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Alcohol-Related Consequences Mediating PTSD Symptoms and Mental Health–Related Quality of Life in OEF/OIF Combat Veterans

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ABSTRACT Veterans returning from Operation Enduring Freedom and Operation Iraqi Freedom (OEF/OIF) have been found to be at increased risk for post-traumatic stress disorder (PTSD) and alcohol use disorders, leading to negative mental health–related quality of life (MHRQoL). The current study examined the unique impact of alcohol consumption levels versus alcohol-related consequences on the relationship between PTSD symptoms and MHRQoL in a sample of OEF/OIF combat veterans ($N = 205$, median age 29, 95% men). Mediation analyses indicated that the effect of PTSD symptoms on MHRQoL was explained only by alcohol-related consequences and not by alcohol consumption. Findings highlight the importance of including alcohol-related consequences in clinical assessment and intervention programs for OEF/OIF veterans. Additionally, this study enhances knowledge regarding the underlying mechanisms of functional impairment related to PTSD and alcohol use disorders.

INTRODUCTION

Post-traumatic stress disorder (PTSD) is highly comorbid with alcohol use disorders among Operation Enduring Freedom and Operation Iraqi Freedom (OEF/OIF) veterans seeking care through the Veterans Affairs (VA) healthcare system. In fact, research indicates that over 50% of men and 28% of women with PTSD reported concurrent alcohol abuse or dependence;¹ further, approximately 63% of OEF/OIF veterans with an alcohol use disorder meet criteria for PTSD.² A multimodal pathway to account for comorbid PTSD and alcohol use disorders has been posited, in which both self-medication of PTSD symptoms and alcohol withdrawal–induced increases in PTSD symptoms help to explain the continued maintenance of alcohol abuse. When compared to patients with either substance use disorder or PTSD alone, individuals with comorbid PTSD and substance use disorders present unique clinical challenges that can influence treatment outcome, including a more severe clinical profile and poorer social adjustment, which places them at a greater risk for premature termination of therapy,^{3,4} as well as a common perception by clinicians that these comorbid patients are more difficult to treat.⁵

Studies of both military and civilian cohorts have found that PTSD impacts health-related quality of life (HRQoL) across multiple domains of functioning.^{6–10} For instance, both Vietnam era and OEF/OIF era veterans with PTSD are likely to experience poorer functioning and poorer objective

living conditions and lower satisfaction compared to those without PTSD.⁷ Moreover, research suggests that individuals with comorbid PTSD and alcohol use disorders exhibit greater functional impairments in HRQoL than those with alcohol use disorder alone.¹¹

Problem drinking may partially mediate the relationship between PTSD and poor HRQoL.¹² McDevitt-Murphy et al¹³ found that alcohol misuse significantly mediated the relationship between PTSD symptoms and mental HRQoL (MHRQoL), but not physical HRQoL. Given the high rates of comorbid substance use disorders among veterans with other psychiatric disorders¹⁴ and the high prevalence of risky alcohol use in OEF/OIF veterans,¹⁵ examining PTSD, alcohol misuse, and MHRQoL among newly returning OEF/OIF combat veterans is important.¹⁶

Although studies have explored the role of alcohol use as a mediator in the association between PTSD and HRQoL in OEF/OIF veterans,¹² no study to date has made a distinction between alcohol consumption levels versus consequences of alcohol use. Measuring multiple facets of problematic drinking behavior (i.e., overall hazardous drinking, alcohol consumption including quantity/frequency, and alcohol-related consequences) allows for a more comprehensive assessment of drinking behaviors and can help move the field toward a better understanding of mechanisms that link PTSD, problem drinking, and HRQoL.

Highlighting the distinction between consumption and consequences, Mallett et al¹⁷ pointed out that although much research has centered on predictors of alcohol consumption, fewer efforts have focused on predicting alcohol-related consequences, which are multidetermined in nature (may occur more frequently in the presence of certain intrapersonal, interpersonal, and environmental conditions) and may be independent of episodic drinking. Although correlated (greater consumption is associated with greater consequences¹⁸), it is likely that these two constructs are still semi-independent and

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worthy of individual consideration. This position is supported by Ray et al,¹⁹ who directly address the divergent nature of consumption and consequences, stating that not all heavy drinkers experience alcohol-related problems and not all light drinkers avoid them. Furthermore, consequences of drinking may be a more clinically relevant indicator and examination of alcohol-related consequences may shed light on inconsistencies in intervention outcome data.

In regard to screening for problematic alcohol use, assessing both “consumption” and “adverse consequences” has been recommended.²⁰ In fact, questions regarding alcohol-related problems have been shown to be more sensitive indicators of problem drinking than items regarding consumption.²¹ Additionally, alcohol-related problems (above and beyond alcohol-related consumption) have been associated with other negative outcomes, including maladaptive motivation.²² Of concern, currently the Department of Defense and the Veterans Administration both use only measures of consumption (rather than consequences) in their initial screening of potential alcohol misuse (AUDIT consumption factor¹⁹), potentially losing valuable information regarding those for whom alcohol might be problematic.

The aim of the present study was to compare the role of alcohol consumption versus alcohol-related consequences in mediating the relationship between PTSD and MHRQoL in a cohort of OEF/OIF veterans. Because alcohol-related problems (consequences) appear to be as good as or better in predicting a host of outcomes as compared to consumption,^{20,21} we hypothesized that alcohol-related consequences would be a stronger mediator than alcohol consumption in the relationship between PTSD and MHRQoL.

METHOD

Study Sample

Participants were 205 OEF/OIF combat veterans (93% men; 43% active duty, 57% veteran; ages 19–52, median = 29, mean = 29.07, SD = 7.02) who were participating in a larger cross-sectional study of genetic factors underlying vulnerability for PTSD, which excluded participants with a self-reported Axis I disorder diagnosis before deployment (obtained at phone screen), current alcohol dependence, or current drug use participants’ self-identified ethnicity and race was 76% non-Hispanic/Latino, 24% Hispanic/Latino, 79% White, 8% Black, 7% Asian, 2% Native American, 1% Native Hawaiian/Pacific Islander, and 4% “Other.” Utilizing clinical assessments and self-report measures, 49% of participants met PTSD diagnostic criteria, and 70% were identified as non-hazardous drinkers. Participants reported that they consumed 1 to 2 drinks (43%), 3 to 4 drinks (30%), 5 to 6 drinks (17%), 7 to 9 drinks (7%), or 10 or more (3%) drinks each drinking occasion. Recruitment efforts included posting flyers at VA medical centers and military bases and clinician referrals. Participant inclusion required having consumed at least one alcohol beverage in the last 30 days, at least light-

moderate combat exposure on the Combat Exposure Scale,²³ and a 6-month postdeployment interval to prevent the confounding effect of immediate postdeployment adjustment. The study received local institutional review board approval. All participants provided informed consent before being included in the study.

Procedure

Participants completed self-report questionnaires and a clinical interview to characterize the sample demographics and assess study-related constructs. All participants were treated in accordance with the “Ethical Principles of Psychologists and Code of Conduct.”²⁴

Measures

PTSD Symptoms

The total score of the Clinician Administered PTSD Scale (CAPS),²⁵ past month combined DSM-IV version, a structured interview corresponding to the diagnostic criteria for PTSD, provided a continuous measure of PTSD symptoms and PTSD diagnosis in the past month. CAPS assessments were indexed to any lifetime traumatic event meeting PTSD Criterion A endorsed by the participant as currently most distressing, ensuring the capture of maximum symptom burden. The CAPS assesses the frequency and intensity of PTSD symptoms that began or worsened following the Criterion A traumatic event, each rated on a Likert-type scale ranging from 0 (“Never” or “None”) to 4 (“Daily or almost daily” or “Extreme, incapacitating distress, cannot dismiss memories, unable to continue activities”). The CAPS has demonstrated good psychometric properties in numerous studies and is considered to be the “gold standard” in PTSD assessment with excellent inter-rater reliability for continuous scores ($r = 0.92$ – 0.99) and internal consistency ($\alpha = 0.80$ – 0.90). The CAPS demonstrates high sensitivity and specificity, high test–retest reliability, and strong convergence with other PTSD self-report measures.²⁶ The average total score on the CAPS was 51.32 (SD = 31.77; range: 0.00 – 127.00). In order to characterize the sample and determine if PTSD diagnostic criteria were met, the original rationally derived CAPS F1/I2 scoring rule (frequency ≥ 1 , intensity ≥ 2) was used with DSM-IV criteria, which has 91% sensitivity, 71% specificity, and 82% efficiency, with a κ value of 0.63.²⁵

Drinking Behaviors

Alcohol-related consequences and alcohol consumption over the past 12 months were measured utilizing the 10-item Alcohol Use Disorders Identification Test (AUDIT¹⁹). The AUDIT demonstrates good reliability and validity in clinically identifying problem drinking behaviors.^{19,27} To characterize the current study sample, AUDIT item scores ranging from 0 to 4 were summed to yield a composite score ranging from 1 to 30 with a cut-off score of 8 to identify hazardous

drinking.²⁶ The two-factor structure of alcohol consumption (items 1–3) and alcohol-related consequences (items 4–10), recommended over one- or three-factor structures, provided the potential hypothesized mediator variables.²⁸ The two-factor structure demonstrated adequate to good reliability in both alcohol consumption (Cronbach’s α ranging from 0.83 to 0.92) and alcohol-related consequences (Cronbach’s α ranging from 0.67 to 0.92). The average alcohol consumption score was 4.31 (SD = 2.47; range: 1.00–12.00), and the average number of alcohol-related consequences was 2.48 (SD = 4.53; range: 0.00–28.00).

Mental Health–Related Quality of Life

The mental health component score of the 36-item Short-Form Health Survey (SF–36)²⁹ was used to provide a measure of mental health–related quality of life (MHRQoL). The mental health component score (SF-36MCS) assesses the relative functional burden of mental health–related problems. The SF-36 demonstrates high reliability, with internal consistency and test–retest test statistics exceeding 0.90.³⁰ Additionally, the SF-36MCS has demonstrated validity in screening for psychiatric disorders with a sensitivity of 74% and specificity of 81%.²⁹ The average MHRQoL score was 39.33 (SD = 14.89; range: 2.15–65.58).

Statistical Analysis

All analyses were conducted using MPlus version 6.1.³¹ There were no missing data. To examine preliminary hypothesized relationships among study variables, Pearson bivariate correlations were examined (described below). A path analysis framework was used for the primary analyses, in which both alcohol-related consequences and alcohol consumption were simultaneously examined as mediators of the relationship between PTSD symptoms and MHRQoL. Note that this approach controls for the effect of alcohol consumption on MHRQoL when examining whether alcohol-related consequences significantly mediate the effect of PTSD symptoms on MHRQoL. The maximum likelihood estimator with robust standard errors was used in order to ensure robustness against heteroscedasticity, non-normality, and model misspecification. The residual covariance among alcohol-related consequences and consumption was specified. To test the significance of the indirect effects of PTSD symptoms on MHRQoL via alcohol-related consequences and alcohol consumption, we used 95% asymmetric confidence intervals based on the product of the coefficients approach to mediation.³²

To assess for potential confounding effects, a series of one-way analysis of variance were conducted in order to assess whether gender (93% male, 7% female), relationship status (40% married, 60% not married), ethnicity (57% non-Hispanic Caucasian, 43% other ethnicity), or education (28% no college, 57% some college, 15% college degree or higher) were associated with MHRQoL. We found no significant differences in MHRQoL between groups for any

TABLE I. Pearson Bivariate Correlations and Descriptives for Study Variables

Variable	1	2	3	M	SD
1. PTSD symptoms	—	—	—	51.32	31.77
2. Alcohol Consumption	0.09	—	—	4.31	2.47
3. Alcohol-Related Consequences	0.24***	0.58***	—	2.48	4.53
4. Mental Health–Related Quality of Life	–0.75***	–0.18**	–0.33***	39.33	14.89

** $p \leq 0.01$ *** $p \leq 0.001$. PTSD, = Posttraumatic Stress Disorder.

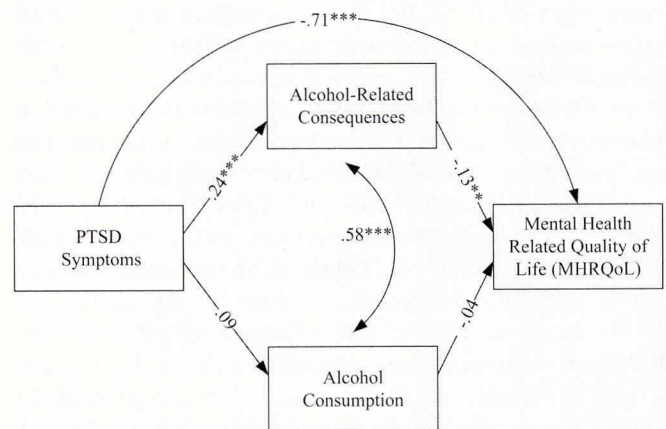
of these categorical demographic variables ($p > .05$), and thus concluded that it was not necessary to include them as covariates in the data analysis. Likewise, age was not included as a covariate because a bivariate correlation indicated that it was not associated with MHRQoL.

RESULTS

Pearson bivariate correlations and descriptive statistics are reported in Table I. There were significant bivariate associations in the expected direction among PTSD symptoms, MHRQoL, and alcohol-related consequences ($p < 0.001$). The association between alcohol consumption and MHRQoL was weak ($r = -0.18, p = 0.010$), and the association between alcohol consumption and PTSD symptoms was nonsignificant ($r = 0.09, p = 0.203$). Conversely, alcohol-related consequences were significantly associated with both MHRQoL ($r = -0.33, p < 0.001$) and PTSD symptoms ($r = 0.24, p = 0.001$).

Mediation Analyses

Figure 1 presents results from the primary analyses (all coefficients are standardized). Higher levels of PTSD symptoms significantly increased risk for alcohol-related consequences



* $p < .05$, ** $p < .01$, *** $p < .001$.

FIGURE 1. Standardized regression coefficients for the relationship between PTSD and MHRQoL as mediated by alcohol-related consequences and alcohol consumption.

($B = 0.24$, $SE = 0.06$, $p < 0.001$), which in turn significantly decreased MHRQoL ($B = -0.13$, $SE = 0.05$, $p = 0.005$). Moreover, alcohol-related consequences significantly mediated the effect of PTSD symptoms on MHRQoL while controlling for alcohol consumption (95% CI for the unstandardized indirect effect = $[-0.031, -0.003]$). However, the direct effect of PTSD symptoms on MHRQoL was also significant ($B = -0.71$, $SE = 0.03$, $p < 0.001$), indicating that alcohol-related consequences did not fully mediate the effect of PTSD symptoms on MHRQoL.

Results also indicated that PTSD symptoms did not significantly influence risk for alcohol consumption ($B = 0.09$, $SE = 0.07$, $p = 0.21$), and that alcohol consumption did not significantly influence MHRQoL ($B = -0.04$, $SE = 0.06$, $p = 0.52$). Therefore, the effect of PTSD symptoms on MHRQoL was mediated only by alcohol-related consequences and not by alcohol consumption levels.

DISCUSSION

As hypothesized, results indicate that alcohol-related consequences partially mediate the association between PTSD symptoms and low MHRQoL (see Fig. 1) among OEF/OIF veterans, even when controlling for levels of alcohol consumption. Thus, one mechanism through which PTSD symptoms may decrease MHRQoL is by increasing alcohol-related consequences, which in turn further decrease MHRQoL. However, the significant direct effect of PTSD symptoms on MHRQoL highlights the fact that PTSD symptoms directly decrease one's MHRQoL, independent of one's alcohol use or consequences.

Bivariate correlations revealed that alcohol-related consequences were significantly related to PTSD symptoms, but alcohol consumption was not significantly associated with PTSD symptoms (see Table I). Further, alcohol consumption did not mediate the association between PTSD symptoms and MHRQoL. Study results with PTSD are similar to those of prior anxiety comorbidity studies, which have found alcohol-related consequences to be more greatly associated with social anxiety and generalized anxiety than alcohol consumption levels.^{33,34}

Although a significant correlation was found between alcohol consumption and alcohol-related consequences, results indicated that the link between PTSD symptoms and poor MHRQoL among OEF/OIF veterans was partially explained by the negative consequences of alcohol use, rather than the volume or frequency of drinking. Findings highlight the need to routinely assess for alcohol-related consequences among OEF/OIF veterans in order to address an important mechanism through which PTSD symptoms may lead to poor MHRQoL. Results also lend additional support to existing research demonstrating the importance of addressing problematic drinking among OEF/OIF veterans presenting for PTSD treatment.

Because functional impairments associated with mental health were found to be more strongly linked to alcohol-

related consequences than alcohol consumption, the development of prevention and intervention programs for OEF/OIF veteran drinkers with PTSD symptoms should aim to assess and reduce the incidence of negative consequences related to drinking, rather than reducing alcohol consumption levels alone. Although, it is certainly possible that veterans who consume very large amounts of alcohol may eventually experience alcohol-related consequences, post hoc analysis of these data demonstrated that this is not always the case. Utilizing study standard deviations to create high, low (± 1 SD), and moderate subgroups for alcohol consumption and consequences, post hoc analysis indicated that the majority of the cohort (42%) reported moderate consumption and low consequences, 4% reported high consumption but low consequences, and 3% reported moderate consumption but high consequences.

General screens for problematic alcohol use, such as the AUDIT-C composed of only the three-item alcohol consumption subscale, often assess frequency and volume of drinking only.³⁵ However, study results support the importance of assessing for alcohol-related consequences, rather than only frequency and levels of alcohol consumption. A comprehensive assessment more accurately reflects potentially problematic drinking behaviors among OEF/OIF veterans with PTSD.

Further, study results have important implications for addressing drinking among veterans endorsing PTSD symptoms. Young adult OEF/OIF veterans, especially those not meeting diagnostic criteria for alcohol dependence, may benefit from assessment of and intervention regarding problematic drinking behaviors. However, this veteran cohort is unlikely to embrace traditional abstinence-based alcohol treatments.^{36,37} Intervention to reduce negative consequences of drinking may be more acceptable to this cohort than interventions to reduce quantity of drinking. Results of this study suggest that such intervention may in fact be the most clinically useful focus of treatment as well. Thus, future research explaining the link between PTSD and negative alcohol-related consequences can be helpful. Alternative methods for addressing problematic drinking should be developed and incorporated into PTSD-focused treatments for OEF/OIF veterans who may be motivated to make changes to reduce the negative consequences of alcohol use.

This study has several strengths including (1) exploring multiple rather than one-dimensional facets of problematic drinking; (2) use of both clinical and nonclinical participants (49% met PTSD criteria), which affords the possibility of improving the development of prevention and intervention programs; and (3) utilizing the gold standard in PTSD diagnosis, the Clinician-Administered PTSD Scale (CAPS). Although, this was the first study to examine PTSD, alcohol consumption versus alcohol-related problems, and MHRQoL among OEF/OIF veterans, results should be replicated in future studies and interpreted in light of study limitations, particularly the exclusion of veterans with current alcohol

dependence. Results may not fully generalize to a female veterans or a clinical sample of veterans with diagnosed PTSD or alcohol use disorders. Generalizability of findings should be considered in light of recent changes to PTSD and alcohol use disorder criteria in DSM-5. Additionally, results do not take into account likely comorbidities, such as depression or other substances. In a recent large-scale study, psychiatric diagnoses other than PTSD (especially bipolar disorder and schizophrenia) were most strongly associated with dual diagnosis in the OEF/OIF population.¹³

Given the cross-sectional design of the study, alternative theoretical and directional models that may exist among study variables should be considered. Our cross-sectional data precluded us from testing temporal relations among study variables. A prospective study design would be beneficial in testing the causal effects over time among PTSD symptoms, alcohol behaviors, and MHRQoL. Following replication of results, future studies should also build upon the existing model to incorporate other mechanisms that may mediate or moderate the association between PTSD symptoms and MHRQoL among drinkers, such as coping motives, alcohol-related expectancies, drinking refusal self-efficacy,³⁸ and other cognitive variables.

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