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The Relationship of Risk-Related Behaviors and Substance Use Among U.S. Army National Guard/Army Reserve Soldiers and Deployment Differences

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ABSTRACT

U.S. Army National Guard and Army Reserve (ANG/USAR) soldiers are at risk for substance use, and research in other populations suggests risk-related behaviors and traits affect the propensity for use. Less is known about how deployment might amplify these effects. Our research explored the relations between risk-related behaviors and substance use among ANG/USAR soldiers and investigated differences by deployment (previously vs. never deployed). We drew a subset of data from Operation: SAFETY, an ongoing study of ANG/USAR soldiers and their partners (married/living together as if married). Cross-sectional regression models examined domains of risk (i.e., risk perception, risk-taking/impulsivity, sensation-seeking) and substance use (any current drug use, current non-medical use of prescription drugs, current illicit drug use, alcohol problems, and frequent heavy drinking [FHD]). Final models controlled for age, sex, anger, and PTSD. Interaction terms between risk behaviors and deployment status on substance use were also noted. Results revealed that greater risk perception was significantly associated with a lower likelihood of and protective against FHD. Greater risk-taking/impulsivity was associated with a higher likelihood of any current drug use and alcohol problems. Additionally, interaction models suggest that non-deployed soldiers at every level of risk-taking/impulsivity had a consistently high likelihood of illicit drug use overall. Sensation-seeking was not associated with any outcome. Findings demonstrate that greater risk-taking/impulsivity was associated with substance use, and never deployed/non-deployed ANG/USAR soldiers might be more vulnerable. Our work can help inform substance use interventions in the military by highlighting the role and impact of risk-related behaviors and non-deployment.

KEYWORDS

Risk behaviors; risk perception; risk-taking; impulsivity; sensation-seeking; deployment; non-deployment; soldiers; military; alcohol use; alcohol problems; drug use; illicit drug use

Introduction

United States Army National Guard and Army Reserve soldiers and substance use

Military populations are at an increased risk for substance use which has been attributed to difficult working environments, frequent deployments, combat exposure, managing pain, and the overall challenges of military life (Hoopsick et al., 2017; Lande et al., 2008; O'Brien et al., 2013; Spera et al., 2011). Research also suggests that military service shapes a person's personality, attitudes, and types of behaviors needed to thrive in high-stress conditions (Breivik et al., 2019). This includes engaging in high-risk activities and seeking challenges that might benefit the military's mission and goals in the short term but can be related to problematic behaviors over time (Breivik

et al., 2019). The connection between substance use, and risk-related behaviors has been well-studied. Yet, it is not known how deployment might modify the relations between risk-related behaviors and substance use.

Moreover, little is known about this relationship among United States Army National Guard and Army Reserve (ANG/USAR) soldiers, a sub-population of the military that are at a greater risk for substance use and mental health issues compared to their active-duty counterparts (Cohen et al., 2015; Jacobson et al., 2008, 2020; Wang et al., 2020). A meta-analysis of reports published between 1985 and 2012 suggests that the pooled prevalence of alcohol use disorders was higher among Reserve components (14.5%) compared to that of active-duty components (11.7%) (Cohen et al., 2015). Additionally, Reserve and Guard

soldiers have reported testing positive at 2–3 times the rate of active-duty personnel for illicit drug use (Platteborze et al., 2013). Misuse of prescription drugs has also been reported among ANG/USAR soldiers with lower levels of bodily pain (Vest et al., 2020).

Domains of risk behavior

Three common domains of risk that help explain why and how people behave when confronted with situations involving risk are described using Cherpitel's Risk behavior scale and include risk perception, risk-taking/impulsivity, and sensation-seeking (Cherpitel, 1993). Risk perception is defined as people's subjective judgements and understanding regarding the likelihood of negative experiences and occurrences such as injury, illness, disease, or death (Brewer et al., 2007; Brown, 2014; Paek & Hove, 2017). People who perceive greater risk and harm associated with substance use are less likely to engage in problematic substance use (Lipari et al., 2014). Risk-taking or behavioral impulsivity refers to the tendency for rapid decision making and acting without consideration of consequences (Dawe et al., 2004; Magid et al., 2007; Quinn & Harden, 2013). It has been linked to the development of substance use disorders and frequent relapses due to increased vulnerability and decreased cognitive controls when experiencing higher impulsivity (Rieser et al., 2019). Sensation-seeking is defined as the preference for varied and exciting experiences/sensations or willingness to take risks of various types (Breivik et al., 2019; Magid et al., 2007; Quinn & Harden, 2013). Research shows that high sensation-seeking is associated with higher levels of experimentation with substances (Jensen et al., 2017; Malmberg et al., 2010).

For the purposes of this study, we have operationalized the definition of risk behaviors to include Cherpitel's three risk behavior domains as noted above. These constructs of risk perception, risk-taking/impulsivity, and sensation-seeking are multifaceted yet go hand in hand and revolve around the pursuit of thrill-inducing, stimulating, and potentially hazardous experiences (Dougherty et al., 2015). Such experiences can include risky and harmful use of substances due to decreased risk perception and heightened feelings of risk-taking/impulsivity and sensation-seeking.

Role of deployment/non-deployment

Another factor to consider is the effect, if any, of deployment on substance use and its relationship with risk-related domains. Research to date has showcased

the connection of military service, deployments, and an increased propensity of experiencing substance use disorders or engaging in self-destructive behaviors (Campbell-Sills et al., 2018; Tamburrino et al., 2015; Thomsen et al., 2011). However, a significant body of work also notes that there might be no differences between previously deployed and never-deployed ANG/USAR soldiers and that they might be more alike than different (Hoopsick, Homish, Collins, et al., 2020). Moreover, soldiers who have never been deployed harbor negative emotions related to non-deployment (NDE) such as guilt, othering (in-group vs. out-group feelings), and decreased camaraderie with one's unit which could lead to worsening substance use outcomes (Hoopsick et al., 2019; Hoopsick, Vest, Homish, et al., 2020; Hoopsick et al., 2021). Gaps in literature exist concerning the role of deployment in the relationship between risk behavior domains and substance use among ANG/USAR soldiers.

Current study

The objective of this study is to examine the relationship of risk behavior domains and substance use outcomes among ANG/USAR soldiers. The first aim of the present research is to identify the main associations of risk perception, risk-taking/impulsivity, and sensation-seeking on the likelihood of substance use (alcohol and drug use) within this understudied and vulnerable population of ANG/USAR soldiers. The second aim of this paper is to examine any interactions of deployment status on the relation between risk domains and substance use. Current research suggests that being deployed (for combat or otherwise) acts as a stressor for many behavioral outcomes within the military, however, the effect of non-deployment has not been researched extensively (Godby Vail, 2023; Kelley et al., 2013; Reger et al., 2018; Sullivan et al., 2023; Vogt et al., 2012). We hypothesize that through our cross-sectional research analysis we will uncover new knowledge regarding the influence of domains of risk behavior and substance use, while noting differences by deployment/non-deployment status.

Methods

Recruitment and data collection

The data for this project were drawn from Operation: SAFETY (Soldiers and Family Excelling Through the Years), an ongoing research study that uses survey-based tools to assess the mental health and substance use of ANG/USAR soldiers and their

partners. The overall study sample was recruited across 47 units in 2014–2015 from New York State. Eligibility criteria included: (1) being married or living as if married; (2) one member of the couple being a current Army Reserve or Army National Guard soldier; (3) soldiers within the age range of 18–45 years old; (4) both partners spoke and understood English; (5) both partners were willing and able to participate; and (6) both partners consumed at least one alcoholic beverage in the last year.

Recruitment occurred during drill and training weekends and participants were screened for eligibility and informed consent. They completed an annual survey either online or in person at the State University of New York University at Buffalo South Campus. Surveys were administered through a secure and HIPAA-compliant online survey software called StudyTrax™. Six time points have been collected to date. Participants received \$60 for the baseline survey, \$70 for surveys 2 and 3, \$80 for surveys 4, and \$90 for surveys 5 and 6. The data for this report were examined cross-sectionally at follow-up timepoint 4, which was the first timepoint that included risk behavior questions.

Participants

We drew a subset ($N=343$ soldiers) of data from Operation: SAFETY. Participants were predominantly non-Hispanic White (79.3%), had some college education (92.4%), had a median family income category of \$80,000–\$99,000, and served an average of 9.5 (SD 6.1) years in the military; see Table 1. The majority of the sample was previously deployed (63.6%) and consisted of enlisted soldiers (56.3%).

Measures

Drug use measures

We used the NIDA Modified ASSIST 2.0 (Alcohol, Smoking, and Substance Involvement Screening Test) to assess current drug use (which included illicit drug use and nonmedical use of prescription drugs (NMUPD)) at the fourth survey timepoint (WHO Assist Working Group, 2002). Participants were asked, “In the past 3 months, how often have you used [substance] on your own, either without a doctor’s prescription, in greater amounts, more often or longer than prescribed, or for a reason other than a doctor said you should use them?” Non-medical use of prescription drugs (NMUPD) consisted of sedatives, stimulants, and pain medication, and other prescription drugs while illicit drugs consisted of marijuana/hashish,

Table 1. Study sample characteristics ($N=343$).

	Mean (SD) or % (n)
Sex	
Male	81.3% (279)
Female	18.7% (64)
Age (years)	36.0 (6.5)
Race/Ethnicity	
Non-Hispanic White	79.3% (272)
Non-Hispanic Black	4.7% (16)
Hispanic	8.8% (30)
Other	5.0% (17)
Education	
<HS – HS Grad	7.3% (25)
Some College	51.0% (175)
College +	41.4% (142)
Median Family Income Category	\$80,000–\$99,999
Military Service, years	9.5 (6.1)
Rank	
Enlisted	56.3% (193)
Officer	14.9% (51)
Drug use (in the last 3 months)	
Any current drug use	10.5% (36)
Any current non-medical use of	4.4% (15)
Prescription drugs	6.4% (22)
Any current illicit drug use	
Alcohol use	
AUDIT Score	4.8 (4.7)
Frequent heavy drinking	2.6 (1.6)
Domains of risk	
Risk perception	2.0 (0.8)
Risk-taking/impulsivity	1.9 (0.8)
Sensation-seeking	2.0 (0.8)
Anger score	17.8 (7.0)
Post-traumatic stress disorder (PTSD)	7.9% (27)
Deployment	--
Previously deployed	63.6% (218)
Never deployed	33.8% (116)

cocaine, heroin, hallucinogens, inhalants, illicit opioids, methamphetamine and other street drugs. Each substance was assessed separately. For post-hoc analysis in this study, any current drug use was recorded alongside illicit drug use and NMUPD use separately (WHO Assist Working Group, 2002). Cannabis was included under illicit drug use as it was illegal in New York State at the time of data collection (before 2021). NMUPD is defined as use of prescription-type drugs such as over-the-counter drugs, pain medication, sedatives or stimulants that was not prescribed to the person or use only for the experience or feeling they cause (WHO Assist Working Group, 2002). Any use of either illicit drugs or NMUPD in the past 3 months was considered current drug use and was dichotomized as a yes/no binary variable.

Alcohol use measures

Alcohol problems/problematic or hazardous drinking. Alcohol problems was assessed using the Alcohol Use Disorders Identification Test (AUDIT; Babor & Del Boca, 1992; Saunders et al., 1993). The AUDIT consists of 10 items that are rated on a 4-point scale from 0 (Never) to 4 (Daily or almost daily) ($\alpha: 0.78$). Scores range from 0–40 and questions

include information on frequency of alcohol drinking, whether drinking has caused injury to themselves or others, and if alcohol drinking is associated with feelings of guilt or remorse, to name a few. Higher scores indicate greater alcohol problems. Our analysis used AUDIT total scores and a binary variable to note AUDIT scores of 8 or higher. The cut point for the AUDIT score was set to 8, as scores ≥ 8 correspond to hazardous drinking or having alcohol problems (Babor et al., 2001).

Frequent heavy drinking. Consistent with work by Homish and Leonard (2007), frequent heavy drinking (FHD) was assessed as the maximum report of two items (both rated on a 9-point scale): the frequency of drinking 4+/5+ drinks (female/male) in one day or in a single setting with scores ranging from 1 (Never) to 9 (Everyday), and the frequency of getting drunk in the past year with scores ranging from 1 (Never) to 9 (Everyday) (Bray et al., 2013; Campbell-Sills et al., 2018; Homish & Leonard, 2007).

Domains of risk

Consistent with other work (Cherpitel, 1993), risk categories were divided into risk perception, risk-taking/impulsivity, and sensation-seeking. These constructs relate to risk behaviors that effect decision-making and outcomes (Cherpitel, 1993). Participants were asked to rate the likelihood of something bad happening if they did the following (in present time). For risk perception, they were asked how much each statement described them: if one drove over the speed limit, drove while drunk, drove without a seatbelt, drank a lot, had sex with someone they just met or got drunk and had sex with someone they just met. Responses for each item in the risk perception scale were summed for each respondent. The distribution of summed values was then divided into tertiles of low (1), medium (2), and high-risk perception (3). Risk perception was thought to be an important variable to examine, because it has not been analyzed in prior studies of risk-taking and could reenforce risk-taking behaviors as well as alcohol drinking and subsequent activities.

Risk-taking/impulsivity questions included asking participants how much each statement described them on items such as: “I often act on the spur of the moment without stopping to think,” “I get a real kick out of doing things that are a little dangerous,” “You might say I act impulsively,” “I like to test myself every now and then by doing something a little chancy,” and “Many of my actions seem hasty.” Sensation-seeking

questions included asking participants how much each statement described them: “I am always up for a new experience,” “I like to try new things just for the excitement,” “I go for the thrills in life when I get a chance,” and “I like to experience new and different sensations.” For both the risk-taking/impulsivity and sensation-seeking items, respondents were asked whether each statement described them, on a 4-point scale of “not at all” (scored 1) to “quite a lot” (scored 4). A mean value for all items was calculated separately for both scales. The distribution of mean values for each scale was then divided into tertiles of low (1), medium (2), and high (3).

Covariates

Several potential confounders such as age (from baseline), sex, anger, and post-traumatic stress disorder (PTSD) (from timepoint 4) were added to the adjusted analyses. Anger and PTSD are common mental health problems that affect substance use among military members and could confound the relationship between risk behaviors and substance use. Sex was reported at baseline assessment. Anger was measured using the Patient Reported Outcomes Measurement Information System (PROMIS) Anger assessment (Pilkonis et al., 2011). Scores range from 8 to 40 and the higher the reported score, the greater the anger (Pilkonis et al., 2011).

Post-traumatic stress disorder (PTSD) symptoms were measured using the 20-item self-report measure PTSD Checklist (PCL-5), based on the DSM-5 criteria (Bovin et al., 2016; Blevins et al., 2015). The responses were also dichotomized to previously deployed and never deployed. Moreover, previous work has shown no difference in total PCL-5 scores among deployed and non-deployed soldiers suggesting that service members without deployment experiences can still exhibit PTSD symptomatology (Hoopsick, Homish, Collins, et al., 2020), hence our inclusion of PTSD as a covariate in this study.

Data analysis plan

To examine the cross-sectional association between dependent and independent variables, i.e. substance use and risk behaviors, we used negative binomial and logistic regression models. Negative binomial regression was used for the alcohol use variables (with AUDIT and FHD scores) because the outcomes were count values (Byers et al., 2003) whereas logistic models were used for our binary drug use outcomes. Unadjusted main effect models were constructed for each outcome (any current drug use,

alcohol problems and frequent heavy drinking [FHD]) alongside domains of risk (i.e., risk perception, risk-taking/impulsivity, sensation-seeking). Adjusted main effect final models controlled for age, sex, anger, and PTSD. Interaction models were also included to examine if these relations differed according to deployment status (previously deployed vs. never/non deployed). All analyses were conducted using Stata v. 16 (StataCorp, 2019). Risk ratios (RR) and odds ratios (OR) with 95% confidence intervals (CI) are reported for alcohol and drug outcomes respectively. Predictive margins for significant interactions were also examined and results are presented in the bar chart.

Results

Descriptive results

The mean AUDIT score for the sample of ANG/USAR soldiers was 4.8 (SD: 4.7), and the mean frequent heavy drinking (FHD) value was 2.6 (SD: 1.6). 18.4% of the sample had AUDIT scores greater than 8 (suggesting hazardous or harmful alcohol consumption) (WHO Assist Working Group, 2002). 12% of the sample showed results indicative of frequent heavy drinking (FHD) on a weekly basis. This sample also included 10.5% of people ($n=36$), who reported any current drug use (within this group 6.4% reported any current illicit drug use and 4.4% reported current NMUPD, refer to Table 2). The average score for risk perception was 2.0 (SD: 0.8), for risk-taking/impulsivity was 1.9 (SD: 0.8), and for sensation-seeking was 2.0 (SD: 0.8). These average scores of 2.0 correspond to the value medium. The average anger score was 17.8 (SD: 7.0) and 7.9% of the sample reported having post-traumatic stress disorder (PTSD).

Main effects of domains of risk on substance use

Greater risk-taking/impulsivity was associated with a higher likelihood of any current drug use in both

unadjusted (OR = 1.86, 95% CI: 1.19, 2.91; $p < .01$) and adjusted models (AOR = 1.71, 95% CI: 1.07, 2.75; $p < .05$). Greater risk perception was significantly associated with a lower likelihood of frequent heavy drinking (RR = 0.89, 95% CI: 0.82, 0.97; $p < .01$). The effects remained significant in adjusted models that controlled for age, sex, anger, and post-traumatic stress disorder (ARR = 0.89, 95% CI: 0.82, 0.97; $p < .01$). Greater risk-taking/impulsivity was associated with an increased likelihood of alcohol problems in both unadjusted (RR = 1.22, 95% CI: 1.09, 1.37; $p < .01$) and adjusted models (ARR = 1.21, 95% CI: 1.07, 1.35; $p < .01$) models as wells.

Interaction effects of deployment status on substance use

We observed a trend-level interaction between risk-taking/impulsivity and deployment on any current drug use (AOR = 2.38, 95% CI: 0.90, 6.28; $p < .10$). Current drug use included both current illicit drug use and NMUPD. To study if there were differential effects based on drug type, we conducted a post-hoc analysis to examine both illicit drug use and NMUPD. A significant interaction between risk-taking/impulsivity and deployment on current illicit drug use (AOR = 4.05, 95% CI: 1.07, 15.41; $p < .05$) was observed (Table 3). This finding showed that those previously deployed and with the highest level of risk-taking/impulsivity had the greatest likelihood of engaging in current illicit drug use. Concurrently, the results also depicted that the predicted probability of current illicit drug use among those never deployed stayed consistent and high regardless of low, moderate, or high risk-taking/impulsivity level. (Figure 1). No effect was noted with current NMUPD.

Discussion

We examined domains of risk and drug and alcohol use among United States Army National Guard and

Table 2. Cross-sectional effects of domains of risk on drug and alcohol use.

	Any current drug use		Alcohol problems		Frequent heavy drinking	
	OR (95% CI)	AOR (95% CI)	RR (95% CI)	ARR (95% CI)	RR (95% CI)	ARR (95% CI)
Risk perception	1.11 (0.73, 1.69)	1.06 (0.68, 1.64)	0.90 [^] (0.80, 1.00)	0.90 [^] (0.80, 1.00)	0.89** (0.82, 0.97)	0.89** (0.82, 0.97)
Risk-taking/impulsivity	1.86** (1.19, 2.91)	1.71* (1.07, 2.75)	1.22** (1.09, 1.37)	1.21** (1.07, 1.35)	1.05 (0.96, 1.14)	1.03 (0.94, 1.12)
Sensation-seeking	1.33 (0.87, 2.03)	1.39 (0.88, 2.17)	1.08 (0.97, 1.21)	1.07 (0.96, 1.19)	1.00 (0.92, 1.08)	1.00 (0.91, 1.08)

* $p < .05$; ** $p < .01$; [^]Trend $p < .07$.

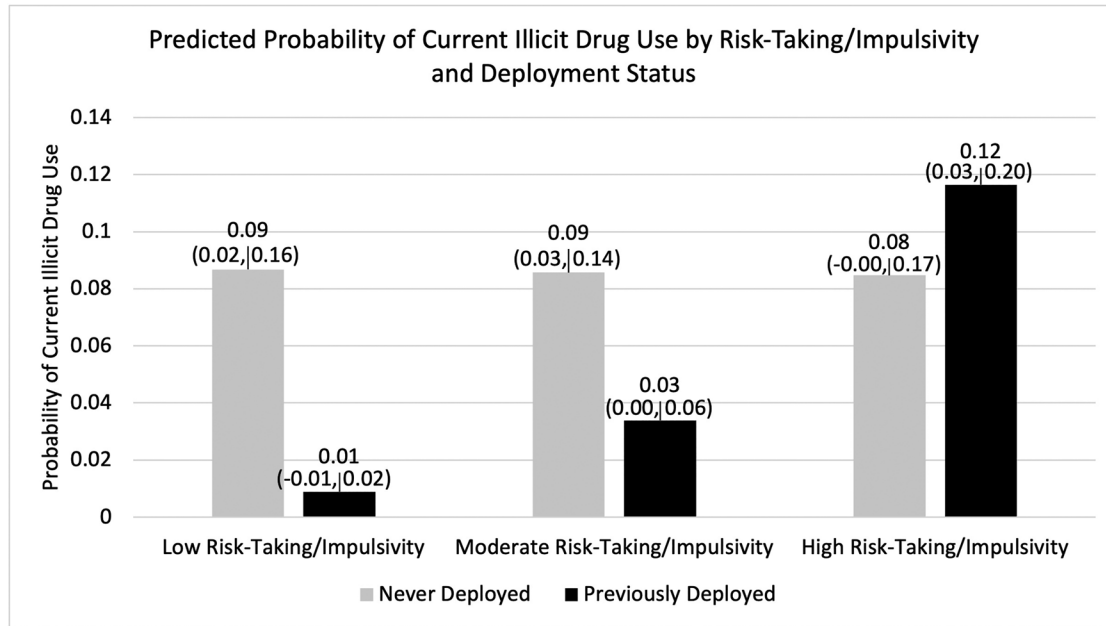
OR=odds ratio; AOR=adjusted odds ratio; RR=risk ratio; ARR=adjusted risk ratio; CI=confidence interval.

Table 3. Cross-sectional effects of deployment status on domains of risk and drug and alcohol use.

Interaction term	Any current drug use	Current NMUPD●	Current illicit drug use	Alcohol problems	Frequent heavy drinking
	AOR (95% CI)	AOR (95% CI)	AOR (95% CI)	ARR (95% CI)	ARR (95% CI)
Risk perception ##	0.51	0.62	0.40	0.97	0.93
Previously deployed	(0.20, 1.31)	(1.40, 2.74)	(1.22, 1.34)	(0.76, 1.24)	(0.77, 1.12)
Risk-taking/ Impulsivity ##	2.38 [^]	1.00	4.05*	1.09	1.06
Previously deployed	(0.90, 6.28)	(0.24, 4.41)	(1.07, 15.41)	(0.87, 1.37)	(0.88, 1.27)
Sensation-seeking ##	1.78	0.58	3.46	0.92	0.86
Previously deployed	(0.70, 4.51)	(1.12, 2.85)	(0.99, 12.15)	(0.73, 1.16)	(0.72, 1.03)

* $p < .05$; ** $p < .01$; [^]Trend $p < .10$.

AOR=adjusted odds ratio; ARR=adjusted risk ratio; CI=confidence interval; ● NMUPD=non-medical use of prescription drugs.

**Figure 1.** Predicted probability of current illicit drug use by risk-taking/impulsivity and deployment status.

Army Reserve (ANG/USAR) soldiers and likelihood of substance use by deployment status. Our findings suggest that risk behaviors and substance use are prevalent among ANG/USAR soldiers. However, our interaction finding showed that current illicit drug use is consistently high among never deployed soldiers with low, moderate, and high risk-taking/impulsivity. To our knowledge, no other studies have examined the relationship between risk behavior domains, substance use, and deployment status. Thus, this research could enhance public health and substance use interventions for ANG/USAR soldiers and especially non-deployed soldiers.

Subsequently, our results show that different domains of risk show varying associations on soldiers' substance use. This particular subgroup of the military experience additional stressors due to the part-time nature of their service such as reduced time with their units, arranging leaves of absence as

needed with their civilian employers, planning for reintegration, and problems linked to social acceptance and victimization because of partial inclusion (Griffith, 2010; Hoopsick et al., 2019; Hoopsick, Vest, Homish, et al., 2020; Lane et al., 2012).

Main effects findings

Our main associations findings relay that risk perception was significantly associated with a lower likelihood of frequent heavy drinking. This indicates that ANG/USAR soldiers with greater risk perception exhibit protective behavior for frequent heavy drinking. This finding might be related to military factors and characteristics such as social support provided by military peers which helps in coping with stress and potentially substance use behaviors such as frequent heavy drinking (Anderson Goodell et al., 2020; Poehlman et al., 2011). Our results further show that

greater risk-taking/impulsivity was associated with a higher likelihood of any current drug use (current illicit drug use and current non-medical use of prescription drugs), and alcohol problems. This finding is consistent with prior research among civilian populations that shows an association between risk-taking behaviors or impulsivity and elevated levels of drug or alcohol use (de-Juan-Ripoll et al., 2021; Grant & Chamberlain, 2014; Moreno et al., 2012; Wagner, 2001). This current study expands upon this idea but within military populations and especially within military Reserve soldiers, a large subgroup of the US military.

Interaction effects findings

Our interaction level findings further shed light on new knowledge pertaining to the role of deployment for ANG/USAR soldiers who exhibit risk-taking/impulsivity and subsequent substance misuse. We observed a trend-level interaction between risk-taking/impulsivity and deployment on any current drug use. Therefore, we explored any current drug use further and conducted a post-hoc analysis on its two categories of current illicit drug use and NMUPD. Our results showed a significant interaction between risk-taking/impulsivity and deployment on current illicit drug use.

Examining this finding further we noted that those with high risk-taking/impulsivity and those who were previously deployed showed the highest likelihood of current illicit drug use. However, the results reported that never-deployed ANG/USAR soldiers with all levels of risk-taking/impulsivity (low, moderate, and high) had a consistently high likelihood for increased current illicit drug use. Our findings demonstrate an important factor to consider, that non-deployed ANG/USAR soldiers who exhibit any level of risk-taking/impulsivity might be at the greatest risk for illicit drug use compared to their deployed counterparts.

Deployment/non-deployment effects findings

Deployment is a vital part of a Reserve soldier's individual and group identity (Griffith, 2011). Research on non-deployment emotions (NDE) among ANG/USAR soldiers suggests that not being deployed is related to feelings of guilt, decreased value, and loss of unit connectedness, which adds to stressors of vicarious trauma and alcohol misuse (Hoopsick, Homish, Bartone, et al., 2018; Hoopsick, Homish, Vest, et al., 2018). In particular, NDE were associated with the frequency of getting drunk and the typical

number of drinks consumed during a drinking episode (Hoopsick, Homish, Vest, et al., 2018). Therefore, the post-hoc analysis of the interaction associations in the present study demonstrates that never deployed soldiers with all levels of risk-taking/impulsivity might have a greater likelihood and probability of current illicit drug use compared to deployed soldiers.

Research implications and impact of findings

Our research has implications for never deployed soldiers who might be more vulnerable to substance use and risk-taking/impulsivity due to NDE or associated stressors. Overall, our research could impact substance use treatment and risk behavior management for service members and in particular, non-deployed ANG/USAR soldiers. While a small portion of previously deployed soldiers had the highest propensity for risk-taking/impulsivity and drug use, never deployed soldiers had steady high rates of increased likelihood of current illicit drug use and risk-taking/impulsivity. Education can be provided to previously deployed and non-deployed ANG/USAR soldiers regarding the influence of engaging in risk behaviors on substance use and how they can be ameliorated by stressors associated with deployment and non-deployment.

In addition, greater risk-taking/impulsivity was associated with a higher likelihood of alcohol problems for ANG/USAR soldiers as well. Therefore, ANG/USAR soldiers might be requiring additional supports and interventions in managing risk behaviors such as risk-taking/impulsivity which is a likely determinant of increased alcohol use. Substance use interventions overall could focus on the importance of managing one's risk behaviors (risk perceptions, risk-taking/impulsivity, sensation-seeking) in relation to their substance use. Consequently, investigations into the protective effect of risk perception and why it is associated with a decreased probability of frequent heavy drinking, can further elucidate how interventions concerning risk perception behaviors can aid in reducing unhealthy alcohol use among ANG/USAR soldiers.

Strengths

This study possessed several notable strengths. Studying risk behaviors in light of substance use and deployment allowed us to highlight an area of potential concern in military populations and empirical research. This research made a significant contribution to our understanding of risk perception, risk-taking/impulsivity, and sensation-seeking behaviors of ANG/USAR soldiers and how they affect the propensity of

drug and alcohol use in this sample. Through use of validated measures and statistical analyses conducted on main effect and interaction effect models, we were able to uncover differences by deployment and non-deployment that can shape future research on examining unique factors related to the prevalence of risk behaviors and substance use among non-deployed soldiers.

Future research can investigate how those who have not been deployed, are perceiving, taking, or seeking risk and related behaviors are engaging in substance use leading to negative outcomes. For all analyses we controlled for comorbid conditions such as anger and PTSD to eliminate any confounding results (Back et al., 2019; Davies et al., 2019; Worthen et al., 2014). A study of ANG/USAR soldiers ($n = 1,293$) noted that 51%–53% of the sample self-reported anger issues and 3.0%–3.4% of that sample reported PTSD (Worthen et al., 2014). Moreover, this research included non-deployed soldiers and women who are often excluded from such research studies and highlights ANG/USAR service members who are a target population with an increased risk of adverse substance use outcomes.

Limitations

There are several limitations to note in the present study. First, as a survey-based research project the collected data is a self-report of the participants mental health and substance use and was not medically verified. However, all measures used to create the survey and questions were based on validated clinical tools and questionnaires used as standard practice. Additionally, the data might also be subject to response bias. Second, this study excluded soldiers who were single, divorced and presently single, or not living with a partner at the time of recruitment which limits the generalizability of results. Conversely, recent national estimates show that majority of military samples are married (U.S. Department of Defense, 2020). Third, it is difficult to ascertain the significance of pre-military and pre-deployment/pre-non-deployment substance use and risk behaviors that might directly or indirectly contribute to the participants present conditions and behaviors. Literature suggests that risk perception and risk-taking behaviors formed during adolescence may influence personality traits later in life (Reniers et al., 2016). Moreover, the scope of our current work does not explore the associations of stigma or other work-related consequences (such as misconducts, punishments, violations, or disciplinary actions) that might impact soldiers' risk behaviors and

subsequent substance use and mental health (Brignone et al., 2017; Britt et al., 2020; Gray et al., 2021; Greene-Shortridge et al., 2007).

Conclusions and future directions

Our findings demonstrate that greater risk-taking/impulsivity was associated with substance use, and greater risk perception was protective against alcohol misuse. Differences in the associations of deployment status on domains of risk and substance use revealed that non-deployed soldiers with low, moderate, and high risk-taking/impulsivity may be at a constant risk for substance misuse. Additional research is needed to further explore how greater risk perception can decrease the likelihood of frequent heavy drinking in ANG/USAR soldiers. Reducing risk-taking/impulsivity and other risk-related behaviors/traits may be critical in preventing problematic substance use among ANG/USAR soldiers—especially among those who have never been deployed. Harm reduction education could also be incorporated in interventions targeting risk behaviors and substance use to reduce the harm associated with risky behaviors and substance use alike.

Moreover, this study only examined cross-sectional differences at survey time-point 4. Since the project is still on-going, longitudinal analyses will show differences in risk behaviors and substance use across time in this population. As this study yielded significant and trend level interactions with risk perception and risk-taking/impulsivity on alcohol and drug use, future research could include tailored sub-questions regarding risk perception/taking/impulsivity in conjunction to substance use. In addition, questions on domains of risk and deployment and non-deployment would also prove useful in understanding the higher levels of substance use issues and risk for non-deployed soldiers. We can also speculate that existing substance use problems could potentially hinder a soldier's perception of risk, risk-taking/impulsivity, and sensation-seeking, and consequently their ability to be deployed (and encounter risky situations) (Gray et al., 2021). Further work can highlight the effect of soldiers with alcohol or drug use problems and emphasize if their non-deployment and associated risk behaviors are a consequence of their substance use.

Furthermore, upcoming research could also include mental health symptomatology such as anxiety, post-traumatic stress disorder (PTSD)/trauma, anger, and depression as potential interactions in risk behaviors and substance use models to understand their

associated effects on the current results. Future research can further include other Reserve and Guard soldiers to study the differences in risk behaviors and substance use by different military branches. Additional research can also be expanded to look at risk behaviors in light of critical factors such as stigma related to seeking substance use treatment as military members, and unique stressors modifying risk behavior propensity and substance use patterns such as work-related consequences, performance or behavior related incidents, and misconducts.

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Ethics statement

The protocol for Operation: SAFETY was reviewed and approved by the State University of New York at Buffalo's Institutional Review Board (study ID 030-402725), as well as the Army Human Research Protections Office, Office of the Chief, Army Reserve and the Adjutant General of the National Guard. Participants provided informed consent at baseline confirming their voluntary participation in Operation: SAFETY.

Author contributions

All authors have approved the final article. Mehreen Arif: Overall writing and editing, Original Draft preparation and Writing, Conceptualization, Formal Analysis. Rachel Hoopsick: Conceptualization, Formal Analysis, Writing-Reviewing and Editing. D. Lynn Homish: Validation, Methodology, Writing- Reviewing and Editing. Greg Homish: Supervision, Methodology, Writing- Reviewing and Editing.

Disclosure statement

No potential conflict of interest was reported by the author(s).

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References

- Anderson Goodell, E. M., Johnson, R. M., Latkin, C. A., Homish, D. L., & Homish, G. G. (2020). Risk and protective effects of social networks on alcohol use problems among Army Reserve and National Guard soldiers. *Addictive Behaviors*, 103, 106244. <https://doi.org/10.1016/j.addbeh.2019.106244>
- Back, S. E., Killeen, T., Badour, C. L., Flanagan, J. C., Allan, N. P., Ana, E. S., Lozano, B., Korte, K. J., Foa, E. B., & Brady, K. T. (2019). Concurrent treatment of substance use disorders and PTSD using prolonged exposure: A randomized clinical trial in military veterans. *Addictive Behaviors*, 90, 369–377. <https://doi.org/10.1016/j.addbeh.2018.11.032>
- Babor, T. F., & Del Boca, F. K. (1992). Just the facts: Enhancing measurement of alcohol consumption using self-report methods. In R. Z. Litten & J. P. Allen (Eds.), *Measuring alcohol consumption: Psychosocial and biochemical methods*. (pp. 3–19). Humana Press. https://doi.org/10.1007/978-1-4612-0357-5_1
- Babor, T. F., Higgins-Biddle, J. C., Saunders, J. B., & Monteiro, M. G. (2001). AUDIT: The Alcohol Use Disorders Identification Test: Guidelines for use in primary care. World Health Organization. Department of Mental Health and Substance Dependence. https://iris.who.int/bitstream/handle/10665/67205/WHO_MSD_MSB_01.6a.pdf?sequence=1
- 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/10.1002/jts.22059>
- 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/10.1037/pas0000254>
- Bray, R. M., Brown, J. M., & Williams, J. (2013). Trends in binge and heavy drinking, alcohol-related problems, and combat exposure in the U.S. military. *Substance Use & Misuse*, 48(10), 799–810. <https://doi.org/10.3109/10826084.2013.796990>
- Brevik, G., Sand, T. S., & Sookermany, A. M. (2019). Risk-taking and sensation seeking in military contexts: A literature review. *SAGE Open*, 9(1), 215824401882449. <https://doi.org/10.1177/2158244018824498>
- Brewer, N. T., Chapman, G. B., Gibbons, F. X., Gerrard, M., McCaul, K. D., & Weinstein, N. D. (2007). Meta-analysis of the relationship between risk perception and health behavior: The example of vaccination. *Health Psychology: Official Journal of the Division of Health*

- Psychology, American Psychological Association, 26(2), 136–145. <https://doi.org/10.1037/0278-6133.26.2.136>
- Brignone, E., Fargo, J. D., Blais, R. K., Carter, M. E., Samore, M. H., & Gundlapalli, A. V. (2017). Non-routine discharge from military service: Mental illness, substance use disorders, and suicidality. *American Journal of Preventive Medicine*, 52(5), 557–565. <https://doi.org/10.1016/j.amepre.2016.11.015>
- Britt, T. W., Sipos, M. L., Klinefelter, Z., & Adler, A. B. (2020). Determinants of mental and physical health treatment-seeking among military personnel. *The British Journal of Psychiatry: The Journal of Mental Science*, 217(2), 420–426. <https://doi.org/10.1192/bjp.2019.155>
- Brown, V. J. (2014). Risk perception: It's personal. *Environmental Health Perspectives*, 122(10), A276–A279. <https://doi.org/10.1289/ehp.122-A276>
- Byers, A. L., Allore, H., Gill, T. M., & Peduzzi, P. N. (2003). Application of negative binomial modeling for discrete outcomes: A case study in aging research. *Journal of Clinical Epidemiology*, 56(6), 559–564. [https://doi.org/10.1016/s0895-4356\(03\)00028-3](https://doi.org/10.1016/s0895-4356(03)00028-3)
- Campbell-Sills, L., Ursano, R. J., Kessler, R. C., Sun, X., Heeringa, S. G., Nock, M. K., Sampson, N. A., Jain, S., & Stein, M. B. (2018). Prospective risk factors for post-deployment heavy drinking and alcohol or substance use disorder among US Army soldiers. *Psychological Medicine*, 48(10), 1624–1633. <https://doi.org/10.1017/S0033291717003105>
- Cherpitel, C. J. (1993). Alcohol, injury, and risk-taking behavior: Data from a national sample. *Alcoholism, Clinical and Experimental Research*, 17(4), 762–766. <https://doi.org/10.1111/j.1530-0277.1993.tb00837.x>
- Cohen, G. H., Fink, D. S., Sampson, L., & Galea, S. (2015). Mental health among reserve component military service members and veterans. *Epidemiologic Reviews*, 37(1), 7–22. <https://doi.org/10.1093/epirev/mxu007>
- Davies, R. L., Prince, M. A., Bravo, A. J., Kelley, M. L., & Crain, T. L. (2019). Moral injury, substance use, and posttraumatic stress disorder symptoms among military personnel: An examination of trait mindfulness as a moderator. *Journal of Traumatic Stress*, 32(3), 414–423. <https://doi.org/10.1002/jts.22403>
- Dawe, S., Gullo, M. J., & Loxton, N. J. (2004). Reward drive and rash impulsiveness as dimensions of impulsivity: Implications for substance misuse. *Addictive Behaviors*, 29(7), 1389–1405. <https://doi.org/10.1016/j.addbeh.2004.06.004>
- de-Juan-Ripoll, C., Chicchi Giglioli, I. A., Llanes-Jurado, J., Marín-Morales, J., & Alcañiz, M. (2021). Why do we take risks? Perception of the situation and risk proneness predict domain-specific risk taking. *Frontiers in Psychology*, 12, 562381. <https://doi.org/10.3389/fpsyg.2021.562381>
- Dougherty, D. M., Lake, S. L., Mathias, C. W., Ryan, S. R., Bray, B. C., Charles, N. E., & Acheson, A. (2015). Behavioral impulsivity and risk-taking trajectories across early adolescence in youths with and without family histories of alcohol and other drug use disorders. *Alcoholism, Clinical and Experimental Research*, 39(8), 1501–1509. <https://doi.org/10.1111/acer.12787>
- Godby Vail, S., Dierst-Davies, R., Kogut, D., Degiorgi Winslow, L., Vargas, J., Koeppl, P., & Marshall-Aiyelawo, K. (2023). Behavioral health and treatment-seeking behaviors among deployed vs. non-deployed service members: How impactful is deployment on well-being? *Military Psychology: The Official Journal of the Division of Military Psychology, American Psychological Association*, 35(2), 107–118. <https://doi.org/10.1080/08995605.2022.2083468>
- Grant, J. E., & Chamberlain, S. R. (2014). Impulsive action and impulsive choice across substance and behavioral addictions: Cause or consequence? *Addictive Behaviors*, 39(11), 1632–1639. <https://doi.org/10.1016/j.addbeh.2014.04.022>
- Gray, J. C., Larson, M. J., Moresco, N., Ritter, G. A., Dufour, S., Milliken, C. S., & Adams, R. S. (2021). The association of engagement in substance use treatment with negative separation from the military among soldiers with post-deployment alcohol use disorder. *Drug and Alcohol Dependence*, 221, 108647. <https://doi.org/10.1016/j.drugalcdep.2021.108647>
- Greene-Shortridge, T. M., Britt, T. W., & Castro, C. A. (2007). The stigma of mental health problems in the military. *Military Medicine*, 172(2), 157–161. <https://doi.org/10.7205/milmed.172.2.157>
- Griffith, J. (2010). Citizens coping as soldiers: A review of deployment stress symptoms among reservists. *Military Psychology*, 22(2), 176–206. <https://doi.org/10.1080/08995601003638967>
- Griffith, J. (2011). Decades of transition for the US reserves: Changing demands on reserve identity and mental well-being. *International Review of Psychiatry (Abingdon, England)*, 23(2), 181–191. <https://doi.org/10.3109/09540261.2010.541904>
- Homish, G. G., & Leonard, K. E. (2007). The drinking partnership and marital satisfaction: The longitudinal influence of discrepant drinking. *Journal of Consulting and Clinical Psychology*, 75(1), 43–51. <https://doi.org/10.1037/0022-006X.75.1.43>
- Hoopsick, R. A., Fillo, J., Vest, B. M., Homish, D. L., & Homish, G. G. (2017). Substance use and dependence among current reserve and former military members: Cross-sectional findings from the National Survey on Drug Use and Health, 2010–2014. *Journal of Addictive Diseases*, 36(4), 243–251. <https://doi.org/10.1080/10550887.2017.1366735>
- Hoopsick, R. A., Homish, D. L., Vest, B. M., & Homish, G. G. (2018). Alcohol use among never-deployed U.S. army reserve and national guard soldiers: The effects of nondeployment emotions and sex. *Alcoholism, Clinical and Experimental Research*, 42(12), 2413–2422. <https://doi.org/10.1111/acer.13901>
- Hoopsick, R. A., Homish, D. L., Bartone, P. T., & Homish, G. G. (2018). Developing a measure to assess emotions associated with never being deployed. *Military Medicine*, 183(9–10), e509–e517. <https://doi.org/10.1093/milmed/usy005>
- Hoopsick, R. A., Benson, K. R., Homish, D. L., & Homish, G. G. (2019). Resiliency factors that protect against post-deployment drug use among male US Army Reserve and National Guard soldiers. *Drug and Alcohol Dependence*, 199, 42–49. <https://doi.org/10.1016/j.drugalcdep.2019.02.017>
- Hoopsick, R. A., Vest, B. M., Homish, D. L., & Homish, G. G. (2020). Problems with social acceptance and social victimization predict substance use among U.S. Reserve/

- Guard soldiers. *Stress and Health: Journal of the International Society for the Investigation of Stress*, 36(3), 311–321. <https://doi.org/10.1002/smi.2934>
- Hoopsick, R. A., Homish, D. L., Collins, R. L., Nochajski, T. H., Read, J. P., & Homish, G. G. (2020). Is deployment status the critical determinant of psychosocial problems among reserve/guard soldiers? *Psychological Services*, 17(4), 461–471. <https://doi.org/10.1037/ser0000331>
- Hoopsick, R. A., Homish, D. L., Vest, B. M., Bartone, P. T., & Homish, G. G. (2021). Resilience to hazardous drinking among never-deployed male United States Army Reserve and National Guard Soldiers. *Alcoholism, Clinical and Experimental Research*, 45(3), 566–576. <https://doi.org/10.1111/acer.14561>
- Jacobson, I. G., Ryan, M. A., Hooper, T. I., 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*, 300(6), 663–675. <https://doi.org/10.1001/jama.300.6.663>
- Jacobson, I. G., Williams, E. C., Seelig, A. D., Littman, A. J., Maynard, C. C., Bricker, J. B., Rull, R. P., & Boyko, E. J. Millennium Cohort Study Team. (2020). Longitudinal investigation of military-specific factors associated with continued unhealthy alcohol use among a large US military cohort. *Journal of Addiction Medicine*, 14(4), e53–e63. <https://doi.org/10.1097/ADM.0000000000000596>
- Jensen, M., Chassin, L., & Gonzales, N. A. (2017). Neighborhood moderation of sensation seeking effects on adolescent substance use initiation. *Journal of Youth and Adolescence*, 46(9), 1953–1967. <https://doi.org/10.1007/s10964-017-0647-y>
- Kelley, M. L., Runnals, J., Pearson, M. R., Miller, M., Fairbank, J. A., & Brancu, M. VA Mid-Atlantic MIRECC Women Veterans Workgroup, VA Mid-Atlantic MIRECC Registry Workgroup. (2013). Alcohol use and trauma exposure among male and female veterans before, during, and after military service. *Drug and Alcohol Dependence*, 133(2), 615–624. <https://doi.org/10.1016/j.drugalcdep.2013.08.002>
- Lande, R. G., Marin, B. A., Chang, A. S., & Lande, G. R. (2008). Survey of alcohol use in the U.S. Army. *Journal of Addictive Diseases*, 27(3), 115–121. <https://doi.org/10.1080/10550880802122711>
- Lane, M. E., Hourani, L. L., Bray, R. M., & Williams, J. (2012). Prevalence of perceived stress and mental health indicators among reserve-component and active-duty military personnel. *American Journal of Public Health*, 102(6), 1213–1220. <https://doi.org/10.2105/AJPH.2011.300280>
- Lipari, R. N., Hedden, S. L., & Hughes, A. (2014). Substance use and mental health estimates from the 2013 National Survey on Drug Use and Health: Overview of findings. In *The CBHSQ Report*. (pp. 1–10). Substance Abuse and Mental Health Services Administration (US). <https://www.ncbi.nlm.nih.gov/books/NBK385055/?report=classic>
- Magid, V., Maclean, M. G., & Colder, C. R. (2007). Differentiating between sensation seeking and impulsivity through their mediated relations with alcohol use and problems. *Addictive Behaviors*, 32(10), 2046–2061. <https://doi.org/10.1016/j.addbeh.2007.01.015>
- Malmberg, M., Overbeek, G., Monshouwer, K., Lammers, J., Vollebergh, W. A., & Engels, R. C. (2010). Substance use risk profiles and associations with early substance use in adolescence. *Journal of Behavioral Medicine*, 33(6), 474–485. <https://doi.org/10.1007/s10865-010-9278-4>
- Moreno, M., Estevez, A. F., Zaldivar, F., Montes, J. M., Gutiérrez-Ferre, V. E., Esteban, L., Sánchez-Santed, F., & Flores, P. (2012). Impulsivity differences in recreational cannabis users and binge drinkers in a university population. *Drug and Alcohol Dependence*, 124(3), 355–362. <https://doi.org/10.1016/j.drugalcdep.2012.02.011>
- O'Brien, C. P., Oster, M., Morden, E., Committee on Prevention, Diagnosis, Treatment, and Management of Substance Use Disorders in the U.S. Armed Forces, Board on the Health of Select Populations, & Institute of Medicine. (2013). *Substance use disorders in the U.S. Armed Forces*. National Academies Press.
- Paek, H. J., & Hove, T. (2017). Risk perceptions and risk characteristics. In *Oxford research encyclopedia of communication*. <https://doi.org/10.1093/acrefore/9780190228613.013.283>
- Pilkonis, P. A., Choi, S. W., Reise, S. P., Stover, A. M., Riley, W. T., & Cella, D. PROMIS Cooperative Group. (2011). Item banks for measuring emotional distress from the Patient-Reported Outcomes Measurement Information System (PROMIS®): Depression, anxiety, and anger. *Assessment*, 18(3), 263–283. <https://doi.org/10.1177/1073191111411667>
- Platteborze, P. L., Kippenberger, D. J., & Martin, T. M. (2013). Drug positive rates for the Army, Army Reserve, and Army National Guard from fiscal year 2001 through 2011. *Military Medicine*, 178(10), 1078–1084. <https://doi.org/10.7205/MILMED-D-13-00193>
- Poehlman, J. A., Schwerin, M. J., Pemberton, M. R., Isenberg, K., Lane, M. E., & Aspinwall, K. (2011). Socio-cultural factors that foster use and abuse of alcohol among a sample of enlisted personnel at four Navy and Marine Corps installations. *Military Medicine*, 176(4), 397–401. <https://doi.org/10.7205/milmed-d-10-00240>
- Quinn, P. D., & Harden, K. P. (2013). Differential changes in impulsivity and sensation seeking and the escalation of substance use from adolescence to early adulthood. *Development and Psychopathology*, 25(1), 223–239. <https://doi.org/10.1017/S0954579412000284>
- Reger, M. A., Tucker, R. P., Carter, S. P., & Ammerman, B. A. (2018). Military deployments and suicide: A critical examination. *Perspectives on Psychological Science: A Journal of the Association for Psychological Science*, 13(6), 688–699. <https://doi.org/10.1177/1745691618785366>
- Reniers, R. L., Murphy, L., Lin, A., Bartolomé, S. P., & Wood, S. J. (2016). Risk perception and risk-taking behaviour during adolescence: The influence of personality and gender. *PloS One*, 11(4), e0153842. <https://doi.org/10.1371/journal.pone.0153842>
- Rieser, N. M., Shaul, L., Blankers, M., Koeter, M., Schippers, G. M., & Goudriaan, A. E. (2019). The predictive value of impulsivity and risk-taking measures for substance use in substance dependent offenders. *Frontiers in Behavioral Neuroscience*, 13, 192. <https://doi.org/10.3389/fnbeh.2019.00192>
- 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* (Abingdon, England), 88(6), 791–804. <https://doi.org/10.1111/j.1360-0443.1993.tb02093.x>
- Spera, C., Thomas, R. K., Barlas, F., Szoc, R., & Cambridge, M. H. (2011). Relationship of military deployment recency, frequency, duration, and combat exposure to alcohol use in the Air Force. *Journal of Studies on Alcohol and Drugs*, 72(1), 5–14. <https://doi.org/10.15288/jsad.2011.72.5>
- StataCorp. (2019). *Stata Statistical Software: Release 16*. College Station, TX: StataCorp LLC. <https://www.stata.com/>
- Sullivan, K., Park, Y., Kale, C. N., Adler, A., Sipos, M. L., & Riviere, L. A. (2023). Positive and negative family communication and mental distress: Married service members during a non-combat deployment. *Family Process*, 1–16. <https://doi.org/10.1111/famp.12874>
- Tamburrino, M. B., Chan, P., Prescott, M., Calabrese, J., Liberzon, I., Slembariski, R., Shirley, E., Fine, T., Goto, T., Wilson, K., Derus, A., Ganocy, S., Beth Serrano, M., & Galea, S. (2015). Baseline prevalence of Axis I diagnosis in the Ohio Army National Guard. *Psychiatry Research*, 226(1), 142–148. <https://doi.org/10.1016/j.psychres.2015.04.003>
- Thomsen, C. J., Stander, V. A., McWhorter, S. K., Rabenhorst, M. M., & Milner, J. S. (2011). Effects of combat deployment on risky and self-destructive behavior among active duty military personnel. *Journal of Psychiatric Research*, 45(10), 1321–1331. <https://doi.org/10.1016/j.jpsychires.2011.04.003>
- U.S. Department of Defense. (2020). 2020 demographics profile of the military community. Washington, DC. <https://www.militaryonesource.mil/data-research-and-statistics/military-community-demographics/2020-demographics-profile/>
- Wang, J., Ursano, R. J., Gifford, R. K., Dinh, H., Farooq, S., Broshek, C. E., Cohen, G. H., Sampson, L., Galea, S., & Fullerton, C. S. (2020). Mental health suicidality in separating U.S. Reserve and National Guard Personnel. *Psychiatry*, 83(2), 166–175. <https://doi.org/10.1080/00332747.2020.1715162>
- Wagner, M. K. (2001). Behavioral characteristics related to substance abuse and risk-taking, sensation-seeking, anxiety sensitivity, and self-reinforcement. *Addictive Behaviors*, 26(1), 115–120. [https://doi.org/10.1016/S0306-4603\(00\)00071-X](https://doi.org/10.1016/S0306-4603(00)00071-X)
- WHO ASSIST Working Group. (2002). The Alcohol, Smoking and Substance Involvement Screening Test (ASSIST): Development, reliability and feasibility. *Addiction* (Abingdon, England), 97(9), 1183–1194. <https://doi.org/10.1046/j.1360-0443.2002.00185.x>
- Worthen, M., Rathod, S. D., Cohen, G., Sampson, L., Ursano, R., Gifford, R., Fullerton, C., Galea, S., & Ahern, J. (2014). Anger problems and posttraumatic stress disorder in male and female National Guard and Reserve Service members. *Journal of Psychiatric Research*, 55, 52–58. <https://doi.org/10.1016/j.jpsychires.2014.04.004>
- Vest, B. M., Hoopsick, R. A., Homish, D. L., & Homish, G. G. (2020). Lower levels of bodily pain increase risk for non-medical use of prescription drugs among current US reserve soldiers. *Addictive Behaviors*, 108, 106443. <https://doi.org/10.1016/j.addbeh.2020.106443>
- Vogt, D., Smith, B. N., King, D. W., & King, L. A. (2012). Manual for the Deployment Risk and Resilience Inventory-2 (DRRI-2): A Collection of Measures for Studying Deployment-Related Experiences of Military Veterans. Boston, MA: National Center for PTSD. <https://www.ptsd.va.gov/professional/assessment/documents/drri2manual.pdf>