Resilience Across Subgroups of Posttraumatic Stress Disorder and

Alcohol Misuse in the Military: A Latent Profile Analysis

by

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Abstract

Veterans and active-duty service members (ADSM) are at an elevated risk for posttraumatic stress disorder (PTSD) and alcohol use misuse. Research indicates patterns of PTSD symptoms and alcohol use are highly heterogeneous, as latent class analysis (LCA) and latent profile analysis (LPA) have identified homogeneous subgroups of individuals. Although research has begun to investigate latent classes' differential relationships with external correlates, none have focused on protective factors. Resilience, an individual's ability to thrive despite adversity, is a known protective factor against alcohol misuse and PTSD among combat Veterans. To better understand the role of resiliency, in a high-risk group (i.e., military community), the completed study replicated and extended findings from the limited number of LCAs/LPAs of DSM-5 PTSD and alcohol misuse, and to examine how quantitative and qualitative class differences in PTSD symptoms and alcohol misuse relate to resiliency and other related constructs (i.e., depression, substance use, and nicotine use). Analyses yielded a 3-profile solution among 1,147 trauma exposed ADSMs and Veterans consisting of a profile with low PTSD/low alcohol, moderate PTSD/low alcohol profile, and a moderate PTSD/high alcohol profile. Covariate analyses demonstrated significant differences between classes based on resilience and depression, but not past two-week substance or nicotine use. Limitations and recommendations for future studies and clinical decision-making are discussed.

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Comorbid Alcohol Misuse and PTSD within the Military

Active-Duty Service Members (ADSMs) and Veterans are more likely to engage in alcohol misuse (Fuehrlein et al., 2016; Grant et al., 20.15; Hasin et al., 2007; Burnett-Zeigler et al., 2011) and be diagnosed with PTSD (Fulton et al., 2015; Kilpatrick et al., 2013) than the general population. A recent systematic literature review (Schein et al., 2021) reported higher ranges of past-year and lifetime PTSD prevalence among military samples when compared to civilian samples using *Diagnostic and Statistical Manual of Mental Disorder, Fifth Edition* (DSM-5; APA, 2013) criteria. Similarly, past year estimates of alcohol misuse ranged from 10.0% to 33.4% among community samples (Grucza et al., 2018) and 36% among Operation Enduring Freedom/Operation Iraqi Freedom (OEF/OIF) Veterans (Burnett-Zeigler et al., 2011). Moreover, the relationship between alcohol misuse and PTSD is strong among Veteran samples (Jacobson et al., 2008; Hoge et al., 2004). Specifically, PTSD has commonly exhibited a strong association with risky drinking patterns (i.e., alcohol misuse, binge drinking and alcohol use disorder [AUD]) (Jakupcak et al., 2010; Mustillo et al., 2015). Furthermore, the prevalence is increased among treatment-seeking samples, with 63% of a sample of over 450,000 treatment-seeking OEF/OIF Veterans experiencing comorbid AUD/PTSD (Seal et al., 2011). These data suggest that the dangerous experiences of military service places Active-Duty Service Members and Veterans at an elevated risk of risky alcohol use and PTSD.

Several theories attempt to illustrate the temporal relationship between risky alcohol use and PTSD. Some hypothesize that individuals who experience traumatic events engage in hazardous alcohol use to avoid distressing symptoms. Temporary relief of PTSD symptoms is provided by alcohol which negatively reinforces and maintains this coping strategy. This theory, termed the self-medication model, considers alcohol use as a means of mitigating the undesirable

effects of PTSD symptoms (Leeies et al., 2010). Other models suggest that alcohol use may serve as a risk factor for the development of PTSD symptoms. Individuals with a drinking history who are faced with a traumatic experience may continue to use alcohol with the intention of avoiding distressing PTSD symptoms. This theory, the mutual maintenance model, views alcohol as an avoidance behavior which inhibits the individual from PTSD recovery, and with alcohol withdrawal symptoms worsening or acting like PTSD symptoms (Kaysen et al., 2017). As withdrawal symptoms and PTSD symptoms may overlap it makes it difficult to determine the sequence of onset found in comorbid PTSD and alcohol use. Similarly, the high-risk model characterizes alcohol use as a risk behavior which may increase the incidence of traumatic events and the subsequent development of PTSD (Windle, 1994). Unlike previous models, the third variable model accounts for comorbid PTSD and risky alcohol use as the result of shared genetic variance (Norman et al., 2012). The causal pathways of these diagnoses remain unclear due to their probable intertwined etiology.

Regardless of the etiology, the comorbidity of risky alcohol use and PTSD tends to lead to symptoms that are more severe, chronic, and treatment-resistant than symptoms associated with either diagnosis on its own (McCarthy & Petrakis, 2010). OEF and OIF Veterans who report hazardous drinking, and an increasing number of PTSD symptoms, also report their global health as poorer than Veterans reporting fewer mental health problems (McDevitt-Murphy et al., 2010). Alcohol misuse has been found to mediate the relationship between PTSD symptoms and the psychological dimension of overall health in OEF and OIF Veterans. According to a nationally representative sample of U.S. Veterans, Veterans with AUD/PTSD were more likely than Veterans experiencing AUD only to experience generalized anxiety disorder, major depression, suicidal ideation and attempts as well as current mental health treatment (Norman et

al., 2018). Collectively, individuals with comorbid AUD and PTSD experience poorer overall and mental health outcomes when compared to individuals with either diagnosis on its own. Typically, these poor outcomes were investigated by leveraging the heterogeneous nature of PTSD, AUD and comorbid PTSD/AUD which indicated distinct subtypes (Olino et al., 2012; Vaidyanathan et al., 2011) and symptom clusters (Blevins et al., 2014; Moss et al., 2007; Wolf et al., 2012). Identifying these subtypes and clusters have enabled us to determine associations of trauma type, drinking classes, and even the risk for developing comorbid AUD/PTSD.

To address the treatment needs of comorbid alcohol misuse/PTSD, both concurrent and integrated treatments were created. Namely, the Concurrent Treatment of PTSD and Substance Use Disorders Using Prolonged Exposure (COPE; Back et al., 2015) and Seeking Safety (SS; Najavits, 2002). Several systematic reviews of comorbid PTSD/substance use disorder psychological interventions have been conducted (Roberts et al., 2015; Simpson et al., 2017; Torchalla et al., 2012; van Dam et al., 2012) which consistently indicate reductions in both PTSD and SUD-related symptoms for both treatment interventions. Despite their effectiveness, each systematic review noted interindividual treatment. One possible explanation may be the way treatment effects are examined. Specifically, treatment effectiveness is measured across individuals as an average (i.e., variable-centered approach) which neglects the heterogeneous symptom presentations among participants. Treatment outcomes may be improved by identifying homogenous subgroups of participants who react to treatment similarly (Panza et al., 2021). One statistical technique which identifies such homogenous subgroups is called latent class analysis.

Latent Variable Mixture Modeling

Psychological research often examines constructs which are not directly observable and relies on inference instead. These unobservable variables are known as latent variables. Latent variable mixture modeling (LVMM), a group of techniques, classifies unobserved subgroups of a population using heterogeneity within the data (McLachlan & Peel, 2000; Muthén & Muthén, 2002; Petersen et al., 2019). The following types of LVMM differ based on characteristics of both latent and observed variables: latent trait analysis, covariance structure analysis, latent profile analysis, and latent class analysis. Latent trait analysis (LTA) maps categorical observed variables onto continuous latent variables. Covariance structure analysis maps continuous observed variables onto continuous latent variables. Latent profile analysis (LPA) maps continuous observed variables onto categorical latent variables. Latent class analysis (LCA) maps categorical observed variables onto categorical latent variables.

Both LCA and LPA are increasingly popular among applied researchers as they utilize a person-centered approach, facilitating the identification of qualitatively different groups who share similar experiences and outcomes (Law & Harrington, 2016). Each subgroup is referred to as a latent class or profile, as these terms are used interchangeably regardless of the variable type (i.e., categorical or continuous) used for analyses (Woo et al., 2018). Each latent class is detected using observed variables, called indicators (Lanza et al., 2013). The pattern of responses to the indicators allows for the identification of classes. Within the LCA/LPA framework, the estimated proportion of a certain response pattern can be expressed as a function of latent class prevalences and item-response probabilities. Latent class prevalences, or γ, is the proportion of the population which falls into each class with a sum of 1 (Lanza et al., 2013). Item-response probabilities, or ρ,

signify the probability of a certain response to an indicator, conditioned on group membership with 0 or 1 representing a strong relationship (Lanza et al., 2013).

PTSD Symptoms as Latent Indicators within a Military Context

Previous research has used LCA and LPA to identify various PTSD subtypes among Veteran and ADSM samples (Byrne et al., 2019; Hansen et al., 2017). These studies have produced findings with quantitative and qualitative differences. Quantitatively, two studies identified a 4-class model of PTSD symptoms (Maguen et al., 2013; Sripada et al., 2020) while two other studies yielded a 3-class model (Campbell-Sills et al., 2022; Steenkamp et al., 2012). The 4-class solutions, based on symptom severity, were labeled as one low class, two moderate classes, and one high class (Maguen et al., 2013; Sripada et al., 2020). Alternatively, the three-class solutions differed as one consisted of one low, medium, and high symptom severity classes (Steenkamp et al., 2012) and the other identified one threat-reactivity profile, one dysphoric profile, and one high-symptom profile (Campbell-Sills et al., 2022).

The number of classes may differ due to differences in assessment measures, and/or sample characteristics. Both studies which supported a 4-class model (Maguen et al., 2013; Sripada et al., 2020) utilized assessment measures based on DSM-IV PTSD criteria while one 3-class model was identified with DSM-III-R PTSD criteria (Steenkamp et al., 2012) and the other used DSM-5 PTSD criteria (Campbell-Sills et al., 2022). Class differences may be expected as PTSD criteria changed from DSM-III-R to DSM-IV to DSM-5. Most notably, the DSM PTSD criteria have expanded to include up to 636,120 combinations of symptoms (Galatzer-Levy & Bryant, 2013). Sample characteristics may also explain these quantitative class differences. Namely, Sripada and colleagues (2020) were the only study to recruit residential treatment-seeking participants.

Despite a replicable 4-class model, Veterans belonging to the moderate latent classes differed within and between samples (Maguen et al., 2013; Sripada et al., 2020). Qualitative differences may be in part due to sample characteristics. Amongst Veterans who entered VA residential PTSD treatment, one moderate subgroup consisted of Veterans with high re-experiencing symptoms and another with high emotional numbing symptoms (Sripada et al., 2020). Conversely, a sample of non-treatment seeking OEF/OIF Veterans splintered into one intermediate class whose Veterans endorsed high emotional numbing and one intermediate class whose Veterans endorsed low emotional numbing (Maguen et al., 2013). Further investigating sample differences This qualitative divergence may be attributed to the differences in sample characteristics (i.e., treatment-seeking vs. non treatment seeking). However, these qualitative differences may also be influenced by symptom measurement. Both studies dichotomized each item of the Posttraumatic Stress Disorder Checklist for DSM-IV (PCL; Weathers et al., 1994) and included them in the model as latent indicators. The PCL for DSM-IV assessed 17 PTSD symptoms across three versions: military, civilian, and specific. Each version presented unique instructions based on the target population or the index event. Respondents were then instructed to identify how much each problem bothered them within the last month on the following scale: 1-Not at all, 2-A little bit, 3-Moderately, 4-Quite a bit, or 5-Extremely. Interestingly, each study chose different scoring methods. Following one of the original scoring methods, Maguen and colleagues (2013) dichotomized each PCL item as present if rated "moderately" or above (i.e., 3-5). Whereas Sripada and colleagues (2020) chose to dichotomize each PCL item using the sample median (i.e., PCL responses 4-5) to ensure normality. It is important for future studies to determine which scoring method is appropriate to balance the needs of the study's sample with the literature's consistency.

Secondary analyses within each of the previously mentioned studies also illustrated the literature's divergence. Three of the four PTSD LCAs investigated the relationship between class membership and other forms of symptomatology. After identifying a 3-class model (i.e., no disturbance class, intermediate disturbance class, and pervasive disturbance class), Steenkamp and colleagues (2012) utilized logistic regression to predict class membership using self-reported peritraumatic dissociation, dissociative experiences, and the number of readjustment problems. Analyses indicated that Veterans in the pervasive disturbance classes had higher levels of readjustment difficulties, peritraumatic dissociation, and general dissociation than Veterans in the intermediate disturbance class. However, both the pervasive and intermediate classes had higher levels of all predictor variables (i.e., readjustment problems, peritraumatic dissociation, and general dissociation) than Veterans in the no disturbance class. Similarly, Sripada and colleagues (2020) conducted logistic regressions to predict class membership using the presence of co-occurring disorders (i.e., alcohol or substance use disorder, anxiety disorder, depression, and serious mental illness). Within the 4-class model (i.e., low symptoms, moderate symptoms with high reexperiencing, moderate symptoms with high emotional number, and high symptoms), only co-occurring anxiety and co-occurring depression were significantly different across classes. Namely, participants in the moderate class with high re-experiencing symptoms were less likely to be depressed when compared to the moderate class with high emotional numbing. Furthermore, participants within the low symptom class were significantly less likely of meeting criteria for an anxiety disorder. Lastly, Campbell-Sills and colleagues (2022) conducted linear regression models to investigate the relationship between PTSD and genetic risk scores. Ultimately, the researchers found that each identified profile (i.e., threat-reactivity profile, dysphoric profile, and high-symptom profile) resulted in higher risk for various

comorbidities. In particular, dysphoric membership resulted in higher risk for major depression and life stress when compared to threat-reactivity membership. Moreover, high-symptom membership translated to a higher risk of PTSD persistence and the highest genetic risk of MDD, ADHD, and schizophrenia. It seems reasonable that the choice of predictors was driven by study aims, hypotheses, and measured variables. Specifically, Steenkamp and colleagues (2012) aimed to examine the heterogeneity in postcombat outcomes, Sripada and colleagues (2020) aimed to identify distinct PTSD symptoms classes which would allow for examinations of clinically significant factors, and Campbell-Sills and colleagues (2022) aimed to identify PTSD subtypes and their associations with genetic risk factors. Taken together, these findings illustrate how secondary analyses can be used to further validate class membership and illustrate relationships between class membership and other variables of interest.

Alcohol Use as Latent Indicators within a Military Context

Investigations using LVMM have also identified alcohol-related subgroups among ADSMs and Veterans. Person-centered research of military alcohol subgroups has begun to support a 4-class model. In a sample of Canadian Armed Forces (CAF) Regular Forces members, researchers identified a 4-class solution consisting of infrequent, moderate, regular binge drinkers with minimal problems, and problem drinkers (Richer et al., 2016). Similarly, an LPA of alcohol use among OEF/OIF Veterans revealed a 4-class solution, namely, mild alcohol behavior, steady drinkers with functional impairment, binge drinkers with no functional impairment, and severe alcohol behavior (Cadigan et al., 2017). Although each sample supported a 4-class model, intermediate subgroups varied. Again, this discrepancy may be accredited to differences in assessment measures, analyses and sample characteristics. Richer and colleagues (2016) conducted an LCA using the Alcohol Use Disorder Identification Test (Babor et al.,

2001), a 10-item measure which assessed alcohol intake (items 1-3), dependence (items 4-6), and alcohol-related consequences (items 7-10). Furthermore, each AUDIT item responses were categorized differently based on participant response frequency. By contrast, Cadigan and colleagues (2017) conducted an LPA based on peak BAC as estimated by the Daily Drinking Questionnaire (DDQ; Collins et al., 1985), DDQ drinks per week, and alcohol-related problems assessed by the Short Inventory of Problems (SIP; Miller et al., 1995). Clearly, the choice of assessment measures influenced the lack of classes across studies. However, what is less clear may be the effect of categorizing data (i.e., LCA) versus placing it on a continuum (i.e., LPA) within person-centered analyses. Discrepancies between moderate symptoms subgroups is evident across both the alcohol and the PTSD literature which may be the result of measurement and analytical differences.

Research has also explored relationships between alcohol subgroups and external variables. This nascent literature (Cadigan et al., 2017; Richer et al., 2016) has consistently investigated associations between demographic variables (i.e., age, sex, race) and group membership. In addition, several studies have focused on other unique forms of symptomatology. For example, Richer and colleagues (2016) conducted logistic regressions to predict class membership based on self-reported past month psychological distress, depression symptoms, and PTSD symptoms among CAF Regular Forces member. Across the 4-class model (i.e., infrequent, moderate, regular binge drinkers with minimal problems, and problem drinkers), problem drinkers were more likely to present with depression and PTSD symptoms than infrequent drinkers. However, moderate and regular binge drinkers did not significantly differ from infrequent drinkers with respect to PTSD symptoms. Conversely, Cadigan and colleagues (2017) utilized analysis of variance to examine differences in depression symptoms, anxiety, and

PTSD symptoms across profiles (i.e., mild alcohol behavior, steady drinkers with functional impairment, binge drinkers with no functional impairment, and severe alcohol behavior). Profiles were significantly different across all external symptoms (i.e., depression, anxiety, and PTSD) with the following profiles listed as those with the highest to lowest self-reported symptoms: steady drinkers with functional impairment, severe alcohol behavior, binge drinkers with no functional impairment, and mild alcohol behavior. Most notably, steady drinkers with functional impairment and severe alcohol behavior profiles reached probable diagnoses of major depressive disorder and PTSD. Thus across two alcohol-focused LCAs/LPAs, subgroups of individuals with higher reported alcohol quantity and frequency are significantly associated with depression and PTSD symptoms.

Co-occurring PTSD and Alcohol as Latent Indicators within a Military Context

Psychiatric comorbidity is highly prevalent among ADSMs and Veterans when compared civilian populations (Betancourt et al., 2019; Kessler et al., 2014). To investigate the interplay between diagnostic categories, researchers have studied psychiatric comorbidity using person-centered analyses. This technique is intended to identify subgroups of individuals considering an intersection of symptoms, protective factors, and behaviors of interest (Collins & Lanza, 2013). However, each study was designed with vastly different aims and indicator variables which leads to disparate findings. Specifically, Richardson and colleagues (2017) performed an LCA among a sample of treatment-seeking CAF Veterans and current members to investigate patterns of psychiatric comorbidities. Ultimately, a 2-class model (i.e., low comorbidity class and high comorbidity class) was identified using binary indicator variables which assessed PTSD symptoms, depressive symptoms, panic disorder, and hazardous alcohol use.

Other LCAs have captured a broader range of psychiatric comorbidities and behaviors of interest. For example, Lorber and colleagues (2017) established subgroups of psychological health problems (i.e., hazardous drinking, non-medical use of prescription medications, suicidal thoughts, suicide attempts, PTSD symptoms, depressive symptoms, and family maltreatment behaviors) in an initial sample and replicated these latent classes using data from an unrelated second sample consisting of cross-sectional surveys of Air Force ADSMs. Each sample best fit the following 6-class model based on clinically significant (CS) internalizing (Int) and externalizing (Ext) behaviors: very low CS-Int/Ext, low CS-Int/Ext , moderate CS-Int/Ext, High CS-Int/Ext, very high CS-Int/Ext, and extremely high CS-Ext. Similarly, Edwards and colleagues (2021) investigated a broad range of mental health and substance use patterns of U.S. Veterans. A spectrum of psychiatric diagnoses (i.e., psychotic disorder, bipolar disorder, major depressive disorder, dysthymia, PTSD, generalized anxiety disorder, borderline personality disorder, antisocial personality disorder, and schizotypal personality disorder) from the Alcohol Use and Associates Disabilities Interview Scheduled-5 (AUDADIS-5) were included in the model as binary indicators. Researchers supported the following 4-class model: healthy class, substance use disorder class (SUD class), personality disorder-substance use disorder class (PD/SUD class), and the depressive disorder class. Most notably, Veterans in either the SUD and PD/SUD classes displayed higher rates of suicide attempts, incarceration, homelessness, and psychiatric treatment when compared to the remaining classes. However, the PD/SUD class exhibited a significantly greater frequency of these high-risk events (i.e., suicide attempts, incarceration, homelessness) compared to the SUD class. In light of the multitude of comorbidities, it may be beneficial to focus on select comorbid indicators to begin identifying subgroups of participants which may aid in future treatment-matching.

To date, only one study has solely examined symptom-based subgroups of comorbid PTSD and AUD in a latent class framework within a treatment-seeking Veteran sample (Panza et al., 2021). Researchers identified subgroups of Veterans with comorbid PTSD/AUD symptom subgroups and investigated the relationship between each subgroup with treatment outcomes. Panza and colleagues (2021) recruited 119 Veterans with comorbid PTSD/AUD and randomized participants to either the COPE (Back et al., 2015) or SS (Najavits, 2002) treatment conditions. Data was collected at baseline, post-treatment, 3-month follow-up and the 6-month follow-up. Researchers performed an LCA using baseline data with binary indicators of PTSD and AUD symptoms. To account for PTSD symptoms, the researchers utilized 4 continuous indicators for each symptom subgroup as assessed by the Clinician Administered PTSD Scale for DSM-5 (CAPS-5; Weathers et al., 2013). Alcohol-related binary indicators consisted of the 11 DSM-5 AUD symptoms using a combination of the Structured Clinical Interview for DSM-IV (SCID-IV) Module E (First et al., 2002) and the Penn Alcohol Craving Scale which accounted for the missing craving criterion from the DSM-IV (PACS; Flannery et al., 1999). Results indicated the following 3-class model best fit the data: moderate PTSD/low AUD impairment, high PTSD/high AUD impairment, and low PTSD/ high AUD impairment.

In line with the larger LCA/LPA literature, Panza and colleagues (2021) also conducted secondary analyses to investigate meaningful differences between the resulting latent classes. Both ANOVAs and chi-square tests were conducted to compare demographic variables and psychiatric variables with class membership. Of note, percent heavy drinking days and percent drug use days within the past 90-days were compared across latent classes. However, neither variable significantly differed across classes.

Panza and colleagues (2021) also analyzed treatment response based on latent class membership and treatment condition (i.e., COPE vs. SS). The results yielded a three-way interaction between time (immediate post-treatment, 3 month, 6 month), treatment condition, and membership across the 3 identified classes. Members of the moderate PTSD/low AUD impairment class only differed at 6 months post-treatment with COPE yielding greater symptom reductions. Participants in the high PTSD/ high AUD impairment class only differed immediately post-treatment as COPE yielded lower symptom endorsement. Lastly, members of the low PTSD/high AUD impairment class who were assigned to COPE demonstrated lower symptom endorsement across all timepoints when compared to SS participants. Thus, Panza and colleagues (2021) have provided initial support for person-centered analyses to explain variations in PTSD/AUD treatment responding. Further research is warranted not only to extend and replicate the previously conducted comorbid PTSD/AUD LCA (Panza et al., 2021), but to explore other associations between class membership, relevant psychiatric comorbidities, and protective factors.

Resilience within a Military Context

Research on resilience among Veteran and ADSM samples has grown significantly in recent years (Britt et al., 2016; Kossek & Perrigrino, 2016; Meredith et al., 2011; Wald et al., 2006). Various conceptualizations of resilience have ranged from trait, outcome, to process oriented. Despite a lack of a universal definition of approach to measurement, each view includes the notion that individuals can show resilience when they are faced with adversity or a stressor and then overcome this obstacle (Meredith et al., 2011). The disparate definitions of resilience and its research has resulted in debate as to which type of research design (i.e., cross-sectional versus longitudinal) should be employed (Litz, 2014; Ungar et al., 2021). Thus, researchers have

designed studies to explore the role that resilience plays in various populations, given their specified resilience conceptualization.

Regardless of its operationalization, resilience is an important concept within the Veteran and ADSM communities. To exhibit resilience, one must experience adversity which many Veterans and ADSMs have endured during training and deployments, combat, and post-deployment adjustments. Thus, Veterans and ADSMs are at high-risk for direct and indirect exposures to potentially traumatic events (PTEs; Wisco et al., 2022). However, the literature has demonstrated that mere exposure to a PTE does not result in the development of PTSD (Andersen et al., 2014; Karstoft et al., 2013; Pavlacic et al., 2022). In contrast, some Veterans and ADSMs have exhibited positive mental health outcomes after trauma exposure (Calhoun & Tedeschi, 2014; Tsai et al., 2016). For example, Veterans who experienced moderate or high levels of combat trauma reported higher posttraumatic growth (PTG), an indicator of resilience, than Veterans who reported lower levels of combat trauma (Gallaway et al., 2011). Given Veterans and ADSMs are at higher risk for PTE, yet not all experience negative outcomes, ensuring psychological health and operational readiness is an obvious target for the military community and various stakeholders. As such, government (deVisser et al., 2016; Cornum et al., 2011) and civilian organizations (Meredith et al., 2011; Saltzman et al., 2011) have underscored its importance through the creation of numerous resilience programs, strategies, and initiatives.

Regardless of the conceptual model or research design, resilience is consistently associated with the psychopathology and behavioral health needs of ADSMs and Veterans. Transdiagnostically, pre-deployment resilience predicted lower incidence of post-deployment emotional disorders (i.e., PTSD; major depressive episodes, generalized anxiety disorder, suicidal ideation) within a sample of active-duty Army soldiers who were followed prior to basic

training through 1-2 months pre-deployment and concluded within 1 month of their return to the U.S. (Campbell-Sills et al., 2018). Similarly, both primary and secondary analyses of the Post-Deployment Mental Health Study, a multi-site study examining post-deployment mental health in U.S. military Afghanistan/Iraq Veterans (PDMH; Brancu et al., 2017; Sheerin et al., 2019), demonstrated elevated resilience scores were inversely associated with current alcohol use, drug use, and current psychiatric diagnosis count among men and women. Longitudinally, lower levels of resilience at baseline were predictive of alcohol misuse after 1-year after controlling for combat exposure and probable PTSD among OEF/OIF Veterans (Green et al., 2014). Thus, research demonstrates that resilience is a protective factor against PTSD and hazardous alcohol use.

Despite the protective effects of resilience, traumatic experiences are not equal in their intra- nor interindividual impact. Furthermore, as mentioned previously, individuals may engage in risky alcohol use in a variety of ways to manage their PTSD-related symptoms. Considering this complexity, researchers have explored individual differences in resilience regarding various symptom presentations. Notably, Isaacs and colleagues (2017) recruited U.S. Veterans to complete two cross-sectional surveys 2 years apart to investigate longitudinal predictors of resilience. Veterans were classified into clusters based on the number of self-reported traumatic events and current distress. Then, cluster analyses were conducted using the Trauma History Screen (THS), PCL-5, e and the Patient Health Questionnaire-4 (PHQ-4). Differences across the following solution were characterized using demographic, military, physical health, and psychosocial variables. Analyses yielded a three-group solution consisting of a Control group (i.e., low trauma exposure and low current psychological distress), Resilient group (i.e., high trauma exposure and low current distress), and a Distressed group (i.e., both high trauma

exposure and current distress). Resilient group membership exhibited lower rates of past psychiatric history and substance abuse when compared to the Distressed group when compared to the other subgroups.

To our knowledge, no studies have examined possible differences in self-perceived resilience among PTSD/alcohol misuse symptoms presentations. By developing a deeper understanding of subgroups of military members suffering from PTSD/alcohol misuse, we may determine how self-perceived resilience is associated with those at high-risk for experiencing risky drinking patterns and debilitating PTSD symptoms. Over time and with additional research, these profiles may enable us to ascertain how self-perceived resilience is linked to the development and maintenance of these disorders. Furthermore, these mental health profiles, with their associated protective factors, may also aid client treatment matching or the development of increasingly effective treatment protocols. Finally, gathering information regarding self-perceived resilience may indicate which of the individual's perceived strengths may be utilized during treatment.

Current Study

Co-occurring PTSD and alcohol misuse is well-documented among Veterans and ADSMs (Debell et al., 2014; Jacobsen et al., 2001; Lai et al., 2015). The combination yields poorer functional and treatment outcomes (Bowe & Rosenheck, 2015; Fuehrlein et al., 2016; Norman et al., 2018). It is important to note, much of this research is based on variable-centered analyses which focused on the contribution a variable may have on an outcome (Laursen & Hoff, 2006). Thus, research aims and hypotheses are focused on the effect of one variable on another (Howard & Hoffman, 2018). However, the collective effect of PTSD and alcohol misuse may not be accurately captured by separating each variable's influence on treatment outcomes.

Furthermore, variable-centered approaches assume that participants within a sample consist of a single set of parameters (Howard & Hoffman, 2018) and ignore possible qualitatively different subgroups. In contrast, person-centered analyses focus on the patterns of multiple factors within individuals and not among variables (Bámaca-Colbert & Gayles, 2010). These analyses result in subgroups with different constellations of attributes (Spurk et al., 2020). Given that comorbid PTSD and alcohol misuse is treated in a concurrent (i.e., SS) or integrated (i.e., COPE) fashion and treatment responses have varied based on the effect of one variable upon another (Roberts et al., 2015; Simpson et al., 2017), research is warranted to statistically investigate symptom presentations in a holistic manner considering the collective effect (i.e., person-centered approach) of PTSD and alcohol misuse.

An extension of the person-centered analyses is to investigate theoretically related constructs called covariates. Further investigation of these covariates provides descriptive information of the resulting profiles and the possible relationship between profiles (Marsh et al., 2009; Nylund-Gibson & Masyn et al., 2016). As expected, previous research has identified significant relationships between depression and substance use with PTSD-only latent classes and alcohol-only latent classes. However, research has not investigated depression and substance use as covariates as it relates to comorbid trauma- and substance use-related latent profiles. Moreover, previous research has not investigated the relationship of a self-perceived resilience with latent class or profiles. Examining the relationships between latent participant subgroups and covariates is important as it may facilitate identification of secondary treatment targets and/or patient self-perceived strengths to be utilized for treatment planning.

The current study was designed to rectify methodological and theoretical gaps in the existing literature. To date, only one study has identified comorbid PTSD/AUD symptom classes among

treatment-seeking Veterans (Panza et al., 2021) using a person-centered approach (i.e., LCA). However, the analyses were underpowered due to a small sample size (N=119). Previous research denoted samples of 300 or greater are necessary to minimize the possibility of poor fit indices, models which overfit the data (i.e., non-convergence), and failure to identify smaller classes (Nylund-Gibson & Choi, 2018). In addition, several of the previous LPA/LCA studies in this area of research made use of categorical variables as indicators of PTSD and/or alcohol use and symptoms. To ensure proper identification of profiles, the current study conducted an LPA using continuous indicators with a sample of 1,147 trauma exposed ADSMs and Veterans. Utilization of continuous rather than categorical indicators has the potential to avoid a loss of valuable information of individuals who may report subthreshold yet clinically significant symptom presentation (i.e., individual differences), loss of power, spurious findings, overlooking nonlinear effects, and difficulty synthesizing literature findings, all known disadvantages of using categorical indicators (MacCallum et al., 2002). Furthermore, considering symptoms on a continuum, rather than categories, is consistent with the DSM-5-TR's dimensional approach to psychiatric diagnoses (APA, 2022). Thus, the current study was designed with the goal of potentially identifying profiles based on a broader range of co-occurring PTSD symptoms and alcohol misuse.

The current study also aimed to reduce the economic burden of comorbid trauma and alcohol-related symptoms via less resource-intensive assessments. According to recent estimates, the economic burden of PTSD totals to $42.7 billion per year in the military population equating to $25,684 per individual with PTSD in the military population (Davis et al., 2022). Similarly, past estimates of excessive alcohol use cost the U.S. military 1.12 billion per year (Harwood et al., 2009). Given the economic burden and the rising numbers of Veterans (Government

Accountability Office, 2021) and ADSMs (Quartana et al., 2014) seeking mental healthcare, additional improvements in effective treatment matching are warranted. One pragmatic solution may be to reduce the time and professional burden of pre-treatment assessment measures. Previous LCA/LPA studies within this literature have utilized assessment measures which require increasing time and level of training. Namely, the SCID (i.e., estimated administration time of 45-180 minutes by a trained professional) and the CAPS-5 (i.e., estimated administration time of 45-60 minutes by a trained professional). Although these measures provide valid and reliable data, they do require costly resources which may not be available at every treatment setting by every provider. Thus, the current study utilized reliable and valid assessment measures which require reduced time and training.

Based on the review of the literature, we hypothesized that the current study's LPA would identify homogenous subgroups that differed quantitatively and qualitatively regarding co-occurring alcohol misuse and PTSD symptoms. It is important to note, there are no current guidelines for naming latent classes or profiles within the literature. However, naming conventions are dependent on the indicator variables. Previous studies, including the only published LVMM study that focused on comorbid PTSD/AUD among Veterans (Panza et al., 2021), utilized naming conventions which reflected the severity of symptoms (i.e., low, moderate, and high). Relatedly, previous alcohol LCAs and LPAs have named classes based on the severity and frequency of alcohol-related behaviors and consequences. Given that the current study utilized the PTSD Checklist for DSM-5 (PCL-5; Weathers et al., 2013b) and the Alcohol Use Disorder Identification Test- Consumption (AUDIT-C; Bush et al., 1998), the hypotheses and resulting latent profiles were named to reflect the severity of PTSD symptoms and patterns of alcohol consumption. Thus, the current study hypothesized the following:

- Hypothesis 1: Previous research has yielded 4-class solutions consisting of multiple moderate symptom classes utilizing PTSD-only indicators (Maguen et al., 2013, & Sripada et al., 2020) and alcohol-only indicators (Cadigan et al., 2017, & Richer et al., 2016. As such, we hypothesized that a 4-class model would best fit the current sample and would also contain multiple moderate symptom profiles.
    - High PTSD/High alcohol with frequent binge episodes
    - Moderate PTSD/Moderate alcohol with frequent binge episodes
    - Moderate PTSD/Moderate alcohol without binge episodes
    - Low PTSD/Low alcohol without binge episodes
- Hypothesis 2: Consistent with the previous literature (Green et al., 2014), it is hypothesized that self-reported resilience would be significantly predictive of profile membership. Namely, participants with higher resilience scores would have a greater likelihood of membership in profiles with less severe PTSD and less frequent binge episodes.
- Hypothesis 3: As past research has demonstrated (Brancu et al., 2017; Sheerin et al., 2019), it is hypothesized that self-reported depression scores would be significantly predictive of profile membership. Specifically, participants with higher levels depressive symptoms would have a greater likelihood of membership in profiles with more severe PTSD and frequent binge episodes.
- Hypothesis 4: Consistent with previous findings (Brancu et al., 2017; Sheerin et al., 2019), it is hypothesized that past two-week nicotine/tobacco use and past two-week substance use would be significantly predictive of profile membership. It was

hypothesized that participants with greater substance use would be more likely to be classified into profiles with more severe PTSD and frequent binge episodes.

Methods

Participants

All data was provided from an intensive outpatient treatment center for post-9/11 military servicemembers and Veterans at a Southeastern academic medical center. Participants were interviewed as part of an intake assessment to determine inclusion or referral out of the treatment program. Participants completed this intake free-of-charge either in-person or over the phone with a licensed clinical psychologist, supervised clinical psychology post-doctoral fellow, or a supervised psychology graduate student. Participants were included in the current study if they endorsed at least one potentially traumatic event on the Life Events Checklist for DSM-5 (LEC-5; Weathers et al., 2013a), regardless of combat-relatedness or method of trauma exposure (i.e., directly experienced, witnessed it happen to someone else, learned about it, or part of a job). Participants without self-reported trauma-exposure were excluded from the current study.

Sample data consisted of interviews collected from 2012 to 2020 with an initial sample of 2,978 ADSMs and Veterans. Missing data was identified among demographic variables and variables of interest. Based on the current study's exclusion criteria, participants who denied any trauma exposure on the LEC-5 (n=293) were excluded from the data set. Regarding demographic variables, racial identity (n= 105), ethnicity (n=94), and education (n=8) were missing from the data set for some participants. Regarding the primary variables of interest, depression (n= 1247) and resilience (n=84) were also missing from the data set for some participants. It is important to note that a greater amount of data was missing from the variables of interest as these measures were included later in the data collection timeline. Participants with missing data were excluded

listwise from the analyses. A total of 1,147 participants were used in the analyses. Descriptive statistics of the full sample and the resulting profiles can be found in Table 1.

Measures

Demographics. A custom demographics questionnaire was created to obtain information about participants, such as age, sex, gender, race, ethnicity, sexual orientation, education, affiliated military branch, and current military service status. Demographic variables were used to describe the current sample and were not used in any formal hypothesis testing.

Past Two-Week Substance Use. A custom questionnaire was created to obtain the number of days each participant used cannabis, stimulants, heroin, other non-prescribed opiates, steroids, and other drugs within the past two weeks. The previously mentioned substances were combined due to low endorsement of each substance across the sample. Past two-week substance use was utilized as a distal variable within the LPA analyses.

Past Two-Week Nicotine Use. A custom questionnaire was created to obtain the number of days each participant used tobacco/nicotine products within the past two weeks. Past two-week nicotine/tobacco use was utilized as a distal variable within the LPA analyses.

Life Events Checklist for DSM-5 (LEC-5; Weathers et al., 2013a). The LEC-5 is a self-report measure to screen for traumatic life events. Based on the DSM-5 PTSD criterion A, respondents are presented with 16 potentially traumatic events and one "other" traumatic event. For each type of event the respondent indicates whether the event "happened to me", "witnessed it", "learned about it", "part of my job", "not sure" or "doesn't apply". Respondents may endorse multiple types of events and multiple methods of exposure. The LEC-5 does not include a scoring system; thus, the measure does not yield a total score or composite score. Consistent with previous Veteran and ADSM research (Decker et al., 2021; DeViva et al., 2020; Sloan et al., 2016; Weiss

et al., 2022), the LEC-5 was used only to identify trauma-exposed participants and to describe the current sample. The LEC-5 was not utilized in any formal hypothesis testing.

PTSD Checklist for DSM-5 (PCL-5; Weathers et al., 2013b). Based on the diagnostic criteria from the DSM-5, the PCL-5 assesses the presence of 20 PTSD symptoms over the past month, which apply to both civilian and the military populations (Blevins et al., 2015). The PCL-5 instructs participants to identify one traumatic event the respondent has experienced as the index event. The self-report rating scale provides a range of response choices: 0-Not at all, 1-A little bit, 2-Moderately, 3-Quite a bit, and 4-Extremely. Total PCL-5 scores range from 0-80, with PTSD symptom severity increasing as the total score increases (Bovin et al., 2016). Symptoms are separated based on the following symptom domains: reexperiencing, avoidance, negative alterations in cognitions and mood, and hyperarousal. PCL-5 scores indicate strong internal consistency and adequate discriminant and convergent validity (Bovin et al., 2015; Wortmann et al., 2016). PCL-5 subscale scores were utilized as continuous indicators within the LPA analyses. Cronbach's alpha for the current sample indicated a range of acceptable to good internal consistency for all subscales (α= .78-.90) and excellent internal consistency for the total score (α= .94)

Alcohol Use Disorder Identification Test- Consumption (AUDIT-C; Bush et al., 1998). Alcohol use was measured using the AUDIT-C, a brief screening test for heavy drinking and/or alcohol abuse or dependence. The AUDIT-C is a 3-item questionnaire to assess alcohol use frequency during the past year, number of standard drinks consumed during a typical occasion and the frequency of consuming 6 or more drinks on one occasion in the past year. All questions originate from the 10-item AUDIT (Saunders et al., 1993) with questions scored using a 0–4-point range and a possible total range of 0-12 points. Respondents' total scores can be

categorized as low risk (i.e. 0-2 points), moderate risk (i.e., 3-5 points), high risk (i.e., 6-7 points), and severe risk (8-12 points) for men and women. However, hazardous alcohol scoring criteria varies by gender, with $\geq$ 4 points for men and $\geq$ 3 points for women. Psychometric evaluations demonstrate satisfactory levels of internal consistency along with convergent and discriminant validity (Bradley et al., 2003). Each AUDIT-C item was included as a continuous indicator within the LPA analyses. Cronbach's alpha for the current sample indicated acceptable internal consistency (α= .76).

Connor-Davidson Resilience Scale-10 (CD-RISC 10; Campbell-Sill & Stein, 2007). The CD-RISC 10 consists of 10 items from the original 25-item CD-RISC (Connor & Davidson, 2003), both measuring resilience. This measure assesses the "ability to tolerate experiences such as change, personal problems, illness, pressure, failure, and painful feelings" (Campbell-Sill & Stein, 2007). Item responses use a 5-point Likert scale ranging from 0 (i.e., not true at all) to 4 (i.e., true nearly all of the time) with total scores ranging 0-40. The CD-RISC 10 has demonstrated good internal consistency along with convergent and divergent validity across samples (Campbell-Sills & Stein, 2007; Herbert et al., 2018; Scali et al., 2012). Resilience total scores were utilized as a distal variable within the LPA analyses. Cronbach's alpha for the current sample indicated excellent internal consistency (α= .90).

Patient Health Questionnaire-9 (Kroenke & Spitzer, 2002). The PHQ-9 is the 9-item depression scale of the patient health questionnaire (PHQ) which corresponds to the DSM-IV criteria for depression. The measure assesses depression symptom severity during the past two weeks. Responses to each question range from 0 (i.e., not at all) to 3 (i.e., nearly every day) with total scores ranging from 0-27. The PHQ-9 has demonstrated good internal reliability **(**α= .84-.89) across samples (Contractor et al., 2018; Fine et al., 2013; Spitzer et al., 2001). Past two-week

depression total scores were utilized as a distal variable within the LPA analyses. Cronbach's alpha for the current sample indicated good internal consistency (α= .82).

Data Analysis

Data analyses followed the six foundational steps of LPA, as outlined by Ferguson and colleagues (2020). The data was inspected, cleaned for analysis, and checked for statistical assumptions (i.e., step 1). The preliminary analyses (i.e., missing data, descriptive statistics, bivariate correlations) were conducted using IBM SPSS Statistics (Version 28). Next, LPA models were evaluated in an iterative fashion (i.e., step 2) using Mplus version 8.5 (Muthén & Muthén, 2020). A series of LPAs were conducted beginning with 1 profile and an additional profile was added for each subsequent analysis. All LPAs included PCL-5 subscales (i.e., re-experiencing, avoidance, negative alteration in cognitions and mood and hyperarousal) and AUDIT-C items as continuous indicator variables. All LPAs were re-run twice for log-likelihood replication to ensure local maxima were not incorrectly identified (Asparouhov & Muthen, 2014). Each model was then evaluated for model fit and interpretability (i.e., step 3) via holistic assessment of model fit indices, model testing, and model characteristics. The Akeike's information criterion (AIC; Akaike, 1987) and the Bayesian information criteria (BIC; Schwarz, 1978) were utilized as model fit indices. Both model fit indices (i.e., AIC, BIC) favor lower values and are interpreted as a better fit to the data. Model testing was conducted using the Vuong-Lo-Mendell Rubin likelihood ratio test (VLMR; Lo et al., 2001), the adjusted Lo-Mendell-Rubin likelihood ratio test (adjusted LMR; Lo et al., 2001), and bootstrapped parametric likelihood ratio test (BLRT; McLachlan & Peel, 2000). All model tests are significance tests comparing one model (*k*) with a model containing one less profile (*k*-1). A profile which yields a non-significant model test indicates that the current model *(k)* is not an

improvement and previous model (*k-1*) should be retained. Lastly, class sizes and entropy were utilized as model characteristics. Currently, there are no guidelines for an acceptable number of participants within a profile. However, previous research indicated that profiles containing at least 30-60 participants support generalizability within large samples (Vincent & Weir, 2012). Lastly, entropy was examined as an index of classification accuracy which favors higher values as a model with great classification accuracy. Overall, the chosen model yielded model fit indices with lower values, non-significant model tests, higher entropy values, and profiles which contain at least 60 participants.

After retaining the final model, each profile was examined the pattern of variables within and across each profile (i.e., step 4). Then, covariate analyses were conducted (i.e., step 5) using the BCH approach (Bolck et al., 2004). Thus, analyses estimated the relationship between the assigned profile membership and the distal outcome using the individual's modal posterior probability using Mplus version 8.5 (Muthén & Muthén, 2020). As such, continuous indicators were included in the first step. Then, an individual's most likely profile membership was determined using the modal posterior probability while accounting for the rate of classification error. Last, class differences on the external covariates (i.e., self-reported resilience, past 2-week depression symptoms, and past 2-week substance use) were examined using most likely profile membership and calculated using multinomial logistic regression. The presentation of results is found in the following section (i.e., step 6).

Results

Outline of Results Presentation

The following results are outlined in accordance with Ferguson and colleagues (2020) six foundational steps of the LPA process. Namely, the data was inspected (i.e., step 1), an iterative evaluation of models was conducted (i.e., step 2) and the models were then determined based on fit and interpretability (i.e., step 3). Next, patterns in profiles were investigated (i.e., step 4) and covariate analyses were conducted (i.e., step 5). Finally, results were presented (i.e., step 6).

Preliminary Analyses

Data was examined for missing and implausible values across all variables (i.e., step 1). As noted in the participants section, missing data were handled using listwise deletion and no improbable values were identified in the final sample. Missing data were examined and largely attributed to changes in data collection procedures, and not to either missing at random (MAR) or missing completely at random (MCAR). Thus, listwise deletion was determined to be more appropriate than full information maximum likelihood (FIML) and multiple imputation (MI) as their assumptions were not met (i.e., MAR and MCAR).

Preliminary analyses regarding frequency, means, standard deviations, and distributions were conducted across all demographic variables (i.e., age, sex, gender, race, ethnicity, sexual orientation, education, affiliated military branch, and current military service status) and variables of interest (i.e., PCL-5 subscales, AUDIT-C items, CD-RISC-10 total scores, PHQ-9 total scores, past 2-week tobacco/nicotine use and past 2-week substance use). Demographic characteristics and descriptive statistics for the final sample, and for each profile are included in

Tables 1 and 3, respectively. It is important to note, that additional information regarding the type of traumatic event (i.e., combat-related vs. not combat-related) as well as the number of traumatic events endorsed may also be found in Table 1. Furthermore, potential differences in demographic variables across profiles were investigated and reported on Table 1. Both sex (male and female) and trauma type (combat-related and not combat-related) were statistically different across profiles.

To test the assumption that LPA indicator variables are normally distributed (Spurk et al., 2020) values of skewness and kurtosis were examined. Analyses revealed that items 2 (i.e., alcohol quantity) and 3 (i.e., alcohol binge frequency) of the AUDIT-C were skewed and kurtotic. Specifically, item 2 was positively skewed (3.10) and leptokurtic (10.70). Item 3 was also positively skewed (1.57) and platykurtic (1.95). Given the data's non-normal distribution, the LPA was conducted using maximum likelihood with robust standard errors (MLR; Vermunt & Magidson, 2002).

Correlation

Bivariate correlations were conducted for the full sample and can be found in Table 2. As expected, all PTSD symptom clusters (i.e., PCL-5 subscales) exhibited significant positive correlations with each other. Similarly, all alcohol-related items (i.e., AUDIT-C) demonstrated significant positive correlations with each other. Significant correlations were also observed across variable domains. Namely, alcohol frequency was negatively correlated with PTSD intrusion and avoidance, while alcohol quantity and alcohol binge frequency were only positively correlated with PTSD arousal/reactivity. Furthermore, resilience and depression were negatively correlated with each other and separately correlated with all PTSD subscales.

Specifically, resilience was negatively correlated with all PCL-5 subscales. In contrast, depression was positively correlated with all PCL-5 subscales. However, resilience, but not depression, was positively correlated with alcohol frequency. Regarding past 2-week nicotine/tobacco use, only significant positively correlations were observed with alcohol frequency and past 2-week substance use. Lastly, 2-week substance use was also positively correlated with depression and PTSD arousal/reactivity.

Latent Profile Model

A total of 4 LPAs were conducted beginning with one profile and adding an additional profile with every subsequent model (i.e., step 2). The best fitting model was determined via an assessment (i.e., step 3) of fit indices, model testing, and model characteristics of 1- to 4- profiles (see Table 4). Additional models (i.e., 5 or more profiles) were not considered as the log-likelihood values were not replicated even after increasing the number of random starts (Spurk et al., 2020). The remaining models (i.e., 1-4 profiles) were then examined using fit indices. The fit indices employed (i.e., AIC and BIC) are similar in that both consider the complexity of the model given the sample size (Sinha et al., 2020). However, the AIC penalizes increasing model complexity with twice the number of parameters while the BIC penalizes using the log of N times the number of parameters (Lanza et al., 2013). Thus, a better fitting model is indicated by lower AIC and/or BIC values. Results indicated that both AIC and BIC values continuously dropped from the 1- to 4- profile solutions. As such, the fit indices favored more complex models (i.e., > 5 class solutions) which is expected as the fit indices of large samples (N > 500) with numerous indicators tends to erroneously favor more complex models (Sinha et al., 2020). Namely, the AIC (Tofighi & Enders, 2008; Morgan, 2015) overestimates the number of profiles

and the BIC (Morgan et al., 2016) overestimates profiles in non-normal data. As the fit indices incorrectly identified more complex models, model testing was considered using the VLMR test, adjusted LMR test, and the BLRT. To interpret model testing a non-significant p-value ($p > .05$) favors the previous model (k-1) as the best fitting model (Padgett & Tipton, 2020). The BLRT consistently yielded significant p-values which indicated the data best fits more complex profiles. However, previous research demonstrated that the BLRT may overestimate the number of profiles (Morin & Marsh, 2015) and has yet to be applied to non-normal data. As such, a greater emphasis on the VLMR and adjusted LMR test were placed for profile selection. It is important to note, the adjusted LMR has previously outperformed the BLRT by not overestimating the number of profiles in non-normally distributed data (Morgan et al., 2016). Regarding the VLMR and adjusted LMR tests, only the 4-profile solution yielded a nonsignificant values VLMR (VLMR $p = .52$; adjusted LMR $p = .53$) which suggested that the 3-profile solution best fit the data. Lastly, model characteristics (i.e., profile size and entropy) were evaluated. Regarding profile size, no LPA solutions included a profile containing less than 60 participants and entropy indicated a high level of classification accuracy across all profile models (0.84-1.00). Given the holistic assessment of latent profiles, the 3-profile solution was selected as the best fitting model for this data set. Consistent with hypothesis 1, the retained 3-profile solution contained multiple moderate symptoms profiles. However, the current study did not support a 4-profile solution as hypothesized. Thus, hypothesis 1 was partially supported.

Latent Profile Indicator Variables

Graphical representation of the 3-profile model can be found in Figure1. Profile means were transformed into z-scores for each indicator variable (i.e., PCL-5 subscales and AUDIT-C

items) to aid visualization. The resulting profiles demonstrated varying levels of PTSD symptoms, alcohol use frequency, alcohol quantity, and binge drinking frequency across the 3 profiles (i.e., step 4). The profile with the lowest reported trauma-symptoms and alcohol use (i.e., Profile 1), was named low trauma/ low alcohol. Profile 1 consisted of 38.4% of the current sample whose members reported the lowest values for all indicators variables. Specifically, Profile 1 contained participants who reported symptoms below half the midpoint for all PCL-5 subscales and endorsed the lowest possible drinking patterns (i.e., less than 1 standard drink monthly with less than monthly binge episodes). Both Profiles 2 and 3 yielded moderate trauma symptom estimates but diverged regarding alcohol-related patterns. Namely, Profile 2 members reported similar alcohol consumption to Profile 1. As such, Profile 2 (i.e., 53.3% of the sample) was named moderate trauma/ low alcohol. In contrast, Profile 3 members reported the highest levels of alcohol indicators (i.e., frequency, quantity, and binge episodes) across profiles. Thus, Profile 3 was named moderate trauma/ high alcohol which represented 8.3% of the current sample.

Covariate Analysis

Using the identified 3-profile model, profile membership was regressed on to covariates of interest (i.e., self-reported resilience, past two-week depression, past two-week tobacco/nicotine use, and past two-week substance use) using logistic regression. As previously described, Profile 1 (low PTSD/low alcohol) reported the lowest severity trauma symptoms and lowest frequency and quantity alcohol use. Thus, Profile 1 was chosen as the reference group. Overall, differences when comparing Profile 1 to Profile 2, Profile 1 to Profile 3, and Profile 2 to

Profile 3 were analyzed. The following logistic regression results can be found in Table 5 with the associated odd ratios (i.e., step 5).

Consistent with hypothesis 2, participants with higher self-reported resilience were more likely to be in Profile 1 (i.e., low PTSD/low alcohol) when compared to Profiles 2 and 3. However, when analyzing the differences between Profile 2 and 3, participants in Profile 3 (i.e., moderate PTSD/high alcohol) endorsed higher self-reported resilience than Profile 2 (i.e., moderate PTSD/low alcohol).

In line with hypothesis 3, participants who endorsed higher levels of depression were more likely to be members of Profiles 2 and 3 (i.e., profiles with higher trauma symptoms) than Profile 1 (i.e., hypothesis 3). Unexpectedly, when comparing participants from either profile with moderate trauma symptoms (i.e., Profiles 2 and 3), participants who also endorsed high alcohol use with frequent binge episodes (i.e., Profile 3) were less likely to endorse past two-week depressive symptoms.

Inconsistent with hypothesis 4, past two-week tobacco/nicotine use and two-week substance use yielded insignificant results. Namely, all odds ratio 95% confidence intervals contained a value of 1. As such, there is no association between profile membership or the covariates (i.e., tobacco/nicotine use and substance use).

Discussion

The current study sought to identify homogenous subgroups of Veterans and ADSMs who reported trauma- and alcohol-related symptoms using time- and cost-effective measures via person-centered analyses. Aside from replicating previous LVMM investigations (Panza et al.,

2021) of the same symptoms in a similar population (i.e., treatment-seeking Veterans), the current study intended to broaden the indicator variables by including the full range of symptom severity. In addition, the current study aimed to deepen our understanding of the resulting subgroups through related constructs such as substance use, depression, and self-reported resilience. Generally, the results indicated that ADSMs and Veterans reported a mild to moderate range of co-occurring trauma- and alcohol-related symptoms, and that those reported symptoms can be used to generate the three distinct profiles. The current findings also demonstrated that each identified profile differed based on self-reported depression, substance use, and self-perceived resilience.

Latent profile analysis was chosen for the current study as it fits the overall research aims. Namely, the conducted study investigated subgroups of PTSD- and alcohol-related symptoms and aimed to understand the relationship of these subgroups with covariates of interest (Collins & Lanza, 2013; Howard & Hoffman, 2018). Further support of utilizing a person-centered approach (i.e., LVMM) is also warranted when subgroups of interest consist of co-occurrent symptoms from different diagnostic categories (Saunders et al., 2016). Identifying latent profiles of co-occurring trauma- and alcohol-related symptoms may be used to inform clinical decision making.

The current study illustrates that PTSD- and alcohol-related symptoms coalesce into qualitatively and quantitatively different homogenous subgroups among Veterans and ADSMs. It was hypothesized that the current sample would yield a 4-profile solution consisting of the following profiles: High PTSD/High alcohol with frequent binge episodes, Moderate PTSD/ Moderate alcohol with frequent binge episodes, Moderate PTSD/Moderate alcohol without binge episodes, and Low PTSD/Low alcohol without binge episodes. In contrast, the current sample

best fits a 3-profile solution containing a low PTSD/ low alcohol profile (i.e., profile 1), a moderate PTSD/low alcohol profile (i.e., profile 2), and a moderate PTSD/ high alcohol profile (i.e., profile 3). The current 3-profile solution is quantitatively similar to previous research (Panza et al., 2021) and contains one qualitatively similar subgroup. Specifically, each study consists of a moderate PTSD/low alcohol subgroup. However, the remaining participant subgroups differ. The current findings indicate the existence of a low PTSD/low alcohol profile and a moderate PTSD/high alcohol profile. Conversely, previous research has yielded a high PTSD/high AUD impairment and low PTSD/high AUD impairment subgroups (Panza et al., 2021). Overall, previous research yielded higher symptom severity across participant subgroups.

The qualitative differences across samples may be attributed to a combination of sample characteristics and assessment measures. Regarding sample characteristics, the current study included treatment-seeking participants who endorsed a PTSD criterion A event and with any level of alcohol use. However, the Panza (2021) study only included treatment-seeking participants who endorsed subthreshold or threshold PTSD, and current AUD with 20 days of heavy alcohol use (i.e., $\geq$4 standard drinks for woman, $\geq$5 standard drinks for men) within the past 90 days. As such, previous research yielded latent subgroups based on a restricted and perhaps elevated range of symptoms presentations when compared to the current study. Specifically, 91.7% of the current sample fell below the alcohol inclusion criteria (i.e., current AUD and 20 days of heavy alcohol use within the past 90 days) found within the Panza study's (2021) sample. Thus, the current sample consisted of a predominantly mild to moderate self-reported alcohol use when compared to previous research which partially explains qualitatively different latent profiles.

Assessment measures may also explain the qualitative differences between the current study's findings and previous research. Regarding PTSD symptoms, the current study utilized the PCL-5 while the Panza study (2021) utilized the CAPS-5. Although both measures assess PTSD symptoms, the PCL-5 captures self-reported distress related to PTSD symptoms (Bovin & Marx, 2023) while the CAPS-5 combines the intensity and frequency of PTSD symptoms to capture the presence or absence of DSM-5 PTSD criteria (Weathers et al., 2018). As the number of items and the range of possible total scores are identical, comparisons of PCL-5 and CAPS-5 total scores consistently illustrate that PCL-5 total scores are 8-20 points higher than CAPS-5 total scores (Resick et al., 2023). As such, differences in administration (i.e., participant versus clinician-administrated) and assessment instructions may account for the divergence of latent subgroups between the current study and previous research (Panza et al., 2021).

Despite the lack of support for a 4-profile model, the current study did lend partial support for hypothesis 1. Specifically, 2 out of the 3 profiles did consist of moderate PTSD symptoms. Consistent with the larger PTSD LVMM literature, previous samples have identified moderate PTSD symptom subgroups (Maguen et al., 2013; Sripada et al., 2020). However, each study has resulted in qualitatively different moderate subgroups. In a residential treatment-seeking sample of Veterans, a moderate PTSD group with high re-experiencing symptoms and another with high emotional numbing symptoms emerged (Sripada et al., 2020). In contrast, one moderate PTSD group with high emotional numbing and another with low emotional numbing best fit a sample of non-treatment seeking OEF/OIF Veterans (Maguen et al., 2013). Whereas the current sample resulted in 2 moderate PTSD subgroups with different alcohol-related severities (i.e., moderate PTSD/low alcohol, moderate PTSD/high alcohol). One possible reason for this divergence may be the type of latent indicators included in each model. Based on study aims,

previous research has solely included PTSD-related latent indicators while the current study focused on co-occurring PTSD and alcohol indicators. In contrast, Panza and colleagues (2021) included both PTSD and AUD indicators into an LCA model and did not identify multiple moderate subgroups. Namely, a moderate PTSD/low AUD impairment, high PTSD/high AUD impairment, and a low PTSD/high AUD impairment best fit a sample of treatment-seeking Veterans. Collectively, the conducted study lent partial support for hypothesis 1.

Partial support regarding the relationship between resilience and profile membership was also documented. We hypothesized that participants with higher self-reported resilience scores were more likely to reside within profiles containing less severe PTSD and less frequent binge episodes (i.e., hypothesis 2). Based on covariate analyses, participants with the lowest PTSD symptoms and alcohol consumption (i.e., Profile 1) reported the highest resilience scores. Unlike Profile 1, the moderate PTSD profiles with low alcohol use (i.e., Profile 2) and high alcohol (i.e., Profile 3) consisted of participants whom reported significantly lower self-reported resilience. It appears the overall pattern of results are consistent with previous research. Among samples of post-9/11 Veterans, resilience has inversely related to psychopathology, including PTSD, alcohol use, drug use and depressive symptoms (Green et al., 2010; Green et al, 2014; Mansfield et al., 2011; Pietrzak et al., 2011, Pietrzak & Southwick, 2011). Thus, resilience continues to demonstrate a negative relationship with psychopathology among Veterans and ADSMs. However, a better understanding of resilience and its many conceptualizations (i.e., trait, process, outcome, and consequence) is necessary for future research. For instance, the current results could be interpreted as a result of a buffer which an individual possessed prior to adversity, or it could be a response to a stressor. Thus, additional research using a longitudinal design may further develop our understanding of resilience and its relationship to psychopathology. Despite

the overall support of hypothesis 2, there remains an unexpected finding between the moderate symptom profiles. Namely, participants in the moderate PTSD/high alcohol profile (i.e., Profile 3) endorsed greater resilience scores than participants in the moderate PTSD/low alcohol profile (i.e., Profile 2). Not only is this finding contrary to the conducted study's hypotheses, it is contrary to previous literature. To date, no previous study has demonstrated that participants with moderate PTSD/high alcohol ratings (i.e., Profile 3) have greater perceived resilience than those with moderate PTSD/low alcohol ratings (i.e., Profile 2). Regarding differences in reported alcohol use, participants in Profile 3 (i.e., moderate PTSD/high alcohol) averaged 5-6 standard drinks (SD) approximately 2-3 time per week with monthly binge drinking. Whereas, participants in Profile 2 (i.e., moderate PTSD/low alcohol) drank less than 3 SD less than 2-4 times per month with less than monthly binge drinking. One possible explanation may involve misperceptions regarding alcohol use. As a Veteran or ADSM engages in a regular pattern of elevated alcohol use, then the maintenance of their symptoms may be misperceived as resilience. Namely, CD-RISC-10 items, such as "Coping with stress can strengthen me" or "I can handle unpleasant feelings" may be endorsed at different rates based on profile membership. Participants who maintain their elevated alcohol use, rather than cycle in and out of heavy use, may perceive themselves to be coping well and thus, resilient. In contrast, individuals who engage in minimal alcohol use with less than monthly binge drinking (i.e., Profile 2), may interpret their inconsistent alcohol use as evidence of maladaptive coping and in turn, less resilient.

Another possible explanation may include the beliefs that participants have regarding the link between PTSD symptoms and alcohol misuse. Namely, alcohol expectancies are the beliefs an individual holds concerning the perceived outcomes of their alcohol use (Leigh, 1989).

Alcohol expectancies consist of positive or negative beliefs which may facilitate a pleasant or unpleasant outcome for the drinker, respectively. Given the well-documented relationship between PTSD and alcohol use (Debell et al., 2014; Jacobsen et al., 2001; Lai, et al., 2015), research has expanded to now include PTSD-related alcohol expectancies. Researchers have also identified positive (i.e., belief that alcohol would improve PTSD symptoms) and negative (i.e., belief that alcohol would worsen PTSD symptoms) PTSD-related alcohol expectancies (Norman et al., 2008). Participants who reported moderate PTSD/high alcohol (i.e., Profile 3) may have reported greater resilience scores than participants with moderate PTSD/low alcohol (i.e., Profile 2) due to beliefs regarding the function of their alcohol use. In other words, participants with the highest reported alcohol use may have reported greater resilience scores as they believe alcohol was managing their PTSD symptoms (i.e., positive PTSD-related alcohol expectancies). Although the conducted study did not assess for alcohol expectancies, previous research has demonstrated a relationship between PTSD-related alcohol expectancies and symptom severity among combat Veterans (McDevitt-Murphy et al., 2017). Researchers found that only high or moderate levels of positive PTSD-related alcohol expectancies functioned as a moderator between PTSD and hazardous drinking. Thus, cognitions regarding the interplay between PTSD and alcohol misuse warrant further investigation.

It is important to note these results are only applicable to other studies which utilize the unidimensional conceptualization of resilience. Consistent with the conducted study, resilience may be considered a unidimensional construct which signals a positive adaptation in the face of significant adversity (Fletcher & Sarkar, 2003). Resilience as a unidimensional construct has consistently been supported by Bonanno and colleagues. Through longitudinal investigations, Bonanno and colleagues consider resilience as a trajectory of stable, healthy levels of

psychological functioning occurring pre- and post- adversity (Bonanno, 2004; Bonanno & Diminich, 2013, Bonanno et al., 2011; Bonanno et al., 2015). Criticisms regarding unidimensional resilience research cite the disproportionate use of brief self-report measures (i.e., CD-RISC) or singular outcomes (i.e., depression) as limitations (Infurna & Luthar, 2018). Thus, there is growing a focus on a multidimensional operationalization of resilience. Initial support of the multidimensional nature of resilience was demonstrated by participants who experienced spousal loss (Infurna & Luthar, 2017). Researchers identified a total of five indicators involved in well-being (i.e., life satisfaction, negative affect, positive affect) and health (i.e., perceptions of general health and physical functioning) which they considered facets of multidimensional resilience. Infurna and Luthar (2017) found that each indicator resulted in different rates of a resilient trajectory. Furthermore, researchers identified that combining each resilient indicator (i.e., multidimensional resilience) also resulted in a different rate of resilience within the same sample. As such, defining and operationalizing resilience to include larger numbers of adjustment domains (i.e., multidimensional construct) yields disparate findings when compared to unidimensional models of resilience. Thus, research is warranted to investigate multidimensional resilience amongst high-risk populations, such as ADSMs and Veterans.

The conducted study partially supported the third hypothesis, in which profiles with higher symptoms severities were hypothesized to contain participants who endorsed higher levels of depressive symptoms. When compared to the profile with the lowest symptom severity (i.e., Profile 1; low PTSD/low alcohol), both moderate symptom profiles endorsed higher depressive scores. Interestingly, the moderate PTSD profile with the lower reported alcohol consumption (i.e., Profile 2) endorsed greater depression scores than the moderate PTSD profile with the greatest alcohol consumption (i.e., Profile 3). Despite, the logistic regression's

significant difference between these profiles, the profile means indicate each profile falls within the moderately severe level of depression.

The results did not support the hypothesis that past two-week nicotine/tobacco use and past two-week substance use would be significantly predictive of profile membership (i.e., hypothesis 4). While nicotine/tobacco and substance have been traditionally linked to PTSD and alcohol-related symptoms, it was not demonstrated in the current sample. One possible explanation for this divergence is the low rates of endorsement within the sample. Namely, 23.9% of the sample endorsed past two-week nicotine/tobacco use and 32.7% endorsed past-two week substance use. Furthermore, low frequency of past two-week nicotine/tobacco use (*M*= 3.54 days) and substance use (*M*= 1.9 days) was also evident within the current sample. Whereas, 11.7% of a sample of combat-exposed Veterans (Sheerin et al., 2019) endorsed hazardous alcohol use (Sheerin et al., 2019) and ultimately, found predictive relationships between substance use and greater severities of psychopathology (i.e., trauma and alcohol related symptoms). Thus, the sample may not have contained a sufficient number of participants who endorsed frequent tobacco or substance use to replicate this finding. Future research is warranted to replicate this finding through recruitment of participant samples which result in a full range of nicotine/tobacco and substance use quantity and frequency.

Limitations and Future Directions

The present study consists of several methodological shortcomings which may be improved upon by future research. Namely, the present study relied on cross-sectional data to identify participant profiles. Although cross-sectional data is necessary to establish latent profiles, it does not illustrate the long-term utility of subgroup identification. Previous research

has investigated the clinical utility of class or profile membership through treatment outcomes. Most notably, Panza and colleagues (2021) identified a 3-class model and then conducted multilevel models to compare latent classes on treatment outcomes across post-treatment, 3- and 6- month follow ups. Overall, results indicated that post-treatment and 6-month post treatment outcomes differed based on class membership. Moreover, longitudinal research designs would allow for the investigation of possible changes in subgroup symptom endorsement over time. As psychiatric symptoms change over time, it would be beneficial to track profile membership longitudinally using latent transition analysis (LTA). Whether or not a participant's profile membership changes over time would aid treatment planning. Thus, additional longitudinal research to investigate the validity and clinical utility of these homogenous subgroups is warranted.

The findings of the current study are also limited due to a lack of replication. Researchers have cautioned against the utility of latent subgroups in isolation (Saunders et al., 2016). Across the LVMM literature, researchers have identified the best LPA/LCA model for their sample and investigated the clinical utility of this model within the same data set. However, questions remain as to whether these isolated models would be replicated or prove to be clinically useful when investigated in different samples or treatment settings (Chekroud & Koutsouleris, 2018). Future research is warranted to replicate the identified 3-profile solution using a different sample and to conduct analyses which test its clinical utility across samples and settings.

Consideration of different study measures is also warranted. The present study exclusively utilized self-report measures which prioritize practicality over validity and reliability. Although all measures demonstrated good psychometric properties, none captured the same time

period. Both indicator variables and covariates ranged from assessing the past two-weeks up to the past year, and those differences could make it difficult to account for the true relationships among the variables. Regarding the assessment of trauma-related symptoms, research has indicated that PCL-5 scores are consistently elevated when compared to CAPS-5 total scores (Resick et al., 2023). PTSD symptom discrepancies may be attributed to participant reporting styles. Researchers hypothesized that PCL-5 overreporting may be attributed to a lack of understanding of accurate symptoms (Kramer et al., 2023), PTSD-related inattentiveness (van Minnen et al., 2020) or their own general distress (Resick et al., 2023). In contrast, participants may have underreported alcohol and substance use. Namely, the current sample endorsed low rates of alcohol and substance use when compared to other treatment seeking military samples. In a sample of VA treatment-seeking Veterans (Brown et al., 2022), participants' average drinks per drinking day (i.e., 8.93) is significantly greater than the current sample's average of approximately 1-2 drinks per day. Similar differences were also documented within a Veteran treatment-seeking sample in non-VA facilities (Boscarino et al., 2015), as 11.9% were classified as heavy drinkers (i.e., 15 or more drinks per week for men; 8 or more drinks per week for women). Whereas the current sample only contained 8.3% of participants who endorsed 5-6 standard drinks (SDs) approximately 2-3x/week on the AUDIT-C. Thus, the current sample endorsed fewer and less frequent alcohol use than previously published estimates among treatment-seeking Veterans. Although neither referring treatment providers nor treatment-seeking ADSMs or Veterans were provided with substance-related program expectations prior to the intake, many may have had preconceived sobriety-related assumptions. Thus, participants may have underreported their current alcohol and or substance use to ensure a higher likelihood of acceptance into the treatment program. To reduce the effect of symptom overreporting and or

underreporting, researchers may consider clinician administered assessments, collateral reports, or a combination of assessment measures capturing the same time period to accurately measure trauma- and substance-related variables.

Conclusions

The conducted study was the first to identify latent profiles of co-occurring PTSD and alcohol misuse among Veterans and ADSMs using time and cost-effective assessment measures. The study aimed to replicate the latent subgroups of PTSD/AUD symptoms found by Panza and colleagues (2021) using a large sample and extend their findings by including participants whom reported subthreshold symptoms. The current study also extended previous research by examining how quantitative and qualitative subgroup differences in PTSD symptoms and alcohol misuse relate to resiliency and other related constructs (i.e., depression, substance use, and nicotine use). Similar to previous research, a 3-profile model best fit comorbid self-reported PTSD/alcohol misuse. However, the current model contained qualitatively different subgroups which could be due to differences in assessment measures or the mild to moderate symptom range reported by the sample. Regarding covariates, both depression and resilience were significantly predictive of profile membership and as such, consistent with the literature. Regardless of these findings, participants who reported moderate PTSD symptoms with high alcohol use (i.e., Profile 3) reported greater resilience and less depressive symptoms than the remaining profiles with significantly less reported alcohol use (i.e., Profiles 1 and 2). The unexpected findings may be attributed to participants' PTSD-related alcohol expectancies. Lastly, neither nicotine/tobacco nor substance use were significantly predictive of profile membership which may be due to low endorsement rates.

The conducted study adds to the collective understanding of comorbid trauma- and alcohol-related symptoms, which may be beneficial for research and clinical work, alike. Both researchers and clinical providers have investigated how to treat these co-occurring symptoms. Although treatment-seeking Veterans and ADSMs respond to both concurrent and integrated treatment programs, there still exists a proportion of patients who symptoms persist via variable-centered analyses. The current study has expanded our initial understanding of how person-centered analyses may identify subgroups which may explain differential treatment responses. Specifically, how profiles of trauma- and alcohol-related symptoms may be associated with covariates of interest (i.e., self-reported depression, substance use, and resilience). To date, only one study has investigated differential treatment responses in a categorical manner using classes of trauma- and alcohol-related symptoms. Namely, Panza and colleagues (2021) identified 3 classes and found that class membership was predictive of treatment response among treatment-seeking Veterans diagnosed with PTSD and AUD. The current study identified symptom profiles in a dimensional manner which included subthreshold trauma- and alcohol-related symptoms. Utilizing the identified latent profiles could inform treatment outcome studies for participants who identify mild to moderate symptom severities. Thus, future research is warranted to utilize latent profiles to predict treatment response.

References

Agrawal, A., Lynskey, M. T., Madden, P. A. F., Bucholz, K. K., & Heath, A. C. (2007). A latent class analysis of illicit drug abuse/dependence: Results from the National Epidemiological Survey on Alcohol and Related Conditions. *Addiction, 102*(1), 94–104. https://doi-org.spot.lib.auburn.edu/10.1111/j.1360-0443.2006.01630.x

Akaike, H. (1998). Information theory and an extension of the maximum likelihood principle. In Selected papers of hirotugu akaike (pp. 199-213). New York, NY: Springer New York.

American Psychiatric Association. (2013). *Diagnostic and statistical manual of mental disorder*s (5th ed.). https://doi.org/10.1176/appi.books.9780890425596

Andersen, S. B., Karstoft, K.-I., Bertelsen, M., & Madsen, T. (2014). Latent trajectories of trauma symptoms and resilience: The 3-year longitudinal prospective USPER study of Danish veterans deployed in Afghanistan. *The Journal of Clinical Psychiatry, 75*(9), 1001–1008. https://doi-org.spot.lib.auburn.edu/10.4088/JCP.13m08914

Asparouhov, T., & Muthén, B. (2014). Auxiliary variables in mixture modeling: Three-step approaches using M plus. Structural equation modeling: A multidisciplinary Journal, 21(3), 329-341. https://doi.org/10.1080/10705511.2014.915181

Babor T. F., de la Fuente J. R., Saunders J., Grant M. (2001). The Alcohol Use Disorders Identification Test: Guidelines for use in primary health care. (WHO Publication No. 92.4). World Health Organization, Geneva, Switzerland. https://www.paho.org/sites/default/files/Auditmanual_ENG.pdf

Back, S. E., Foa, E. B., Killeen, T. K., Mills, K. L., Teesson, M., Cotton, B. D., Carroll, K., Brady, K. T., 2015. Concurrent Treatment of PTSD and Substance Use Disorders Using

Prolonged Exposure (COPE): Therapist Guide. Oxford University Press, Oxford, England.

Bámaca-Colbert, M. Y., & Gayles, J. G. (2010). Variable-centered and person-centered approaches to studying Mexican-origin mother–daughter cultural orientation dissonance. *Journal of Youth and Adolescence*, *39*(11), 1274–1292. https://doi-org.spot.lib.auburn.edu/10.1007/s10964-009-9447-3

Banfield, J. D., & Raftery, A. E. (1993). Model-Based Gaussian and Non-Gaussian Clustering. Biometrics, 49(3), 803–821. https://doi-org.spot.lib.auburn.edu/10.2307/2532201

Betancourt, J. A., Granados, P. S., Pacheco, G. J., Reagan, J., Shanmugam, R., Topinka, J. B., Beauvais, B. M., Ramamonjiarivelo, Z. H., & Fulton, L. V. (2021). Exploring Health Outcomes for U.S. Veterans Compared to Non-Veterans from 2003 to 2019. *Healthcare (Basel, Switzerland)*, *9*(5), 604. https://doi.org/10.3390/healthcare9050604

Blevins, C. A., Weathers, F. W., Davis, M. T., Witte, T. K., & Domino, J. L. (2015). The posttraumatic stress disorder checklist for DSM-5 (PCL-5): Development and initial psychometric evaluation. *Journal of Traumatic Stress*, *28*(6), 489–498. https://doi-org.spot.lib.auburn.edu/10.1002/jts.22059

Blevins, C. A., Weathers, F. W., & Witte, T. K. (2014). Dissociation and posttraumatic stress disorder: A latent profile analysis. *Journal of Traumatic Stress*, *27*(4), 388–396. https://doi-org.spot.lib.auburn.edu/10.1002/jts.21933

Bolck, A., Croon, M., & Hagenaars, J. (2004). Estimating Latent Structure Models with Categorical Variables: One-Step Versus Three-Step Estimators. *Political Analysis*, *12*(1), 3–27. Doi:10.1093/pan/mph001

Bonanno, G. A. (2004). Loss, Trauma, and Human Resilience: Have We Underestimated the Human Capacity to Thrive After Extremely Aversive Events? *American Psychologist, 59(*1), 20–28. https://doi-org.spot.lib.auburn.edu/10.1037/0003-066X.59.1.20

Bonanno, G. A., & Diminich, E. D. (2013). Annual research review: Positive adjustment to adversity—Trajectories of minimal–impact resilience and emergent resilience. *Journal of Child Psychology and Psychiatry, 54*(4), 378–401. https://doi-org.spot.lib.auburn.edu/10.1111/jcpp.12021

Bonanno, G. A., Romero, S. A., & Klein, S. I. (2015). The temporal elements of psychological resilience: An integrative framework for the study of individuals, families, and communities. *Psychological Inquiry*, *26*(2), 139–169. https://doi-org.spot.lib.auburn.edu/10.1080/1047840X.2015.992677

Bonanno, G. A., Westphal, M., & Mancini, A. D. (2011). Resilience to loss and potential trauma. *Annual Review of Clinical Psychology*, *7*, 511–535. https://doi-org.spot.lib.auburn.edu/10.1146/annurev-clinpsy-032210-104526

Boscarino, J. A., Hoffman, S. N., Pitcavage, J. M., & Urosevich, T. G. (2015). Mental Health Disorders and Treatment Seeking Among Veterans in Non-VA Facilities: Results and Implications from the Veterans' Health Study. *Military Behavioral Health, 3*(4), 244–254. https://doi.org/10.1080/21635781.2015.1077179

Bovin, M. J., & Marx, B. P. (2023). The problem with overreliance on the PCL–5 as a measure of PTSD diagnostic status. *Clinical Psychology: Science and Practice, 30*(1), 122–125. https://doi-org.spot.lib.auburn.edu/10.1037/cps0000119

Bovin, M. J., Marx, B. P., Weathers, F. W., Gallagher, M. W., Rodriguez, P., Schnurr, P. P., & Keane, T. M. (2016). Psychometric properties of the PTSD Checklist for Diagnostic and

Statistical Manual of Mental Disorders–Fifth Edition (PCL-5) in veterans. *Psychological Assessment, 28*(11), 1379–1391. https://doi-org.spot.lib.auburn.edu/10.1037/pas0000254

Bowe, A., & Rosenheck, R. (2015). PTSD and substance use disorder among veterans: Characteristics, service utilization and pharmacotherapy. *Journal of Dual Diagnosis, 11*(1), 22–32. https://doi-org.spot.lib.auburn.edu/10.1080/15504263.2014.989653

Bozdogan, H. (1987). Model selection and Akaike's Information Criterion (AIC): The general theory and its analytical extensions. *Psychometrika, 52*(3), 345–370. https://doi-org.spot.lib.auburn.edu/10.1007/BF02294361

Bradley, K. A., Bush, K. R., Epler, A. J., Dobie, D. J., Davis, T. M., Sporleder, J. L., Maynard, C., Burman, M. L., & Kivlahan, D. R. (2003). Two Brief Alcohol-Screening Tests From the Alcohol Use Disorders Identification Test (AUDIT): Validation in a Female Veterans Affairs Patient Population. *Archives of Internal Medicine*, *163*(7), 821–829.

Brancu, M., Wagner, H. R., Morey, R. A., Beckham, J. C., Calhoun, P. S., Tupler, L. A., Marx, C. E., Taber, K. H., Hurley, R. A., Rowland, J., McDonald, S. D., Hoerle, J. M., Moore, S. D., Kudler, H. S., Weiner, R. D., & Fairbank, J. A. (2017). The Post-Deployment Mental Health (PDMH) study and repository: A multi-site study of US Afghanistan and Iraq era veterans. I*nternational Journal of Methods in Psychiatric Research, 26*(3). https://doi-org.spot.lib.auburn.edu/10.1002/mpr.1570

Brown, D. G., Flanagan, J. C., Jarnecke, A., Killeen, T. K., & Back, S. E. (2022). Ethnoracial differences in treatment-seeking veterans with substance use disorders and co-occurring PTSD: Presenting characteristics and response to integrated exposure-based treatment. *Journal of ethnicity in substance abuse, 21*(3), 1141–1164. https://doi.org/10.1080/15332640.2020.1836699

Britt, T. W., Shen, W., Sinclair, R. R., Grossman, M. R., & Klieger, D. M. (2016). How much do we really know about employee resilience? *Industrial and Organizational Psychology: Perspectives on Science and Practice, 9*(2), 378–404. https://doi-org.spot.lib.auburn.edu/10.1017/iop.2015.107

Burnett-Zeigler, I., Ilgen, M., Valenstein, M., Zivin, K., Gorman, L., Blow, A., Duffy, S., & Chermack, S. (2011). Prevalence and correlates of alcohol misuse among returning Afghanistan and Iraq veterans. *Addictive Behaviors, 36*(8), 801–806. https://doi-org.spot.lib.auburn.edu/10.1016/j.addbeh.2010.12.032

Bush, K., Kivlahan, D. R., McDonell, M. B., Fihn, S. D., & Bradley, K. A. (1998). The AUDIT alcohol consumption questions (AUDIT-C): an effective brief screening test for problem drinking. *Archives of Internal Medicine, 158*(16), 1789-1795. https://doi.org/10.1001/archinte.158.16.1789

Cadigan, J. M., Klanecky, A. K., & Martens, M. P. (2017). An examination of alcohol risk profiles and co-occurring mental health symptoms among OEF/OIF veterans. *Addictive Behaviors, 70*, 54–60. https://doi-org.spot.lib.auburn.edu/10.1016/j.addbeh.2017.02.009

Calhoun, L.G., Tedeschi, R.G., 2014. Handbook of Posttraumatic Growth: Research and Practice. Psychology Press, New York.

Campbell, S. L., Kessler, R. C., Ursano, R. J., Sun, X., Taylor, C. T., Heeringa, S. G., Nock, M. K., Sampson, N. A., Jain, S., & Stein, M. B. (2018). Predictive validity and correlates of self-assessed resilience among US Army soldiers. *Depression and Anxiety, 35*(2), 122–131. https://doi-org.spot.lib.auburn.edu/10.1002/da.22694

Campbell-Sills, L., & Stein, M. B. (2007). Psychometric analysis and refinement of the Connor-Davidson Resilience Scale (CD-RISC): Validation of a 10-item measure of resilience.

Journal of Traumatic Stress, *20*(6), 1019–1028. https://doi-org.spot.lib.auburn.edu/10.1002/jts.2027

Campbell-Sills, L., Sun, X., Choi, K. W., He, F., Ursano, R. J., Kessler, R. C., Levey, D. F., Smoller, J. W., Gelernter, J., Jain, S., & Stein, M. B. (2022). Dissecting the heterogeneity of posttraumatic stress disorder: Differences in polygenic risk, stress exposures, and course of PTSD subtypes. *Psychological Medicine*, *52*(15), 3646–3654. https://doi-org.spot.lib.auburn.edu/10.1017/S0033291721000428

Chekroud, A. M., & Koutsouleris, N. (2018). The perilous path from publication to practice. *Molecular Psychiatry*, *23*(1), 24–25. https://doi-org.spot.lib.auburn.edu/10.1038/mp.2017.227

Collins, L. M., & Lanza, S. T. (2013). *Latent class and latent transition analysis: With applications in the social, behavioral, and health sciences*. John Wiley & Sons.

Collins, R. L., Parks, G. A., & Marlatt, G. A. (1985). Social determinants of alcohol consumption: The effects of social interaction and model status on the self-administration of alcohol. *Journal of Consulting and Clinical Psychology*, *53*(2), 189–200. https://doi-org.spot.lib.auburn.edu/10.1037/0022-006X.53.2.189

Connor, K. M., & Davidson, J. R. T. (2003). Development of a new resilience scale: The Connor-Davidson Resilience Scale (CD-RISC). *Depression and Anxiety*, *18*(2), 76–82. https://doi-org.spot.lib.auburn.edu/10.1002/da.10113

Contractor, A. A., Greene, T., Dolan, M., & Elhai, J. D. (2018). Relations between PTSD and depression symptom clusters in samples differentiated by PTSD diagnostic status. *Journal of Anxiety Disorders*, *59*, 17–26. https://doi-org.spot.lib.auburn.edu/10.1016/j.janxdis.2018.08.004

Cornum, R., Matthews, M. D., & Seligman, M. E. P. (2011). Comprehensive Soldier Fitness: Building resilience in a challenging institutional context. *American Psychologist, 66*(1), 4–9. https://doi-org.spot.lib.auburn.edu/10.1037/a0021420

Davis, L. L., Schein, J., Cloutier, M., Gagnon-Sanschagrin, P., Maitland, J., Urganus, A., ... & Houle, C. R. (2022). The economic burden of posttraumatic stress disorder in the United States from a societal perspective. *The Journal of Clinical Psychiatry, 83*(3), 40672. https://www.psychiatrist.com/jcp/trauma/ptsd/economic-burden-posttraumatic-stress-disorder-united-states-societal-perspective/

Dawson, D. A., Grant, B. F., Stinson, F. S., & Zhou, Y. (2005). Effectiveness of the Derived Alcohol Use Disorders Identification Test (AUDIT-C) in Screening for Alcohol Use Disorders and Risk Drinking in the US General Population. *Alcoholism: Clinical and Experimental Research*, *29*(5), 844–854. https://doi-org.spot.lib.auburn.edu/10.1097/01.ALC.0000164374.32229.A2

Debell, F., Fear, N. T., Head, M., Batt-Rawden, S., Greenberg, N., Wessely, S., & Goodwin, L. (2014). A systematic review of the comorbidity between PTSD and alcohol misuse. *Social Psychiatry and Psychiatric Epidemiology: The International Journal for Research in Social and Genetic Epidemiology and Mental Health Services*, *4*9(9), 1401–1425. https://doi-org.spot.lib.auburn.edu/10.1007/s00127-014-0855-7

Decker, S. E., Rosen, M. I., Cooney, N. L., Schnurr, P. P., & Black, A. C. (2021). Correspondence between retrospective and momentary self-reported posttraumatic stress disorder symptoms: Evidence for peak and end effects in veterans. *Journal of Traumatic Stress*. https://doi-org.spot.lib.auburn.edu/10.1002/jts.22669

de Visser, E. J., Dorfman, A., Chartrand, D., Lamon, J., Freedy, E., & Weltman, G. (2016). Building resilience with the Stress Resilience Training System: Design validation and applications. *Work: Journal of Prevention, Assessment & Rehabilitation, 54*(2), 351–366. https://doi-org.spot.lib.auburn.edu/10.3233/WOR-162295

DeViva, J. C., Rosen, M. I., Cooney, N. L., & Black, A. C. (2020). Ecological momentary assessment of sleep and PTSD symptoms in a veteran sample. *Psychological Trauma: Theory, Research, Practice, and Policy, 12*(2), 186–192. https://doi-org.spot.lib.auburn.edu/10.1037/tra0000494

Dziak, J. J., Bray, B. C., Zhang, J., Zhang, M., & Lanza, S. T. (2016). Comparing the performance of improved classify-analyze approaches for distal outcomes in latent profile analysis. *Methodology: European Journal of Research Methods for the Behavioral and Social Sciences, 12*(4), 107–116. https://doi.org/10.1027/1614-2241/a000114

Edwards, E. R., Barnes, S., Govindarajulu, U., Geraci, J., & Tsai, J. (2021). Mental health and substance use patterns associated with lifetime suicide attempt, incarceration, and homelessness: A latent class analysis of a nationally representative sample of US veterans. *Psychological Services, 18*(4), 619–631. https ://doi-org.spot.lib.auburn.edu/10.1037/ser0000488

Enders, C. K. (2010). *Applied missing data analysis*. New York, NY: Guilford Press.

Ferguson, S. L., G. Moore, E. W., & Hull, D. M. (2020). Finding latent groups in observed data: A primer on latent profile analysis in Mplus for applied researchers. International Journal of Behavioral Development, 44(5), 458-468. https://doi.org/10.1177/0165025419881721

Fine, T. H., Contractor, A. A., Tamburrino, M., Elhai, J. D., Prescott, M. R., Cohen, G. H., Shirley, E., Chan, P. K., Goto, T., Slembarski, R., Liberzon, I., Galea, S., & Calabrese, J.

R. (2013). Validation of the telephone-administered PHQ-9 against the in-person administered SCID-I major depression module. *Journal of Affective Disorders, 150*(3), 1001–1007. https://doi-org.spot.lib.auburn.edu/10.1016/j.jad.2013.05.029

First, M. B., Spitzer, R. L., Gibbon, M., Williams, J. B., 2002. Structured Clinical Interview for DSM-IV-TR Axis I Disorders, Patient Edition. In: Research Version. American Psychiatric Publishing, Washington, DC.

Flannery, B. A., Volpicelli, J. R., & Pettinati, H. M. (1999). Psychometric properties of the Penn Alcohol Craving Scale. *Alcoholism: Clinical and Experimental Research, 23*(8), 1289–1295. https://doi-org.spot.lib.auburn.edu/10.1097/00000374-199908000-00001

Fletcher, D., & Sarkar, M. (2013). Psychological resilience: A review and critique of definitions, concepts, and theory. *European Psychologist, 18*(1), 12–23. https://doi-org.spot.lib.auburn.edu/10.1027/1016-9040/a000124

Fuehrlein, B. S., Mota, N., Arias, A. J., Trevisan, L. A., Kachadourian, L. K., Krystal, J. H., Southwick, S. M., & Pietrzak, R. H. (2016). The burden of alcohol use disorders in US military veterans: Results from the National Health and Resilience in Veterans Study. *Addiction, 111*(10), 1786–1794. https://doi-org.spot.lib.auburn.edu/10.1111/add.13423

Fulton, J. J., Calhoun, P. S., Wagner, H. R., Schry, A. R., Hair, L. P., Feeling, N., Elbogen, E., & Beckham, J. C. (2015). The prevalence of posttraumatic stress disorder in Operation Enduring Freedom/Operation Iraqi Freedom (OEF/OIF) veterans: A meta-analysis. *Journal of Anxiety Disorders, 31*, 98–107. https://doi-org.spot.lib.auburn.edu/10.1016/j.janxdis.2015.02.003

Galatzer-Levy, I. R., & Bryant, R. A. (2013). 636,120 ways to have posttraumatic stress disorder. *Perspectives on Psychological Science, 8*(6), 651–662. https://doi-org.spot.lib.auburn.edu/10.1177/1745691613504115

Gallaway, M. S., Millikan, A. M., & Bell, M. R. (2011). The association between deployment-related posttraumatic growth among US Army soldiers and negative behavioral health conditions. *Journal of Clinical Psychology, 67*(12), 1151–1160. https://doi-org.spot.lib.auburn.edu/10.1002/jclp.20837

Government Accountability Office. (2021, May 17). *Veterans' Growing Demand for Mental Health Services*. GAO. https://www.gao.gov/products/gao-21-545sp

Grant, B. F., Goldstein, R. B., Saha, T. D., Chou, S. P., Jung, J., Zhang, H., Pickering, R. P., Ruan, W. J., Smith, S. M., Huang, B., & Hasin, D. S. (2015). Epidemiology of DSM-5 alcohol use disorder: Results from the National Epidemiologic Survey on Alcohol and Related Conditions III. *JAMA Psychiatry, 72*(8), 757–766. https ://doi-org.spot.lib.auburn.edu/10.1001/jamapsychiatry.2015.0584

Green, K. T., Beckham, J. C., Youssef, N., & Elbogen, E. B. (2014). Alcohol misuse and psychological resilience among US Iraq and Afghanistan era veterans. *Addictive Behaviors, 3*9(2), 406–413. https://doi-org.spot.lib.auburn.edu/10.1016/j.addbeh.2013.08.024

Green, K. T., Calhoun, P. S., Dennis, M. F., & Beckham, J. C. (2010). Exploration of the resilience construct in posttraumatic stress disorder sensitivity and functional correlates in military combats veterans who have served since September 11, 2001. *The Journal of Clinical Psychiatry, 71*(7), 823–830. https://doi-org.spot.lib.auburn.edu/10.4088/JCP.09m05780blu

Grucza, R. A., Sher, K. J., Kerr, W. C., Krauss, M. J., Lui, C. K., McDowell, Y. E., Hartz, S., Virdi, G., & Bierut, L. J. (2018). Trends in adult alcohol use and binge drinking in the early 21st-Century United States: A meta-analysis of 6 national survey series. *Alcoholism: Clinical and Experimental Research*, *42*(10), 1939–1950. https://doi-org.spot.lib.auburn.edu/10.1111/acer.13859

Hansen, M., Ross, J., & Armour, C. (2017). Evidence of the dissociative PTSD subtype: A systematic literature review of latent class and profile analytic studies of PTSD. *Journal of Affective Disorders, 213*, 59–69. https://doi-org.spot.lib.auburn.edu/10.1016/j.jad.2017.02.004

Harwood, H. J., Zhang, Y., Dall, T. M., Olaiya, S. T., & Fagan, N. K. (2009). Economic implications of reduced binge drinking among the military health system's TRICARE Prime plan beneficiaries. *Military Medicine, 174*(7), 728–736. https://doi-org.spot.lib.auburn.edu/10.7205/MILMED-D-03-9008

Hasin, D. S., Keyes, K. M., Hatzenbuehler, M. L., Aharonovich, E. A., & Alderson, D. (2007). Alcohol consumption and posttraumatic stress after exposure to terrorism: Effects of proximity, loss, and psychiatric history. *American Journal of Public Health, 97*(12), 2268–2275. https://doi-org.spot.lib.auburn.edu/10.2105/AJPH.2006.100057

Hébert, M., Parent, N., Simard, C., & Laverdière, A. (2018). Validation of the French Canadian version of the brief Connor–Davidson Resilience Scale (CD-RISC 10). *Canadian Journal of Behavioural Science/Revue canadienne des sciences du comportement, 50*(1), 9. http://dx.doi.org/10.1037/cbs0000092

Hoge, C. W., Castro, C. A., Messer, S. C., McGurk, D., Cotting, D. I., & Koffman, R. L. (2004). Combat Duty in Iraq and Afghanistan, Mental Health Problems, and Barriers to Care. *The*

New England Journal of Medicine, 351(1), 13–22. https://doi-org.spot.lib.auburn.edu/10.1056/NEJMoa040603

Howard, M. C., & Hoffman, M. E. (2018). Variable-centered, person-centered, and person-specific approaches: Where theory meets the method. *Organizational Research Methods, 21*(4), 846–876. https://doi-org.spot.lib.auburn.edu/10.1177/1094428117744021

Infurna, F. J., & Luthar, S. S. (2017). The multidimensional nature of resilience to spousal loss. *Journal of Personality and Social Psychology, 112*(6), 926–947. https://doi-org.spot.lib.auburn.edu/10.1037/pspp0000095.supp (Supplemental)

Infurna, F. J., & Luthar, S. S. (2018). Re-evaluating the notion that resilience is commonplace: A review and distillation of directions for future research, practice, and policy. *Clinical Psychology Review, 65*, 43–56. https://doi-org.spot.lib.auburn.edu/10.1016/j.cpr.2018.07.003

Ioannidis, K., Askelund, A. D., Kievit, R. A., & van Harmelen, A. L. (2020). The complex neurobiology of resilient functioning after childhood maltreatment. *BMC medicine, 18*(1), 32. https://doi.org/10.1186/s12916-020-1490-7

Isaacs, K., Mota, N. P., Tsai, J., Harpaz-Rotem, I., Cook, J. M., Kirwin, P. D., Krystal, J. H., Southwick, S. M., & Pietrzak, R. H. (2017). Psychological resilience in US military veterans: A 2-year, nationally representative prospective cohort study. *Journal of Psychiatric Research, 84*, 301–309. https://doi-org.spot.lib.auburn.edu/10.1016/j.jpsychires.2016.10.017

Jacobson, I. G., Ryan, M. A. K., Hooper, T. J., Smith, T. C., Amoroso, P. J., Boyko, E. J., Gackstetter, G. D., Wells, T. S., & Bell, N. S. (2008). Alcohol use and alcohol-related problems before and after military combat deployment. *JAMA: Journal of the American*

*Medical Association, 300(*6), 663–675. https://doi-org.spot.lib.auburn.edu/10.1001/jama.300.6.663

Jacobsen, L. K., Southwick, S. M., & Kosten, T. R. (2001). Substance use disorders in patients with posttraumatic stress disorder: A review of the literature. *The American Journal of Psychiatry, 158*(8), 1184–1190. https://doi-org.spot.lib.auburn.edu/10.1176/appi.ajp.158.8.1184

Jakupcak, M., Tull, M. T., McDermott, M. J., Kaysen, D., Hunt, S., & Simpson, T. (2010). PTSD symptom clusters in relationship to alcohol misuse among Iraq and Afghanistan war veterans seeking post-deployment VA health care. *Addictive Behaviors, 35*(9), 840–843. https://doi-org.spot.lib.auburn.edu/10.1016/j.addbeh.2010.03.023

Karstoft, K.-I., Armour, C., Elklit, A., & Solomon, Z. (2015). The role of locus of control and coping style in predicting longitudinal PTSD-trajectories after combat exposure. *Journal of Anxiety Disorders, 32*, 89–94. https://doi-org.spot.lib.auburn.edu/10.1016/j.janxdis.2015.03.007

Kaysen, D., Bedard-Gilligan, M. A., & Stappenbeck, C. A. (2017). PTSD and alcohol associations among trauma-exposed women: Critical questions for the field. *Clinical Psychology: Science and Practice, 24*(1), 23–26. https://doi-org.spot.lib.auburn.edu/10.1111/cpsp.12168

Kessler, R. C., Heeringa, S. G., Stein, M. B., Colpe, L. J., Fullerton, C. S., Hwang, I., Naifeh, J. A., Nock, M. K., Petukhova, M., Sampson, N. A., Schoenbaum, M., Zaslavsky, A. M., & Ursano, R. J. (2014). Thirty-day prevalence of DSM-IV mental disorders among nondeployed soldiers in the US Army: Results from the Army Study to Assess Risk and

Resilience in Servicemembers (Army STARRS). *JAMA Psychiatry*, *71*(5), 504–513. https://doi-org.spot.lib.auburn.edu/10.1001/jamapsychiatry.2014.28

Kilpatrick, D. G., Resnick, H. S., Milanak, M. E., Miller, M. W., Keyes, K. M., & Friedman, M. J. (2013). National estimates of exposure to traumatic events and PTSD prevalence using DSM-IV and DSM-5 criteria. *Journal of Traumatic Stress*, *26*(5), 537–547. https://doi-org.spot.lib.auburn.edu/10.1002/jts.21848

Kline, R. B. (2016). *Principles and practice of structural equation modeling* (Fourth Edition). New York, NY: Guilford Press.

Kossek, E. E., & Perrigino, M. B. (2016). Resilience: A review using a grounded integrated occupational approach. *The Academy of Management Annals*, *10*(1), 729–797. https://doi-org.spot.lib.auburn.edu/10.1080/19416520.2016.1159878

Kramer, L. B., Whiteman, S. E., Petri, J. M., Spitzer, E. G., & Weathers, F. W. (2023). Self-rated versus clinician-rated assessment of posttraumatic stress disorder: An evaluation of discrepancies between the PTSD checklist for DSM-5 and the Clinician-Administered PTSD Scale for DSM-5. *Assessment*, *30*(5), 1590–1605. https://doi-org.spot.lib.auburn.edu/10.1177/10731911221113571

Kroenke, K., & Spitzer, R. L. (2002). The PHQ-9: A new depression diagnostic and severity measure. *Psychiatric Annals*, *32*(9), 509–515. https://doi-org.spot.lib.auburn.edu/10.3928/0048-5713-20020901-06

Lai, H. M. X., Cleary, M., Sitharthan, T., & Hunt, G. E. (2015). Prevalence of comorbid substance use, anxiety and mood disorders in epidemiological surveys, 1990–2014: A systematic review and meta-analysis. D*rug and Alcohol Dependence*, *154*, 1–13. https://doi-org.spot.lib.auburn.edu/10.1016/j.drugalcdep.2015.05.031

Lanza, S. T., Tan, X., & Bray, B. C. (2013). Latent class analysis with distal outcomes: A flexible model-based approach. *Structural equation modeling: a multidisciplinary journal, 20*(1), 1-26. https://doi.org/10.1080/10705511.2013.742377

Laursen, B. P., & Hoff, E. (2006). Person-centered and variable-centered approaches to longitudinal data. Merrill-Palmer Quarterly, 52, 377-389. http://dx.doi.org/10.1353/mpq.2006.0029

Law, E. H., & Harrington, R. (2016). A primer on latent class analysis. Value & Outcomes Spotlight, 2(6), 18-19. https://www.ispor.org/docs/default-source/publications/value-outcomes-spotlight/november-december-2016/vos-primer-on-latent-class-analysis.pdf?sfvrsn=52b359b7_2#:~:text=LCA%20is%20a%20person%2Dcentered,construct%20or%20variable%20(Table)

Leeies, M., Pagura, J., Sareen, J., & Bolton, J. M. (2010). The use of alcohol and drugs to self-medicate symptoms of posttraumatic stress disorder. Depression and Anxiety, 27(8), 731–736. https://web-s-ebscohost-com.spot.lib.auburn.edu/ehost/pdfviewer/pdfviewer?vid=64&sid=28d16dad-1e65-4179-a309-7f853441f291%40redis

Leigh, B. C. (1989). In search of the seven dwarves: Issues of measurement and meaning in alcohol expectancy research. *Psychological Bulletin, 105*(3), 361–373. https://doi-org.spot.lib.auburn.edu/10.1037/0033-2909.105.3.361

Litz BT. (2014). Resilience in the aftermath of war trauma: a critical review and commentary. Interface Focus 4: 20140008. http://dx.doi.org/10.1098/rsfs.2014.0008

Lo, Y., Mendell, N. R., & Rubin, D. B. (2001). Testing the Number of Components in a Normal Mixture. *Biometrika, 88*(3), 767–778. http://www.jstor.org/stable/2673445

Lorber, M. F., Heyman, R. E., & Slep, A. M. S. (2017). A longitudinal investigation of the psychological health of United States Air Force base communities. *Journal of Community Psychology, 45*(8), 1033–1049. https://doi-org.spot.lib.auburn.edu/10.1002/jcop.21909

MacCallum, R. C., Zhang, S., Preacher, K. J., & Rucker, D. D. (2002). On the practice of dichotomization of quantitative variables. *Psychological Methods, 7*(1), 19–40. https://doi-org.spot.lib.auburn.edu/10.1037/1082-989X.7.1.19

Maguen, S., Madden, E., Bosch, J., Galatzer-Levy, I., Knight, S. J., Litz, B. T., Marmar, C. R., & McCaslin, S. E. (2013). Killing and latent classes of PTSD symptoms in Iraq and Afghanistan veterans. *Journal of Affective Disorders, 145*(3), 344–348. https://doi-org.spot.lib.auburn.edu/10.1016/j.jad.2012.08.021

Mansfield, A. J., Bender, R. H., Hourani, L. L., & Larson, G. E. (2011). Suicidal or self-harming ideation in military personnel transitioning to civilian life. *Suicide and Life-Threatening Behavior, 41*(4), 392–405. https://doi-org.spot.lib.auburn.edu/10.1111/j.1943-278X.2011.00039.x

Marsh, H. W., Lüdtke, O., Trautwein, U., & Morin, A. J. S. (2009). Classical latent profile analysis of academic self-concept dimensions: Synergy of person- and variable-centered approaches to theoretical models of self-concept. *Structural Equation Modeling, 16*(2), 191–225. https://doi-org.spot.lib.auburn.edu/10.1080/10705510902751010

Masten, A. S., Lucke, C. M., Nelson, K. M., & Stallworthy, I. C. (2021). Resilience in development and psychopathology: Multisystem perspectives. *Annual Review of Clinical Psychology, 17*, 521–549. https://doi-org.spot.lib.auburn.edu/10.1146/annurev-clinpsy-081219-120307

McCarthy, E., & Petrakis, I. (2010). Epidemiology and management of alcohol dependence in individuals with post-traumatic stress disorder. *CNS Drugs*, *24*(12), 997–1007. https://doi-org.spot.lib.auburn.edu/10.2165/11539710-000000000-00000

McDevitt-Murphy, M. E., Williams, J. L., Bracken, K. L., Fields, J. A., Monahan, C. J., & Murphy, J. G. (2010). PTSD symptoms, hazardous drinking, and health functioning among US OEF and OIF veterans presenting to primary care. Journal of Traumatic Stress, 23(1), 108–111. https://web-s-ebscohost-com.spot.lib.auburn.edu/ehost/pdfviewer/pdfviewer?vid=85&sid=28d16dad-1e65-4179-a309-7f853441f291%40redis

McLachlan, G. & Peel, D. (2000) Finite Mixture Models. Wiley Series in Probability and Statistics, John Wiley & Sons, Inc. http://dx.doi.org/10.1002/0471721182

Meredith, L.S., Sherbourne, C. D., Gaillot, S. J., Hansell, L., Ritschard, H. V., Parker, A. M., & Wrenn, G. (2011). *Promoting psychological resilience in the U.S. military*. RAND Corporation. https://www.rand.org/pubs/monographs/MG996.html

Miller, W. R., Tonigan, J. S., & Longabaugh, R. (1995). The Drinker Inventory of Consequences (DrInC): An instrument for assessing adverse consequences of alcohol abuse. Test Manual, (Volume 4, Project MATCH Monograph series). National Institute on Alcohol Abuse and Alcoholism.

Moss, H. B., Chen, C. M., & Yi, H.-Y. (2007). Subtypes of alcohol dependence in a nationally representative sample. *Drug and Alcohol Dependence*, *91*(2–3), 149–158. https://doi-org.spot.lib.auburn.edu/10.1016/j.drugalcdep.2007.05.016

Mustillo, S. A., Kysar-Moon, A., Douglas, S. R., Hargraves, R., Wadsworth, S. M., Fraine, M., & Frazer, N. L. (2015). Overview of depression, post-traumatic stress disorder, and

alcohol misuse among active duty service members returning from Iraq and Afghanistan, self-report and diagnosis. *Military Medicine*, *180*(4), 419–427. https://doi-org.spot.lib.auburn.edu/10.7205/MILMED-D-14-00335

Muthen, L. K., & Muthen, B. O. (2020). MPlus (Version 8.5) [Computer software]. Muthen & Muthen. https://www.statmodel.com/index.shtml.

Muthén, L. K., & Muthén, B. O. (2002). How to use a Monte Carlo study to decide on sample size and determine power. *Structural equation modeling*, *9*(4), 599-620. https://doi.org/10.1207/S15328007SEM0904_8

Najavits, L. M., 2002. Seeking Safety: A Treatment Manual for PTSD and Substance Abuse. Guilford Publications., New York, NY.

Norman, S. B., Haller, M., Hamblen, J. L., Southwick, S. M., & Pietrzak, R. H. (2018). The burden of co-occurring alcohol use disorder and PTSD in US Military veterans: Comorbidities, functioning, and suicidality. *Psychology of Addictive Behaviors*, *32*(2), 224–229. https://doi-org.spot.lib.auburn.edu/10.1037/adb0000348

Norman, S. B., Inaba, R. K., Smith, T. L., & Brown, S. A. (2008). Development of the PTSD-Alcohol Expectancy Questionnaire. *Addictive Behaviors*, *33*(6), 841–847. https://doi-org.spot.lib.auburn.edu/10.1016/j.addbeh.2008.01.003

Norman, S. B., Myers, U. S., Wilkins, K. C., Goldsmith, A. A., Hristova, V., Huang, Z., McCullough, K. C., & Robinson, S. K. (2012). Review of biological mechanisms and pharmacological treatments of comorbid PTSD and substance use disorder. *Neuropharmacology*, *62*(2), 542–551. https://doi-org.spot.lib.auburn.edu/10.1016/j.neuropharm.2011.04.032

Nylund-Gibson, K., & Choi, A. Y. (2018). Ten frequently asked questions about latent class analysis. *Translational Issues in Psychological Science, 4*(4), 440–461. https://doi-org.spot.lib.auburn.edu/10.1037/tps0000176

Nylund-Gibson, K., & Masyn, K. E. (2016). Covariates and mixture modeling: Results of a simulation study exploring the impact of misspecified effects on class enumeration. *Structural Equation Modeling, 23*(6), 782–797. https://doi-org.spot.lib.auburn.edu/10.1080/10705511.2016.1221313

Olino, T. M., Klein, D. N., Farmer, R. F., Seeley, J. R., & Lewinsohn, P. M. (2012). Examination of the structure of psychopathology using latent class analysis. *Comprehensive Psychiatry, 53*(4), 323–332. https ://doi-org.spot.lib.auburn.edu/10.1016/j.comppsych.2011.05.008

Osofsky, J. D., Osofsky, H. J., Weems, C. F., King, L. S., & Hansel, T. C. (2015). Trajectories of post-traumatic stress disorder symptoms among youth exposed to both natural and technological disasters. *Journal of Child Psychology and Psychiatry, 56*(12), 1347–1355. https://doi-org.spot.lib.auburn.edu/10.1111/jcpp.12420

Panza, K. E., Kline, A. C., Norman, G. J., Pitts, M., & Norman, S. B. (2021). Subgroups of comorbid PTSD and AUD in US military veterans predict differential responsiveness to two integrated treatments: A latent class analysis. J*ournal of Psychiatric Research, 137*, 342–350. https://doi-org.spot.lib.auburn.edu/10.1016/j.jpsychires.2021.02.061

Pavlacic, J. M., Buchanan, E. M., McCaslin, S. E., Schulenberg, S. E., & Young, J. N. (2022). A systematic review of posttraumatic stress and resilience trajectories: Identifying predictors for future treatment of veterans and service members. *Professional*

Psychology: Research and Practice, 53(3), 266–275. https://doi-org.spot.lib.auburn.edu/10.1037/pro0000451.supp

Petersen, K. J., Qualter, P., & Humphrey, N. (2019). The application of latent class analysis for investigating population child mental health: A systematic review. *Frontiers in Psychology, 10*. https://doi-org.spot.lib.auburn.edu/10.3389/fpsyg.2019.01214

Pietrzak, R. H., Russo, A. R., Ling, Q., & Southwick, S. M. (2011). Suicidal ideation in treatment-seeking Veterans of Operations Enduring Freedom and Iraqi Freedom: The role of coping strategies, resilience, and social support. *Journal of Psychiatric Research, 45*(6), 720–726. https://doi-org.spot.lib.auburn.edu/10.1016/j.jpsychires.2010.11.015

Pietrzak, R. H., & Southwick, S. M. (2011). Psychological resilience in OEF–OIF Veterans: Application of a novel classification approach and examination of demographic and psychosocial correlates. *Journal of Affective Disorders, 133*(3), 560–568. https://doi-org.spot.lib.auburn.edu/10.1016/j.jad.2011.04.028

Resick, P. A., Straud, C. L., Wachen, J. S., LoSavio, S. T., Peterson, A. L., McGeary, D. D., Young-McCaughan, S., Taylor, D. J., Mintz, J., & STRONG STAR Consortium and the Consortium to Alleviate PTSD (2023). A comparison of the CAPS-5 and PCL-5 to assess PTSD in military and veteran treatment-seeking samples. *European journal of psychotraumatology, 14*(2), 2222608. https://doi.org/10.1080/20008066.2023.2222608

Richardson, J. D., Ketcheson, F., King, L., Shnaider, P., Marlborough, M., Thompson, A., & Elhai, J. D. (2017). Psychiatric comorbidity pattern in treatment-seeking veterans. *Psychiatry Research, 258*, 488–493. https://doi-org.spot.lib.auburn.edu/10.1016/j.psychres.2017.08.091

Richer, I., Lee, J. E. C., & Born, J. (2016). Patterns of alcohol use among Canadian military personnel and their associations with health and well-being. *Health Psychology, 35*(7), 685–694. https://doi-org.spot.lib.auburn.edu/10.1037/hea0000328

Roberts, N. P., Roberts, P. A., Jones, N., & Bisson, J. I. (2015). Psychological interventions for post-traumatic stress disorder and comorbid substance use disorder: A systematic review and meta-analysis. C*linical Psychology Review*, *38*, 25–38. https://doi-org.spot.lib.auburn.edu/10.1016/j.cpr.2015.02.007

Rumpf, H.-J., Hapke, U., Meyer, C., & John, U. (2002). Screening for alcohol use disorders and at-risk drinking in the general population: Psychometric performance of three questionnaires. *Alcohol and Alcoholism, 37*(3), 261–268. https://doi-org.spot.lib.auburn.edu/10.1093/alcalc/37.3.261

Rutten, B. P. F., Hammels, C., Geschwind, N., Menne, L. C., Pishva, E., Schruers, K., van den Hove, D., Kenis, G., van Os, J., & Wichers, M. (2013). Resilience in mental health: Linking psychological and neurobiological perspectives. *Acta Psychiatrica Scandinavica*, *128*(1), 3–20. https://doi-org.spot.lib.auburn.edu/10.1111/acps.12095

Saltzman, W. R., Lester, P., Beardslee, W. R., Layne, C. M., Woodward, K., & Nash, W. P. (2011). Mechanisms of risk and resilience in military families: Theoretical and empirical basis of a family-focused resilience enhancement program. *Clinical Child and Family Psychology Review*, *14*(3), 213–230. https://doi-org.spot.lib.auburn.edu/10.1007/s10567-011-0096-1

Saunders, J. B., Aasland, O. G., Babor, T. F., de la Fuente, J. R., & Grant, M. (1993). Development of the Alcohol Use Disorders Identification Test (AUDIT): WHO collaborative project on early detection of persons with harmful alcohol consumption: II.

Addiction, 88(6), 791–804. https://doi-org.spot.lib.auburn.edu/10.1111/j.1360-0443.1993.tb02093.x

Saunders, R., Cape, J., Fearon, P., & Pilling, S. (2016). Predicting treatment outcome in psychological treatment services by identifying latent profiles of patients. *Journal of affective disorders, 197*, 107–115. https://doi.org/10.1016/j.jad.2016.03.011

Scali, J., Gandubert, C., Ritchie, K., Soulier, M., Ancelin, M. L., & Chaudieu, I. (2012). Measuring resilience in adult women using the 10-items Connor-Davidson Resilience Scale (CD-RISC). Role of trauma exposure and anxiety disorders. PloS one, 7(6), e39879. https://doi.org/10.1371/journal.pone.0039879

Schein, J., Houle, C., Urganus, A., Cloutier, M., Patterson-Lomba, O., Wang, Y., King, S., Levinson, W., Guérin, A., Lefebvre, P., & Davis, L. L. (2021). Prevalence of post-traumatic stress disorder in the United States: a systematic literature review. *Current Medical Research and Opinion, 37*(12), 2151-2161. https://doi.org/10.1080/03007995.2021.1978417

Schwarz, G. (1978). Estimating the Dimension of a Model. The Annals of Statistics, 6(2), 461–464. http://www.jstor.org/stable/2958889

Sheerin, C. M., Amstadter, A. B., Kurtz, E. D., Bountress, K. E., Stratton, K. J., & McDonald, S. D. (2019). The association of resilience on psychiatric, substance use, and physical health outcomes in combat trauma-exposed military service members and veterans. *European Journal of Psychotraumatology, 10*(1). https://doi-org.spot.lib.auburn.edu/10.1080/20008198.2019.1625700

Seal, K. H., Cohen, G., Waldrop, A., Cohen, B. E., Maguen, S., & Ren, L. (2011). Substance use disorders in Iraq and Afghanistan veterans in VA healthcare, 2001–2010: Implications for

screening, diagnosis and treatment. *Drug and Alcohol Dependence*, *116*(1–3), 93–101. https://doi-org.spot.lib.auburn.edu/10.1016/j.drugalcdep.2010.11.027

Simpson, T. L., Lehavot, K., & Petrakis, I. L. (2017). No wrong doors: Findings from a critical review of behavioral randomized clinical trials for individuals with co-occurring alcohol/drug problems and posttraumatic stress disorder. *Alcoholism: Clinical and Experimental Research*, *41*(4), 681–702. https://doi-org.spot.lib.auburn.edu/10.1111/acer.13325 sp

Sloan, D. M., Unger, W., & Gayle Beck, J. (2016). Cognitive-behavioral group treatment for veterans diagnosed with PTSD: Design of a hybrid efficacy-effectiveness clinical trial. *Contemporary Clinical Trials*, *47*, 123–130. https://doi-org.spot.lib.auburn.edu/10.1016/j.cct.2015.12.016

Spitzer, R. L., & BW, W. J. (2001). The PHQ-9. Journal of General Internal Medicine, 16(9), 606-613. doi:10.1046/j.1525-1497.2001.016009606.x

Spurk, D., Hirschi, A., Wang, M., Valero, D., & Kauffeld, S. (2020). Latent profile analysis: A review and "how to" guide of its application within vocational behavior research. Journal of Vocational Behavior, *120*. https://doi.org/10.1016/j.jvb.2020.103445

Sripada, R. K., Hoff, R., Pfeiffer, P. N., Ganoczy, D., Blow, F. C., & Bohnert, K. M. (2020). Latent classes of PTSD symptoms in veterans undergoing residential PTSD treatment. *Psychological Services*, *17*(1), 84–92. https://doi-org.spot.lib.auburn.edu/10.1037/ser0000284

Steenkamp, M. M., Nickerson, A., Maguen, S., Dickstein, B. D., Nash, W. P., & Litz, B. T. (2012). Latent classes of PTSD symptoms in Vietnam veterans. *Behavior Modification*, *36*(6), 857–874. https://doi-org.spot.lib.auburn.edu/10.1177/0145445512450908

Torchalla, I., Nosen, L., Rostam, H., & Allen, P. (2012). Integrated treatment programs for individuals with concurrent substance use disorders and trauma experiences: A systematic review and meta-analysis. *Journal of Substance Abuse Treatment, 42*(1), 65–77. https://doi-org.spot.lib.auburn.edu/10.1016/j.jsat.2011.09.001

Tsai, J., Mota, N. P., Southwick, S. M., & Pietrzak, R. H. (2016). What doesn't kill you makes you stronger: A national study of US military veterans. *Journal of Affective Disorders, 189*, 269–271. https://doi-org.spot.lib.auburn.edu/10.1016/j.jad.2015.08.076

Ungar, M., Theron, L., Murphy, K., & Jefferies, P. (2021). Researching multisystemic resilience: A sample methodology. *Frontiers in Psychology, 11*. https://doi-org.spot.lib.auburn.edu/10.3389/fpsyg.2020.607994

Vaidyanathan, U., Patrick, C. J., & Iacono, W. G. (2011). Patterns of comorbidity among mental disorders: A person-centered approach. *Comprehensive Psychiatry, 52*(5), 527–535. https ://doi-org.spot.lib.auburn.edu/10.1016/j.comppsych.2010.10.006

van Dam, D., Vedel, E., Ehring, T., & Emmelkamp, P. M. G. (2012). Psychological treatments for concurrent posttraumatic stress disorder and substance use disorder: A systematic review. *Clinical Psychology Review, 32*(3), 202–214. https://doi-org.spot.lib.auburn.edu/10.1016/j.cpr.2012.01.004

van Minnen, A., van Dalen, B., Voorendonk, E. M., Wagenmans, A., & de Jongh, A. (2020). The effects of symptom overreporting on PTSD treatment outcome. *European Journal of Psychotraumatology, 11*(1). https://doi-org.spot.lib.auburn.edu/10.1080/20008198.2020.1794729

Vermunt, J. K., & Magidson, J. (2002). Latent class cluster analysis. Applied latent class analysis, 11(89-106), 60.

Weir, J. P., & Vincent, W. J. (2020). Statistics in kinesiology. Human Kinetics Publishers.

Wald, J., Taylor, S., Asmundson, G. J., Jang, K. L., & Stapleton, J. (2006). Literature review of concepts: Psychological resiliency. Vancouver, Canada: British Columbia University. https://apps.dtic.mil/sti/pdfs/ADA472961.pdf

Weathers, F. W., Blake, D. D., Schnurr, P. P., Kaloupek, D. G., Marx, B. P., & Keane, T. M. (2013a). The Life Events Checklist for DSM-5 (LEC-5) –Standard. [Measurement instrument]. Available from https://www.ptsd.va.gov/

Weathers, F. W., Bovin, M. J., Lee, D. J., Sloan, D. M., Schnurr, P. P., Kaloupek, D. G., Keane, T. M., & Marx, B. P. (2018). The Clinician-Administered PTSD Scale for DSM-5 (CAPS-5): Development and initial psychometric evaluation in military veterans. *Psychological assessment, 30*(3), 383–395. https://doi.org/10.1037/pas0000486

Weathers, F.W., Litz, B.T., Huska, J.A., & Keane, T.M. (1994). PTSD Checklist—Civilian version. Boston : National Center for PTSD, Behavioral Science Division.

Weathers, F. W., Litz, B. T., Keane, T. M., Palmieri, P. A., Marx, B. P., & Schnurr, P. P. (2013b). The PTSD Checklist for DSM-5 (PCL-5) – Standard [Measurement instrument]. Available from https://www.ptsd.va.gov/

Weiss, N. H., Schick, M. R., Contractor, A. A., Goncharenko, S., Raudales, A. M., & Forkus, S. R. (2022). Posttraumatic stress disorder symptom severity modulates avoidance of positive emotions among trauma-exposed military veterans in the community. *Psychological Trauma: Theory, Research, Practice, and Policy*, *14*(3), 446–452. https://doi.org/10.1037/tra0001048

Windle, M. (1994). Substance use, risky behaviors, and victimization among a US national adolescent sample. *Addiction, 89*(2), 175–182. https://doi-org.spot.lib.auburn.edu/10.1111/j.1360-0443.1994.tb00876.x

Wisco, B. E., Nomamiukor, F. O., Marx, B. P., Krystal, J. H., Southwick, S. M., & Pietrzak, R. H. (2022). Posttraumatic Stress Disorder in US Military Veterans: Results From the 2019-2020 National Health and Resilience in Veterans Study. *The Journal of Clinical Psychiatry, 83*(2). https://doi-org.spot.lib.auburn.edu/10.4088/JCP.20m14029

Wolf, E. J., Miller, M. W., Reardon, A. F., Ryabchenko, K. A., Castillo, D., & Freund, R. (2012). A latent class analysis of dissociation and posttraumatic stress disorder: Evidence for a dissociative subtype. JAMA Psychiatry, 69(7), 698–705. https ://search-ebscohost-com.spot.lib.auburn.edu/login.aspx?direct=true&db=psyh&AN=2013-03107-008&site=ehost-live

Woo, S. E., Jebb, A. T., Tay, L., & Parrigon, S. (2018). Putting the "person" in the center: Review and synthesis of person-centered approaches and methods in organizational science. *Organizational Research Methods, 21*(4), 814–845. https://doi-org.spot.lib.auburn.edu/10.1177/1094428117752467

Wortmann, J. H., Jordan, A. H., Weathers, F. W., Resick, P. A., Dondanville, K. A., Hall-Clark, B., Foa, E. B., Young-McCaughan, S., Yarvis, J. S., Hembree, E. A., Mintz, J., Peterson, A. L., & Litz, B. T. (2016). Psychometric analysis of the PTSD Checklist-5 (PCL-5) among treatment-seeking military service members. *Psychological assessment, 28*(11), 1392–1403. https://doi.org/10.1037/pas0000260

Appendix

Table 1.

Demographic Characteristics

	Full Sample	Profile 1: Low PTSD/Low Alcohol	Profile 2: Moderate PTSD/Low Alcohol	Profile 3: Moderate PTSD/High Alcohol
	Percent	Percent	Percent	Percent
Age				
Under 21	0.2	0.5	0	0
21-40	55.9	54.1	56.2	62.1
41-65	41.6	42.8	42.2	32.6
65 and over	2.3	2.6	1.6	4.3
Sex				
Male	**68.7****	**71.4****	**63.8****	**87.4****
Female	31.3	28.6	36.2	12.6
Race				
White	55.2	58.3	50.9	68.4
Black	39.6	37.4	43.5	24.2
Multiple	2.2	1.6	2.8	1.1
Asian	1.6	1.4	1.3	4.2
Native Hawaiian or Other Pacific Islander	1.0	1.1	0.8	2.1
American Indian or Alaskan Native	0.4	0.2	0.7	0
Ethnicity				
Non-Hispanic or Latino	93.4	93	93.1	96.8
Hispanic or Latino	6.6	7	6.9	3.2
Sexual Orientation				
Heterosexual	91.6	91.8	91.2	93.7
Gay	8.1	8	8.5	6.3
Declined to answer	0.3	0.2	0.3	0
Education				
Elementary school	0.1	0	0	1.1
High school	35.3	36.5	34.2	36.8
College	50.7	49	51.9	51.6
Graduate or professional school	13.9	14.5	13.9	10.5

Affiliated Military Branch				
Army	69.7	70.5	69.1	70.5
Navy	10.5	10.7	10.5	10.5
Marine Corps	12.3	11.8	12.1	15.8
Air Force	11.2	11.1	11.3	11.6
National Guard	10.5	10.4	10.6	9.5
Coast Guard	1.4	1.6	1.5	0
Current Military Service Status				
Active-Duty or Reservist	20.2	21.1	18.4	27.4
Veteran	79.8	78.9	81.6	72.6
Type of Traumatic Event				
Combat-related	**88.8***	**85.9***	**90.2***	**93.7***
Not combat-related	11.2	14.1	9.8	6.3
Number of Traumatic Events				
1	88.4	85.9	90.8	84.2
2	7.9	10.5	5.6	10.5
3	3.7	3.6	3.6	5.3

Note. The sum of affiliated military branch exceed 100 as some participants identified multiple military branches; $^{*}p < .05$, $^{**}p < .001$

Table 2.

Bivariate Correlations for Variables of Interest Among Full Sample

	1	2	3	4	5	6	7	8	9	10	11
1. PTSD intrusion	-										
2. PTSD avoidance	.72**	-									
3. PTSD cognition/mood	.64**	.65**	-								
4. PTSD arousal/reactivity	.64**	.61**	.74**	-							
5. Alcohol frequency	-.06*	-.08*	-.05	.00	-						
6. Alcohol quantity	-.02	.03	.05	.09**	.44**	-					
7. Alcohol binge frequency	-.04	-.03	.01	.07*	.63**	.64**	-				
8. Resilience	-.31**	-.28**	-.43**	-.38**	.08*	.01	.03	-			
9. Depression	.41**	.40**	.60**	.56**	-.04	.02	-.01	-.38**	-		
10. Past 2-week nicotine/tobacco use	-.01	.01	.04	.04	.07*	.03	.05	-.01	.05	-	
11. Past 2-week substance use	.03	.05	.06	.08**	.05	.01	.04	.02	.08**	.83**	-

Note. PTSD= PCL-5, Alcohol= AUDIT-C, Resilience= CD-RISC-10, Depression= PHQ-9; * $p < .05$ ** $p < .001$

Table 3.

Descriptive Statistics for Variables of Interest Among Full Sample and Profiles

	Full Sample		Profile 1: Low PTSD/Low Alcohol		Profile 2: Moderate PTSD/Low Alcohol		Profile 3: Moderate PTSD/High Alcohol	
	M	SD	M	SD	M	SD	M	SD
PTSD intrusion	11.89	4.82	7.87	3.36	14.74	3.48	12.25	4.75
PTSD avoidance	5.27	2.10	3.42	1.64	6.52	1.34	5.76	1.81
PTSD cognition/mood	17.8	6.17	12.35	4.70	21.51	4.03	19.27	4.97
PTSD arousal/reactivity	15.12	4.71	10.98	3.63	17.83	3.08	16.95	3.92
Alcohol frequency	1.51	1.28	1.51	1.15	1.24	1.20	3.26	0.89
Alcohol quantity	0.27	0.68	0.15	0.39	0.08	0.27	2.06	0.97
Alcohol binge frequency	0.64	0.95	0.52	0.72	0.40	0.66	2.78	0.88
Resilience	19.77	7.73	22.75	6.91	17.60	7.51	19.83	8.13
Depression	15.45	5.68	12.24	5.05	17.67	4.97	16.04	5.78
Past 2-week nicotine/tobacco use days	1.38	3.71	1.37	3.72	1.31	3.60	1.86	4.31
Past 2-week substance use days	1.9	4.58	1.76	4.40	1.91	4.50	2.52	5.75

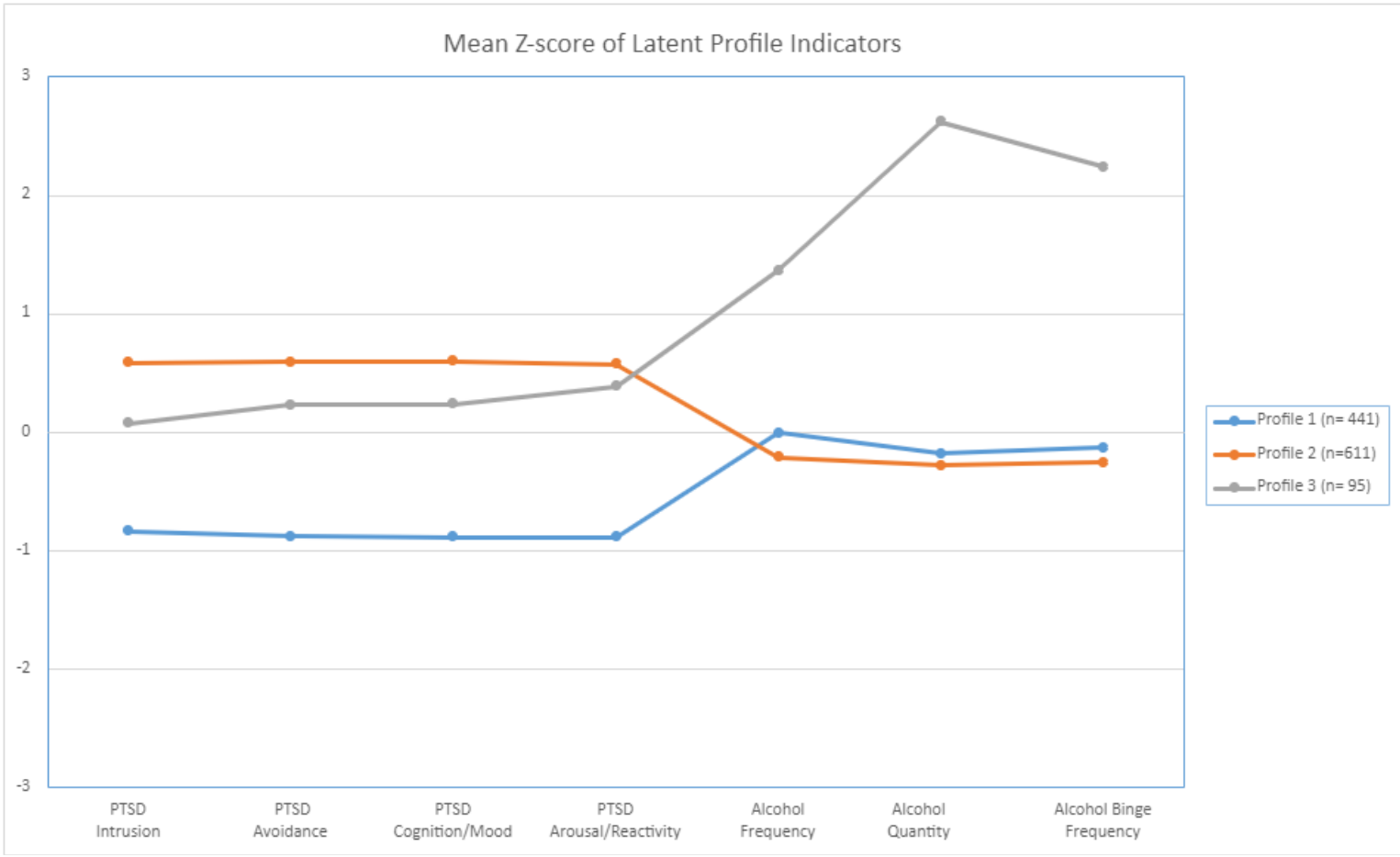
Note. PTSD= PCL-5, Alcohol= AUDIT-C, Resilience= CD-RISC-10, Depression= PHQ-9.

Table 4.

Fit Indices for LPA models with 1-4 Profiles

Model	LL	*n* par	AIC	BIC	a-BIC	VLMR *p*-value	a-VLMR *p*-value	BLRT *p*-value	Entropy
1 Profile	-17700.973	14	35429.946	35500.574	35456.106	-	-	-	-
2 Profile	-16787.247	22	33618.494	33729.482	33659.603	<.001	<.001	<.001	0.84
3 Profile	**-16138.232**	**30**	**32336.464**	**32487.812**	**32392.522**	**.0008**	**.0009**	**<.001**	0.89
4 Profile	-15766.976	38	30757.093	30948.8	30828.1	0.5224	0.5275	<.001	1.00

Figure 1.



Note. Profile 1= low PTSD/low alcohol. Profile 2= moderate PTSD/low alcohol. Profile 3= moderate PTSD/high alcohol.

Table 5.

Multinomial Logistic Regression for the Full Sample

	Profile 1 (REF) vs. Profile 2	Profile 1 (REF) vs. Profile 3	Profile 2 (REF) vs. Profile 3
Factor	OR (95% CI)	OR (95% CI)	OR (95% CI)
Resilience	**0.93 (0.91, 0.95)**	**0.96 (0.93, 0.99)**	**1.04 (1.01, 1.07)**
Depression	**1.24 (1.19, 1.29)**	**1.16 (1.10, 1.22)**	**0.94 (0.89, 0.98)**
Past 2-week nicotine	0.95 (0.87, 1.03)	0.98 (0.88, 1.09)	1.04 (0.96, 1.12)
Past 2-week substance use	1.03 (0.96, 1.11)	1.03 (0.94, 1.13)	1.00 (0.94, 1.08)

Note. Resilience= CD-RISC-10, Depression= PHQ-9. Bold values = significant class differences.