VISN 6 MIRECC) data repository of OEF/OIF veterans and active duty personnel who served in the U.S. Armed Forces subsequent to September 11, 2001. The data were originally collected between July 2005 and March 2012 during a single research visit. Participants were recruited via mailings, advertisements, and clinic referrals across the four VISN 6 MIRECC sites and provided written consent for their participation. The original study was approved by all four VA Institutional Review Boards; this de-identified secondary data analysis was approved by the Hampton VA Medical Center and Old Dominion University IRBs.

Data were available on 1,825 participants (1,450 [79.5%] men; 375 [20.5%] women). The demographics of this sample match the demographics of the original study sample. The mean age of the participants was 37.4 years (SD = 10.0, Range = 19 to 66). Sixty-three percent indicated that they were stationed in a region of conflict during OIF or OEF; most had been enlisted (91.7%). See Table 1.

Measures

Traumatic Life Events Questionnaire (TLEQ; Kubany et al., 2000)—The TLEQ assesses 23 types of potentially traumatic events. It provides a 7-point response (*never, once, twice, 3 times, 4 times, 5 times, more than 5 times, which is scored a "6"*) format to indicate frequency of occurrence for each of the trauma events. The TLEQ was adapted by asking participants to indicate whether each trauma they endorsed was experienced (a) before the military, (b) during the military, and/or (c) after the military (Clancy et al., 2006; Dedert et

al., 2009). Three scores were computed to provide a sum of the mean number of trauma experiences occurring for each time period. Consistent with the DSM-IV diagnostic criteria, the participant must have endorsed fear, helplessness, or horror in response to the trauma for it to be scored as a traumatic event. We removed the one combat-related question to assess non-combat trauma that occurred during military service and to eliminate overlap with the Combat Exposure Scale (below). The TLEQ has good test-retest reliability (Kubany et al., 2000).

Combat Exposure Scale (CES; Keane et al., 1989)—The CES is a 7-item self-report measure that assesses wartime experiences (e.g., "Were you ever under enemy fire"). Items are rated on a 5-point scale from: (1) 'no' to (5) '51 times or more' or 5-point point duration (1) = '*never*' to (5) = '*7 months or more'*, or 4-point frequency (1) = '*none*' to (4) = '*76% or more*'). The total CES score was used in the analyses that follow. Among those who deployed in support of OEF/OIF, men were more likely to endorse at least one combat experience (i.e., 92.6% of men and 85.1% of women, $t(1133) = 3.36$, $p < .01$). For the majority of OEF/OIF men and women, combat exposure could be categorized as light to moderate (77.4% of men and 92.0% of women, respectively). Internal consistency was .88 for men and .80 for women.

Davidson Trauma Scale (DTS; Davidson et al., 1997)—The DTS is a 17-item self-report measure that assesses DSM-IV symptoms of PTSD symptomatology (i.e., reexperiencing, avoidance, numbing, and hyperarousal). Items are scored on a 5-point frequency (0 = "*not at all*" to 4 = "*every day*") and severity scales (0 = "*not at all distressing*" to 4 = "*extremely distressing*"). The DTS has good test-retest reliability and construct validity (Davidson et al., 1997; Zlotnick, Davidson, Shea, & Pearlstein, 1996), and differentiates between veterans with PTSD and with no Axis I diagnosis (McDonald, Beckham, Morey, & Calhoun, 2009). The total DTS score derived from the sum of the individual item frequency and severity scores were used. Alpha for the DTS score was .96 for both men and women.

Beck Depression Inventory–Second Edition (BDI-II; Beck, Steer, & Brown, 1996)—The BDI-II is a 21-item self-report questionnaire designed to assess depressive symptomatology. Respondents endorse one of four statements (scored 0 to 4) that reflect increasing symptomatology. Items scores were summed to create a continuous total score used in the analyses. The BDI-II is widely used in inpatient, outpatient and community settings, with supported reliability and validity in veterans (e.g., Nelligan et al., 2008; Rauch et al., 2010). Cronbach's alpha was .94 for both men and women.

Alcohol Use Disorders Identification Test (AUDIT; Babor, De La Fuente, Saunders, & Grant, 1989)—The AUDIT is a 10-item measure; the first 8 items are scored (0) never, to (4) 4 or more times a week; the last 2 items are scored (0) *No*, (2) *Yes, but no in the last year*, or (4) *Yes, during the last year*. The AUDIT total score was used in all analyses. To provide a comparison to studies that have categorized participants based on a cut-off score, we examined the percentage of men and women who exceeded a total AUDIT score of 8 or higher which suggests possible alcohol misuse. In the present study, 23.3% of

men and 8.8% of women, respectively, met this cut-off score. Of interest is that more women reported abstinence from alcohol than men (29.2% and 18.3%, respectively). The AUDIT total score is sensitive to harmful alcohol use in diverse populations and has demonstrated good internal consistency (Saunders, Aasland, Amundsen, de la Fuente, & Grant, 1993). Internal consistency was .85 for men and .83 for women.

Analysis Plan

We used structural equation modeling to examine the theoretical model illustrated in Figure 1 (Mplus 6; Muthén & Muthén, 1998–2010). As recommended by mediation experts (Fritz & MacKinnon, 2007; Preacher & Hayes, 2004, 2008), we examined the total, direct, and indirect effects of exogenous variables, which were all measured continuously, on the AUDIT total scores using the bias-corrected bootstrap based on 5000 bootstrapped samples (Efron & Tibshirani, 1993). Bootstrapping creates empirically-derived sampling distributions from which statistical tests are based. Importantly, bootstrapping does not rely on the assumption that indirect effects are normally distributed and provides a powerful test of mediation (Fritz & MacKinnon, 2007). We examined age and marital status (0 = not married, 1 = married) as covariates in these models and found that controlling for these variables had no substantive effect on the results.

The percentage of missing data ranged from .1% (n= 2) for all three trauma exposure scores, combat exposure, and depressive symptoms to 1.0% (n = 18) for PTSD scores. Across all models, parameters were estimated using maximum likelihood estimation, and missing data were handled using full information maximum likelihood. The criteria for a well-fitting model were set according to the guidelines suggested by Hu and Bentler (1999): CFI ≥ .95, RMSEA ≤ .06, and SRMR ≤ .08. The criteria for ‘acceptable fit’ were set according to suggestions of CFI ≥ .90, RMSEA ≤ .10, and SRMR ≤ .10 (Kline, 2011). Descriptive statistics for all study variables are shown in Table 2.

Results

Overall Model

In our first model, we examined the unique effects of each of the four measures of trauma exposure (mean number of non-combat trauma experiences before, during, and after the military, and total combat exposure score) on depressive symptoms, PTSS, and alcohol use based on the theoretical model depicted in Figure 1. Our specific interest was examining the total, direct, and indirect effects of trauma exposure on alcohol use via total depressive symptoms and PTSS. We controlled for gender by modeling it as a predictor of all other variables[1].

As shown in Table 3, each trauma exposure variable predicted unique variance in both total depressive symptoms and PTSS. In addition, mean number of post-military trauma

[1]As there were significant gender differences across all study variables except posttraumatic stress symptoms (see Table 1 in Supplementary Material), we controlled for gender by modeling it as a predictor of all other variables. All bivariate correlations between study variables were significant across men and women except for the non-significant correlations between mean trauma experiences before military and combat exposure (see Table 2 in Supplementary Material).

symptoms and combat exposure scores both had small direct effects on alcohol use scores. Depressive symptoms, but not PTSS, also had a direct effect on alcohol use scores. As shown in Table 4, each of the trauma exposure variables had significant indirect effects on reports of total alcohol use via depressive symptoms, but not via PTSS. Thus, our results indicate that the effect of trauma symptoms on alcohol use could be at least partially explained by its relationship to depressive symptoms, though three of the four indirect effects of trauma on alcohol use through PTSS were 'marginally' significant (*p*s < .10).

Multi-Group Model by Gender

Given the main effect of gender on all variables, next, we examined whether gender moderated the relationship between any of our study variables. A multi-group model was run in which all parameters were freely estimated across men (n = 1450) and women (n = 375) in the fully saturated model tested above. Then, all relationships were constrained to equality across the groups to examine if there was a significant decrement in model fit. In the constrained model, the model fit did worsen significantly, $X^2(21) = 34.66$, p = .0308, CFI = .995, TLI = .993, RMSEA = .027, SRMR = .028. To examine moderation, each parameter was constrained to equality (one at a time) across men and women in an otherwise unconstrained model (i.e., all other relationships were allowed to differ across groups). As shown in Table 5, there were only three relationships (of 21) that were not invariant across men and women.

Importantly, the direct relationship between total number of PTSS and alcohol use was positive and significant among men (β = .11), but was negative and non-significant among women (β = −.04). The positive relationship between non-combat trauma experienced during the military and total PTSS appeared slightly stronger in men, and the positive covariance of non-combat trauma experiences before the military and non-combat trauma after the military was somewhat stronger among women than men. Table 5 shows the results of the final multi-group model in which all parameters were constrained across men and women except for the three parameters that were determined to be invariant. This model had excellent model fit: $\chi^2(18) = 17.583$, $p = .4834$, CFI = 1.000, TLI = 1.000, RMSEA = .000, SRMR = .024. Based on this model, the total, indirect, and direct effects of trauma exposure variables on alcohol use were examined. The direct effects are shown in Figure 2.

As shown in Table 6, across both men and women, each trauma exposure variable had a significant total indirect effect on alcohol use signifying that either depressive symptoms, PTSS, or both variables at least partially mediated the trauma-alcohol use relationship. As in the overall model controlling for gender, the multi-group model shows that depressive symptoms significantly mediated the predictive effect of each trauma exposure variable on alcohol use across both men and women. However, the multi-group model also revealed that for men only, the effects of non-combat trauma experiences during the military, non-combat trauma experiences after the military, and combat exposure on alcohol use was partially mediated by the total number of PTSS symptoms. Among men, the indirect effect of non-combat trauma experiences before the military on alcohol use via PTSS symptoms was 'marginally' significant. Among women, none of these indirect effects approached significance given that PTSS symptoms were not predictive of alcohol use among women.

To further explore gender differences in non-combat trauma, we collapsed across time and compared mean TLEQ subscale scores. Women reported significantly more non-combat trauma (p's < .05) across all trauma types (i.e., illness, attack, childhood violence, childhood sexual abuse, and adult sexual abuse) except accidents.

Discussion

Our goal was to examine associations of lifespan trauma (before, during, and after military service) and combat exposure with mental health symptoms and alcohol use. Further, we sought to examine whether these associations differed for men and women. Similar to prior findings of women veterans (Freedy et al., 2010; Sadler et al., 2004; Zinzow et al., 2007), with the exception of accidents, women reported more non-combat trauma than men across various traumatic events. In contrast to women's higher overall rate of lifetime trauma exposure, women reported less combat exposure than men. However, of those who had been deployed to OEF/OIF, over 85% of men and women reported at least one instance of combat exposure. Of these, most men and women endorsed combat exposure in the light to medium range (Keane et al., 1989), suggesting that the gender gap in combat exposure has reduced in current wars. This finding is consistent with Vogt et al. (2011).

Also consistent with previous research on depression (e.g., Iverson et al., 2011; Lapierre, Schwegler, & LaVauve, 2007; Luxton, Skopp, & Maguen, 2010; Maguen et al., 2010) and alcohol use (e.g., SAMHSA, 2010) female veterans reported more depressive symptoms than their male counterparts and male veterans reported twice the level of alcohol use of their female counterparts. Similar to findings from a large scale study of active duty personnel (Foran et al., 2012), women were also more likely to abstain from alcohol use. In the present study, men and women reported similar levels of PTSS. Research on PTSS among women veterans is mixed with some studies indicating more trauma symptoms among women (Gibbons et al., 2012) and others more trauma symptoms among men (see Tolin & Foa, 2006). However, as noted, most recent research indicates that for the OEF/OIF veteran cohort, gender differences in PTSD rates are eliminated when accounting for level of combat exposure (Vogt et al., 2011).

For both men and women, non-combat trauma after military service and combat exposure had significant direct effects on alcohol use even when controlling for depressive symptoms and PTSS. Generally these multi-group direct effect results suggest the relationship between trauma exposure and alcohol use is similar for male and female veterans. Not surprisingly, in our direct effects model, trauma exposure predicted unique variance in depressive and PTSS.

When examining indirect effects of trauma exposure on alcohol use as mediated by depressive or PTSS, gender differences emerged. Overall, trauma exposure variables (i.e., amount of non-combat traumas before, during, or after military service, and combat exposure) had significant indirect effects on alcohol use via depressive but not PTSS for women while both indirect pathways were significant for men. In other words, in terms of depressive symptoms, our results supported the self-medication hypothesis (Dixon et al., 2009; Marshall et al., 2012; Ullman et al., 2006) vis-à-vis trauma exposure for both male

and female veterans. However, in terms of PTSS, self-medication through alcohol was not found to be a supported coping mechanism for women.

Although men have higher rates of alcohol use disorders (SAMHSA, 2010), combat or other traumas associated with depression may have a similar pattern with alcohol use for men and women. Why this would not be the case for PTSS is unclear, though there are a few possible hypotheses. First, research indicates that women and men may perceive (e.g., Irish et al., 2010) and/or may respond to (Tolin & Foa, 2006) trauma differently. Theories such as the "life change model" or "vulnerability perspective" (e.g., Hobfoll, 1989; Holmes & Masuda, 1974) combined with research on increased rates of alcohol misuse in those with childhood abuse history (Rosen & Martin, 1998) and pre-deployment mental health symptoms (Jacobson et al., 2008) support the idea that perhaps men and women enter the military with significant differences in lifetime trauma exposure or life stressors which may predispose them to differences in vulnerability, coping skills, and mental health outcomes.

Alternatively, specific traumatic events, such as level or type of combat exposure, may be more strongly related to alcohol use. This view is supported by recent work indicating that non-combat related lifetime traumatic events cease to predict alcohol misuse for women once combat exposure is accounted for (Hassija, Jakupcak, Maguen, & Shipherd, 2012). It is also possible that alcohol is not an effective or chosen coping mechanism for trauma reactions for women unless this trauma is also associated with depressive symptomatology.

Study Limitations

There are a number of study limitations. The nature of the cross-sectional design raises questions about the directionality of the observed relationships. Longitudinal studies are needed to more clearly elucidate how non-combat-related trauma and combat exposure impact the trajectory of depressive and PTSS and their relationship to alcohol use. Replication is especially important in light of the few studies that have addressed trauma and alcohol use among women veterans. Specifically, as self-report questionnaires of symptoms with different timeframes were used, replicating this study by evaluating but classification of disorders is of critical importance and has clear treatment implications. Moreover, slightly more than half of participants were registered for healthcare services within the VA; their experiences may not be fully representative of all veterans. However, their responses may more accurate reflect the population of veterans receiving treatment within the VA system and residing in the Mid-Atlantic area, an area in which there are a large number of veterans and active duty service members. Another limitation is that 31% of the sample identified themselves as being on active duty (21% of whom were in the National Guard or Reserves), which may limit conclusions regarding post-military trauma.

Importantly, the AUDIT assesses both alcohol consumption and alcohol-related problems; thus, we should caution the reader that alcohol use scores may represent heavy use for some and alcohol-related problems for others. Moreover, we did not examine or control for anxiety, so it is not known whether the effects are through negative affect more generally or depressive symptoms specifically.

Strengths of this study include a large sample size, the use of standardized questionnaires, and statistical modeling of complex interrelationships between commonly experienced but understudied co-morbidities, which represents a methodological advance over other studies of Iraq/Afghanistan era veterans, especially of women veterans.

Clinical Implications

While depressive symptomatology is a significant risk factor for alcohol use among male and female veterans, the relationship of PTSS to alcohol use is more nuanced and appears associated with gender. Although we cannot establish causality from our data, mental health professionals should recognize that not only are non-combat trauma and combat exposure associated with alcohol use, but that for both men and women, depressive symptoms may be a particular risk factor for alcohol use. These also findings underscore the need for gender awareness and thorough ongoing assessment of depression, PTSS, and alcohol use by mental health professionals who work with veterans who have been exposed to a variety of traumatic experiences, including combat.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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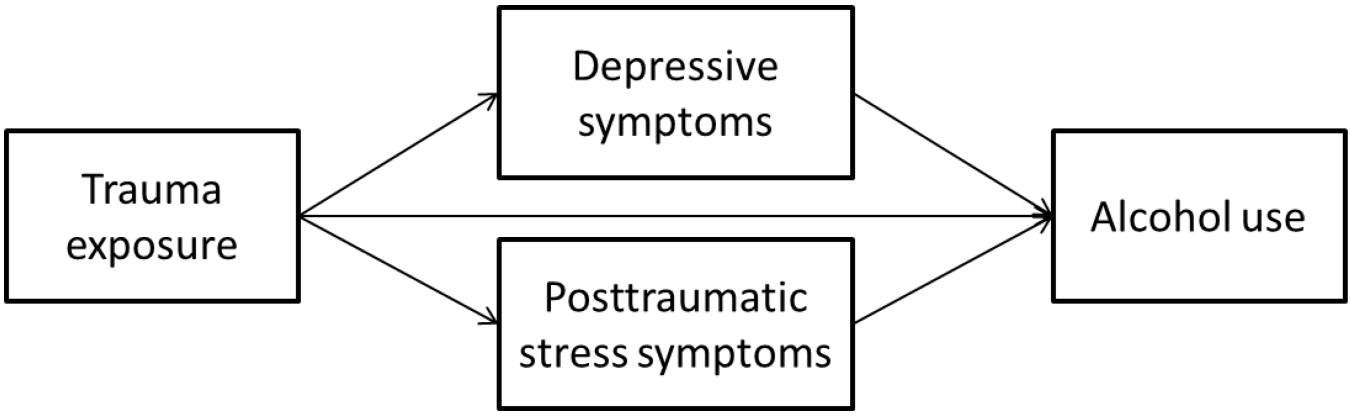

Figure 1.
Theoretical Model

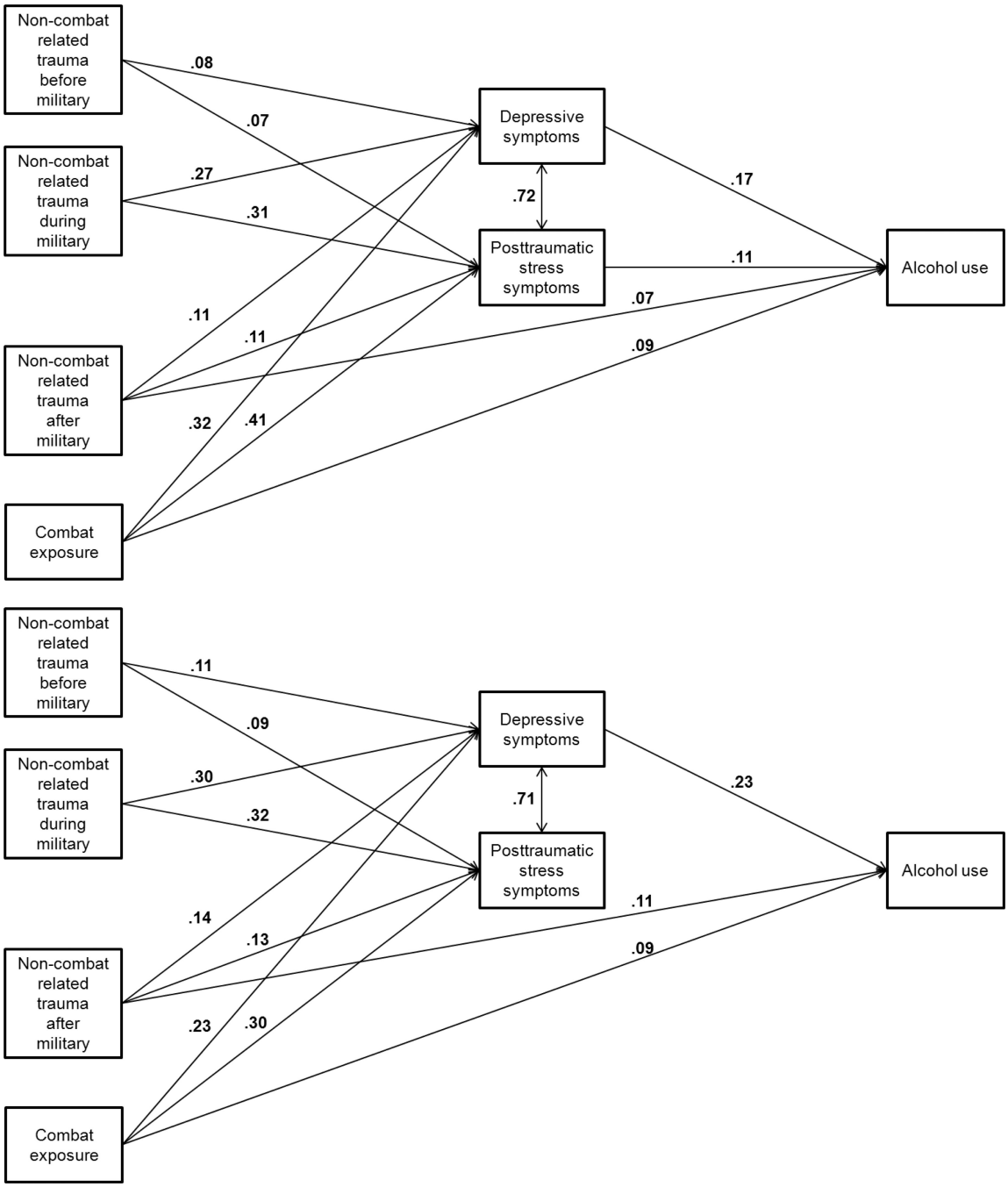

Figure 2.

Multi-Group Model

Note. The top figure depicts the model for men; the bottom figure depicts the model for women. Only significant effects are shown. Significant covariances among trauma exposure variables are omitted for clarity. All regression parameters are standardized. Although most paths were constrained to equality across men and women, differences in the standardized parameter estimates are expected due to different standard deviations in both predictor and outcome variables across men and women. The most substantive difference between the

models for men and women is that posttraumatic stress symptoms were predictive of alcohol use among men, but not among women.

Table 1

Demographic Information by Gender

Variable	Men *N* = 1450 (79.5%)	Women 375 (20.5%)
Race		
White/Caucasian	744 (51.3)	117 (31.2)
Black/African American	659 (45.4)	249 (66.4)
Native American	32 (2.2)	6 (1.6)
Asian	19 (1.3)	4 (1.1)
Pacific Islander	8 (0.6)	1 (0.3)
Missing	0	0
Ethnicity		
Hispanic	83 (5.7)	11(2.9)
Missing	29	8
Marital Status		
Married	806 (55.6)	107 (28.5)
Single	269 (18.6)	130 (34.7)
Remarried	68 (4.7)	9 (2.4)
Divorced or Separated	304 (21.0)	124 (33.1)
Widowed	2 (0.1)	3 (0.8)
Missing	1 (0.1)	2 (0.5)
Service Branch (lifetime experiences, some served in more than 1 branch)		
Army	815 (56.2)	230 (61.3)
Navy	240 (16.6)	61 (16.3)
Air Force	100 (6.9)	25 (6.7)
Marines	100 (14.4)	11 (2.9)
Coast Guard	8 (0.6)	3 (0.8)
Reserves/National Guard	725 (50.0)	191 (50.9)
Current Active Duty		
Army	118 (8.1)	31 (8.3)
Navy	17 (1.2)	1 (0.3)
Air Force	5 (0.3)	0 (0.0)
Marines	10 (0.7)	0 (0.0)
Coast Guard	0 (0.0)	0 (0.0)
Reserves/National Guard	297 (20.5)	86 (22.9)
Served in OEF/OIF		
Yes	947 (65.3)	188(50.1)
No	494 (34.1)	182(48.5)
Missing	9 (0.6)	5(1.3)
Education		
Less than high school	3 (0.2)	0 (0.0)
High school	660 (44.5)	115 (30.6)
Associate/technical	378 (26.0)	110 (29.3)

Variable	Men *N* = 1450 (79.5%)	Women 375 (20.5%)
Bachelor's	244 (16.8)	83 (22.1)
Master/Doctorate	83 (5.7)	36 (9.6)
Other	81 (5.6)	29 (7.7)
Age (in years)	37.53(10.01)	36.9(9.8)

Note. N = 1825. OEF = Operation Enduring Freedom; OIF = Operation Iraqi Freedom.

Table 2

Descriptive Statistics for Study Variables

	Min	Max	*M*	*SD*
Alcohol Use (AUDIT)	0	37	4.70	5.75
Depressive Symptoms (BDI-II)	0	61	13.94	12.59
Posttraumatic Stress Symptoms (DTS)	0	136	39.52	39.51
Mean # of traumas before military	0	15	1.84	2.31
Mean # of traumas during military	0	18	1.72	2.12
Mean # of traumas after military	0	12	0.67	1.35
Combat exposure	0	40	11.25	10.53
Gender (0 = men, 1 = women)	0	1	0.21	0.40

Table 3

Model Predicting Alcohol Use from Depressive Symptoms, Posttraumatic Stress Symptoms, Trauma Experiences, Combat Exposure, and Gender

Outcome: Alcohol Use (AUDIT) R^2 = .127	**b**	**p**	**β**
1. Depressive symptoms	**.078**	.001	.171
2. Posttraumatic stress symptoms	.013	.060	.092
3. Mean # of traumas before military	.078	.285	.032
4. Mean # of traumas during military	−.123	.131	−.046
5. Mean # of traumas after military	**.297**	.041	.070
6. Combat exposure	**.053**	.001	.098
7. Gender (0 = men, 1 = women)	**−2.179**	.000	−.153
Outcome: Depressive Symptoms (BDI-II) R^2 = .289	b	p	β
8. Mean # of traumas before military	**.484**	.000	.089
9. Mean # of traumas during military	**1.625**	.000	.274
10. Mean # of traumas after military	**1.117**	.000	.120
11. Combat exposure	**0.370**	.000	.309
12. Gender	**2.138**	.001	.069
Outcome: Post-Traumatic Stress Symptoms (DTS) R^2 = .386	b	p	β
13. Mean # of traumas before military	**1.313**	.001	.077
14. Mean # of traumas during military	**5.827**	.000	.313
15. Mean # of traumas after military	**3.328**	.000	.114
16. Combat exposure	**1.501**	.000	.400
17. Gender	**4.043**	.039	.041
Outcome: # traumas before military (TLEQ) R^2 =.038	b	p	β
18, Gender	**1.116**	.000	.195
Outcome: # traumas during military (TLEQ) R^2 = .015	b	p	β
19. Gender	**0.633**	.000	.121
Outcome: # traumas after military (TLEQ) R^2 = .008	b	p	β
20. Gender	**0.307**	.000	.092
Outcome: Combat exposure (CES) R^2 = .057	b	p	β
21. Gender	**−6.214**	.000	−.239
Correlations:	b	p	β
22. Mean # traumas before military with traumas during military	**2.075**	.000	.435
23. Mean # traumas before military with traumas after military	**1.106**	.000	.362
24. Mean # traumas before military with combat exposure	.983	.052	.042

Outcome: Alcohol Use (AUDIT) R^2 = .127	**b**	**p**	**β**
25. Mean # traumas during military with traumas after military	**1.090**	.000	.385
26. Mean # traumas during military with combat exposure	**4.926**	.000	.229
27. Mean # traumas after military with combat exposure	**1.377**	.000	.100
28. Depressive symptoms with Posttraumatic stress Sx	**234.827**	.000	.715

Note. AUDIT = Alcohol Use Disorders Identification Test; BDI-II = Beck Depression Inventory-II; DTS = Davidson Trauma Scale; TLEQ = Traumatic Life Events Questionnaire; CES = Combat Exposure Scale. *b* = unstandardized regression coefficients; β = standardized regression coefficients.

Table 4

Indirect Effects of Trauma-related Variables on Alcohol Use via Depressive Symptoms and Posttraumatic Stress Symptoms Controlling for Gender

Predictor Variables:	**Mean # traumas exp. before military (TLEQ)**		**Mean # traumas exp. during military (TLEQ)**		**Mean # traumas exp. after military (TLEQ)**		**Combat Exposure (CES)**	
Outcome Variable: Alcohol Use (AUDIT)	***b***	***p***	***b***	***p***	***b***	***p***	***b***	***p***
Total Effect	.13	.073	.08	.284	**.43**	.003	**.10**	.000
Total Indirect	**.06**	.001	**.20**	.000	**.13**	.000	**.05**	.000
Direct Effect	.08	.285	−.12	.131	**.30**	.041	**.05**	.001
Specific Indirect Effects								
Depressive symptoms (BDI-II)	**.04**	.014	**.13**	.001	**.09**	.008	**.03**	.001
Posttraumatic stress symptoms (DTS)	.02	.111	.08	.067	.04	.080	.02	.061

Note. AUDIT = Alcohol Use Disorders Identification Test; BDI-II = Beck Depression Inventory-II; DTS = Davidson Trauma Scale; TLEQ = Traumatic Life Events Questionnaire; CES = Combat Exposure Scale. All parameter estimates and significance test are based on 5000 bootstrapped samples. Significant effects ($p < .05$) are bolded for emphasis. b = unstandardized regression coefficients.

Table 5

Multi-group Analyses by Gender

	Men		Women		Difference	
Outcome: Alcohol Use (AUDIT)	*b*	*p*	*b*	*p*	X^2	*p*
Depressive symptoms (BDI-II)	**.080**	.000	**.080**	.000	0.10	.7545
Posttraumatic stress symptoms (DTS)	**.017**	.017	−.004	.621	**6.44**	.0112
Mean # traumas exp. before military (TLEQ)	.087	.196	.087	.196	0.06	.8058
Mean # traumas exp. during military (TLEQ)	−.096	.220	−.096	.220	2.14	.1440
Mean # traumas exp. after military (TLEQ)	**.312**	.025	**.312**	.025	0.00	.9844
Combat exposure (CES)	**.051**	.002	**.051**	.002	0.00	.9473
Outcome: Depressive symptoms	*b*	*p*	*b*	*p*	X^2	*p*
Mean # traumas exp. before military	**.484**	.001	**.484**	.001	0.54	.4623
Mean # traumas exp. during military	**1.625**	.000	**1.625**	.000	1.16	.2824
Mean # traumas exp. after military	**1.117**	.000	**1.117**	.000	3.77	.0523
Combat exposure	**.370**	.000	**.370**	.000	1.03	.3097
Outcome: Posttraumatic stress symptoms	*b*	*p*	*b*	*p*	X^2	*p*
Mean # traumas exp. before military	**1.300**	.001	**1.300**	.001	0.46	.4973
Mean # traumas exp. during military	**5.984**	.000	**5.413**	.000	**3.91**	.0480
Mean # traumas exp. after military	**3.328**	.000	**3.328**	.000	2.20	.1382
Combat exposure	**1.500**	.000	**1.500**	.000	1.31	.2517
Correlations:	*b*	*p*	*b*	*p*	X^2	*p*
Mean # traumas before military with traumas during military	**2.030**	.000	**2.030**	.000	2.50	.1137
Mean # traumas during military with traumas after military	**.990**	.000	**1.485**	.000	**9.23**	.0024
Mean # traumas before military with combat exposure	.966	.057	.966	.057	0.55	.4578
Mean # traumas during military with traumas after military	**1.065**	.000	**1.065**	.000	3.04	.0812
Mean # traumas during military with combat exposure	**4.945**	.000	**4.945**	.000	0.30	.5833
Mean # traumas during military with combat exposure	**1.372**	.000	**1.372**	.000	0.50	.4870
Depressive symptoms with posttraumatic stress Sx	**234.687**	.000	**234.687**	.000	1.21	.2723

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Note. AUDIT = Alcohol Use Disorders Identification Test; BDI-II = Beck Depression Inventory-II; DTS = Davidson Trauma Scale; TLEQ = Traumatic Life Events Questionnaire; CES = Combat Exposure Scale. *b* = unstandardized regression coefficients.

Table 6

Indirect Effects of Trauma-related Variables on Alcohol Use via Depressive Symptoms and Posttraumatic Stress Symptoms Controlling by Gender

Predictors: MEN	**Mean # traumas exp. before military (TLEQ)**		**Mean # traumas exp. during military (TLEQ)**		**Mean # traumas exp. after military military (TLEQ)**		**Combat Exposure (CES)**	
Outcome: Alcohol Use (AUDIT)	*b*	*p*	*B*	*p*	*b*	*p*	*b*	*p*
Total Effect	**.15**	.036	.13	.072	**.46**	.002	**.11**	.000
Total Indirect	**.06**	.001	**.23**	.000	**.15**	.000	**.06**	.000
Direct Effect	.09	.196	−.10	.220	**.31**	.025	**.05**	.002
Specific Indirect Effects								
Depressive Symptoms (BDI-II)	**.04**	.010	**.13**	.000	**.09**	.004	**.03**	.000
Posttraumatic Stress Symptoms (DTS)	.02	.069	**.10**	.020	**.06**	.035	**.03**	.019
Predictors: WOMEN	Trauma before military (TLEQ)		Trauma military military (TLEQ)		Trauma after military (TLEQ)		Combat Exposure (CES)	
Outcome: Alcohol Use (AUDIT)	*b*	*p*	*B*	*p*	*b*	*p*	*b*	*p*
Total Effect	.12	.073	.01	.890	**.39**	.006	**.07**	.000
Total Indirect	**.03**	.016	**.11**	.011	**.08**	.018	**.02**	.033
Direct Effect	.09	.196	−.10	.220	**.31**	.025	**.05**	.002
Specific Indirect Effects								
Depressive Symptoms (BDI)	**.04**	.010	**.13**	.000	**.09**	.004	**.03**	.000
Posttraumatic Stress Symptoms (DTS)	−.01	.647	−.02	.621	−.01	.630	−.01	.623

Note. AUDIT = TLEQ = Traumatic Life Events Questionnaire; Alcohol Use Disorders Identification Test; BDI-II = Beck Depression Inventory-II; DTS = Davidson Trauma Scale. All parameter estimates and significance test are based on 5000 bootstrapped samples. Significant effects ($p < .05$) are bolded for emphasis. *b* = unstandardized regression coefficients.