PREDICTORS OF ALCOHOL MISUSE ACROSS THE DEPLOYMENT CYCLE

A Dissertation

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ABSTRACT

The present study sought to identify predictors of alcohol misuse in an active-duty sample of United States Air Force (USAF) Security Forces Airmen using a longitudinal design targeting concurrent and prospective factors as well as predictors of increase in alcohol misuse. Given the well-documented relation between alcohol misuse and negative consequences at the individual, work, and community levels, predictors of alcohol misuse were explored to determine risk factors for developing alcohol-related problems across the deployment cycle. Based upon prior evidence for the association of sociodemographic variables, mental health symptoms, interpersonal factors, and exposure to traumatic events with alcohol misuse in other military samples, the current investigation assessed the utility of these predictors within a sample of USAF Airmen following a year-long, high-risk deployment to Iraq.

Results indicated that sociodemographic variables and combat exposure were largely unrelated to alcohol misuse at either pre- or post-deployment in this sample; by comparison, intrapersonal factors such as posttraumatic stress disorder (PTSD) and depressive symptoms significantly predicted concurrent alcohol misuse at both time points. However, the most striking finding was the large effect size for the predictive utility of intimate relationship distress, especially at post-deployment. Indeed, Airmen who endorsed relationship distress at post-deployment were over seven times more likely to engage in concurrent alcohol misuse and eight times as likely to shift from drinking within recommended limits to engaging in alcohol misuse. Implications of

these findings for assessment and intervention as well as future directions for research regarding alcohol misuse across the deployment cycle were examined.

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CHAPTER I

INTRODUCTION

Since the initial mobilization of troops following the terrorist attacks in September of 2001, an estimated 2.4 million members of the United States Armed Forces have deployed to Afghanistan and Iraq in support of Operations Enduring Freedom (OEF), Iraqi Freedom (OIF), and New Dawn (OND) (True Cost of War Act, 2013). While deployed, these service members are often exposed to harsh, unpredictable environments in which civilians and combatants are indistinguishable, covert aggression is common, and one's very survival is contingent upon maintaining high levels of arousal. Thus, it is not surprising that many combat veterans experience enduring changes in habits, wellness behaviors, interpersonal functioning, and mental health following their return from Afghanistan and Iraq (Conoscenti, Vine, Papa, & Litz, 2009).

Multiple studies have demonstrated that OEF/OIF service members struggle with high rates of mental health problems and, in particular, difficulties with substance use after returning home (Hoge, Auchterlonie, & Milliken, 2006; Jacobson et al., 2008; Seal et al., 2009). Indeed, estimated rates of alcohol misuse (i.e., any drinking behavior that increases an individual's risk for negative health and social consequences to include risky drinking or heavy alcohol use, alcohol abuse, and alcohol dependence) among active-duty service members having recently returned from Afghanistan and Iraq range from 11.5% to 35.4% (Hoge et al., 2004; Jacobson et al., 2008; Milliken, Auchterloine, & Hoge, 2007); rates of alcohol misuse for OEF/OIF veterans seeking primary care

services from Veterans Affairs (VA) Health Care are 26.5% to 40% (Calhoun, Elter, Jones, Kudler, & Straits- Tröster, 2008; Erbes, Westermeyer, Engdahl, & Johnson, 2007; McDevitt-Murphy et al., 2010). Binge drinking (i.e., consuming five or more drinks on the same occasion once during the past 30 days) is common among both active-duty service members (Lande, Marin, Chang, & Lande, 2008) and veterans (Bradley et al., 2001) and is more prevalent in these populations than in even high-risk civilian populations such as college students (Ames & Cunradi, 2004). In fact, a study by Bray and colleagues (2009) found that 47% of service members self-reported binge drinking; comparing 2007 rates of substance use among civilians with 2008 rates of substance use among military personnel, they further determined that rates of heavy alcohol use (i.e., consuming five or more drinks on the same occasion at least once per week during the past 30 days) were significantly higher among military personnel than among civilians (20% versus 14%, respectively) even after controlling for sociodemographic factors.

Since 1980, the military has made progress in reducing smoking and illicit drug use, but has shown significantly less progress in decreasing heavy alcohol use. In fact, according to the 2008 Department of Defense (DoD) Survey of Health Related Behaviors Among Active Duty Military Personnel (HRB Survey; Bray et al., 2009) heavy alcohol use among military personnel increased across all military branches between 1998 and 2002 with further significant increases for both the Marine Corps (25% to 29%) and the Air Force (10% to 14%) from 2005 to 2008. The increasing rate of alcohol misuse among military personnel is disconcerting due to the well-documented relation between alcohol misuse and negative consequences at the individual, family,

work, and community levels. Similar to alcohol-related consequences within civilian populations (Gmel & Rehm, 2003), excessive drinking among military personnel is associated with health problems such as hypertension, stroke, liver disorders, gastrointestinal complications, osteoporosis, and cancer (Aldridge-Gerry, Cucciare, Ghaus, & Ketroser, 2012); familial difficulties such as relationship problems, intimate partner violence, and child maltreatment (Foran & O'Leary, 2008; Stahre, Brewer, Fonseca, & Naimi, 2009); occupational problems such as decreased productivity, lack of deployment readiness, and on-the-job injury (Blume et al., 2006; Fisher, Hoffman, Austin-Lane, & Kao, 2000); and legal difficulties such as arrests related to driving while intoxicated, engaging in physical altercations, or other illegal activities (Bray et al., 2009; Stahre et al., 2009). Indeed, a 2006 Air Force report identified "irresponsible drinking" as a factor in 29% of domestic violence incidents, 33% of suicides, 44% of fatal motor vehicle accidents, and 57% of sexual assaults (U.S. Air Force, 2006).

The negative consequences of alcohol misuse are far reaching. The DoD spends an estimated $425 million annually on medical costs resulting from high alcohol consumption and loses an additional $745 million due to reduced readiness, misconduct charges, and additional force management costs (Harwood, Zhang, Dall, Olaiya, & Fagan, 2009). Binge drinking is associated with greater absenteeism from work as well as significantly decreased productivity among active duty military personnel. The estimated productivity loss to the DoD is 320,000 work days due to absenteeism and an additional 228,000 days due to on-the-job impairment with an approximate cost of $39 million and $28 million, respectively (Dall et al., 2007). Recognizing the need to reduce

the rate of rising medical costs, increase readiness, and improve the overall well-being of the military community, the DoD began allocating funds to the assessment and treatment of alcohol problems starting in the 1970s. Policy directives sought to reduce the risk for substance abuse among active-duty personnel (e.g., U.S. Department of Defense, 1972, 1980, 1997) while the extent of alcohol misuse in the military was assessed using a series of recurring cross-sectional surveys administered in 1980, 1982, 1985, 1988, 1992, 1995, 1998, 2002 and 2005 (Bray & Hourani, 2007). Results of the DoD studies, as well as those conducted by civilian research organizations, have consistently found associations between individual variables and alcohol misuse.

Certain sociodemographic factors such as being lower enlisted, Caucasian, male, unmarried, and childless are all related to higher levels of alcohol consumption among military personnel (Ames & Cunradi, 2004; Bray & Hourani, 2007; Bray et al., 2003; Jacobson et al., 2008; Spera, Thomas, Barlas, Szoc, & Cambridge, 2011). Indeed, service members between the ages of 18 and 25 are almost twice as likely to drink heavily compared to their civilian peers (Bray et al., 2003; Ferrier-Auerbach et al., 2009). Similarly, those service members who have experienced negative consequences due to drinking (as measured by the CAGE questionnaire; Ewing, 1984) are more likely to be less educated, male, single, and enlisted (Blume et al., 2006). It has been suggested that rates of alcohol misuse within the military can be partially explained by demographic factors in combination with specific characteristics of military service. For example, the fact that the majority of OEF/OIF personnel are men under the age of 25 (Bray & Hourani, 2007) coupled with the normalization of regular alcohol consumption

within the military culture (Ames, Cunradi, Moore, & Stern, 2007) likely contribute to service members' heavy drinking behaviors. However, sociodemographic factors alone are not sufficient to explain alcohol misuse, especially following a service member's return from deployment.

Increasingly researchers have begun to examine the impact of deployment and combat exposure on subsequent alcohol misuse in both active duty and reserve service members (Browne et al., 2008; Hooper et al., 2008; Jacobson et al., 2008; Wilk et al., 2010). Overall, combat duty is associated with increased utilization of mental health services and a higher likelihood of attrition from the military (Hoge et al., 2006; Milliken et al., 2007; Seal et al., 2009). Studies examining drinking behaviors in OEF/OIF personnel have demonstrated that service members exposed to combat are more likely to misuse alcohol than those who have not been exposed (Jacobson et al., 2008; McFall, Mackay, & Donovan, 1992; Milliken et al., 2007; Seal, Bertenthal, Miner, Sen, & Marmar, 2007; Smith et al., 2008). These results are consistent with studies conducted with veterans of earlier conflicts such as the Vietnam and Gulf Wars which also found higher rates of substance use, including alcohol misuse, for deployed versus nondeployed service members (Forgas, Meyer, & Cohen, 1996; Iowa Persian Gulf Study Group, 1997; McFall et al., 1992).

Although the association between combat exposure and alcohol misuse has been well-established, fewer studies have focused on the specific aspects of combat that lead to increased alcohol use post-deployment. One study using a sample of U.S. Airmen examined the association between several combat exposure variables and problem

drinking; it was determined that only one type of combat exposure, inspecting a destroyed military vehicle, significantly predicted future alcohol misuse (Spera et al., 2011). Another study based on United Kingdom Armed Forces found that increases in alcohol consumption post-deployment were higher for those who thought they might be killed or who experienced hostility from civilians (Hooper et al., 2008). It has been hypothesized that, regardless of the specific traumatic events to which they have been exposed, service members may increase their alcohol consumption in order to suppress stress responses related to their combat experiences (Kessler et al., 1996).

As a function of the stressors inherent in military settings, it is not surprising that rates of both psychiatric and substance use disorders, including alcohol misuse, among military personnel are significantly higher than among the civilian population (Hoge et al, 2004; Hoge et al., 2006; Seal et al., 2007). Given the prevalence and comorbidity of such disorders within the military, researchers have increasingly examined the association between alcohol use and specific diagnoses such as depression and posttraumatic stress disorder (PTSD). Indeed, prior research has shown that approximately half of service members who screen positive for depression or PTSD also meet criteria for potential alcohol misuse (Thomas et al., 2010). Moreover, in a large cohort study of U.S. military personnel it was found that individuals experiencing PTSD symptoms alone or comorbid PTSD and depression symptoms were more likely to experience new onset prevalence of heavy drinking, binge drinking, and alcohol related problems (Jacobson et al., 2008). Although it has been hypothesized that active duty service members and veterans engage in risky drinking behaviors in an effort to cope

with the negative emotions associated with depression and PTSD (Bradley et al., 2001; Cucciare, Darrow, & Weingardt, 2011; Ferrier-Auerbach et al., 2009), increased alcohol consumption also has the potential to worsen such mental health conditions (Marshall et al., 2006). This self-medication hypothesis has been supported by longitudinal studies of OEF/OIF combat veterans (Hooper et al., 2008; Jacobson et al., 2008) despite evidence from other studies with civilian populations suggesting that alcohol misuse precedes and, thus, predisposes an individual to traumatic exposure (e.g., Cottler, Compton, Mager, Spitznagel, & Janca, 1992). Regardless of the specific mechanism by which mental health disorders and problem drinking behaviors develop, they have the potential to cause both short- and long-term problems for the individual experiencing the symptoms as well as for friends, family, and, in particular, intimate partners.

In a systematic review of the literature regarding alcohol misuse in the context of intimate relationships in civilian samples, Marshal (2003) concluded that problem drinking is consistently associated with marital dissatisfaction, dysfunctional couple interaction patterns, and intimate partner violence. Couples affected by substance abuse, including alcohol misuse, typically experience high levels of instability, conflict, sexual dissatisfaction, and psychological distress (Klostermann, Kelley, Mignone, Pusateri, & Wills, 2011) and are more likely to divorce compared to the general population (Lebow, 2005). Unfortunately, the causal relation between alcohol misuse and relationship distress is not fully understood because much of the research to this point has been cross-sectional. It has been hypothesized that alcohol misuse may act as a chronic stressor, thereby decreasing relationship functioning and increasing negative family interactions

(Gotlib & McCabe, 1990; Halford, Bouma, Kelly, & Young, 1999; O'Farrell & Rotunda, 1997). Alternatively, relationship problems such as poor communication, arguing, and financial stressors may serve as risk factors for the subsequent development of problematic alcohol use (Klostermann, 2006). In an effort to examine the association between relationship distress and alcohol misuse, Whisman, Uebelacker, and Bruce (2006) analyzed data from a longitudinal study with a population-based sample of married adults who did not meet criteria for an alcohol use disorder (i.e., alcohol abuse or dependence) at baseline. Results demonstrated that those who endorsed marital discord at the beginning of the study were 3.7 times more likely to develop an alcohol use disorder at 12-month follow up. These findings were replicated in a Dutch study in which baseline marital discord was associated with a subsequent increased risk of broadband classifications of substance use disorder as well as alcohol abuse (Overbeek et al., 2006). Although few studies have examined alcohol misuse and relationship distress in active-duty military populations (Blow et al., 2013), distressed marriages among veterans have strong associations to depression, violence, suicide, divorce, parenting difficulties, and poor child outcomes (Allen, Rhoades, Stanley, & Markman, 2010; Bell, Harford, Fuchs, McCarroll, & Schwartz, 2006; Gewirtz, Polusny, DeGarmo, Khaylis, & Erbes, 2010; Gorman, Blow, Ames, & Reed, 2011; Karney, Ramchand, Osilla, Caldarone, & Burns, 2008; Marshall, Panuzio, & Taft, 2005). Given the seriousness of such outcomes coupled with their potential to negatively impact not only service members, but also their families, it is imperative that predictors of alcohol

misuse be explored further as a means of developing more effective assessments and interventions for military personnel for use either before or after deployment.

Based upon prior evidence for the association of sociodemographic variables, mental health symptoms, interpersonal factors, and exposure to traumatic events with alcohol misuse in other military samples, the current investigation aimed to assess the generalizability of these predictors to a sample of U.S. Security Force Airmen following a year-long, high-risk deployment to Iraq. Although such predictors have been examined within military samples previously, the current study is unique for a number of reasons. Specifically, much of the research on functioning across the deployment cycle has been conducted with Army combat units; thus, considerably less is known about other military branches or career specialties (Cigrang et al., 2014). Through examining similar predictors within this distinct population, one is able to determine the generalizability of previous findings. In addition, prior research has been inconsistent with regard to the use of comprehensive assessments for examining mental health symptoms. Whereas PTSD and depression tend to be evaluated using well-established measures tapping criteria outlined in the various editions of the *Diagnostic and Statistical Manual of Mental Disorders* (DSM), other outcome variables, such as problematic alcohol use, have at times been derived from responses to very brief screener measures (Milliken et al., 2007; Wilk et al., 2010). This study sought to overcome these limitations by using more comprehensive standardized assessments. Finally, the current study examined service members' functioning across the deployment cycle versus focusing on a single point in time (e.g., post-deployment). Most prior studies have been cross-sectional in nature,

thereby precluding the assessment of change across the deployment cycle and evaluating theories regarding the underlying causes for such change. In the present study, the following hypotheses were evaluated:

(1) Potential sociodemographic risk factors (e.g., being less educated, lower enlisted rank, Caucasian, male, unmarried, and childless) will predict alcohol misuse at pre-deployment (T1), alcohol misuse at post-deployment (T3), and increases in alcohol misuse at T3 (controlling for T1 alcohol misuse).

(2) Intrapersonal factors such as PTSD and depression at T1 will predict alcohol misuse at T1, alcohol misuse at T3, and increases in alcohol misuse at T3 (controlling for T1). The same factors at T3 will predict alcohol misuse at T3 as well as increases in alcohol misuse at T3 (controlling for T1).

(3) Interpersonal factors such as intimate relationship distress (for partnered Airmen) at T1 will predict alcohol misuse at T1, alcohol misuse at T3, and increases in alcohol misuse at T3 (controlling for T1). The same factors at T3 will predict alcohol misuse at T3 as well as increases in alcohol misuse at T3 (controlling for T1).

(4) Exposure to potentially traumatic events as reported at T3 will predict alcohol misuse at T3 as well as increases in alcohol misuse at T3 (controlling for T1).

In addition to these four hypotheses, further analyses examined the predictive power of other theoretically-identified potential predictors (e.g., levels of social support). Finally, results were used to derive user-friendly prediction tables guided by individual and composite prediction models.

CHAPTER II

METHOD

Participants

Participants in the current investigation were a subset of active-duty service members from a larger longitudinal investigation assessing a variety of risk and protective factors impacting U.S. Air Force (USAF) Security Forces across a year-long deployment to Iraq (Cigrang et al., 2014). Two detachments of Airmen (N = 318) were tasked with training Iraqi Police Transition Teams, a high-risk, "outside-the-wire" mission during 2009 and 2010. The majority (95%) of Airmen volunteered for the mission in exchange for preferential base assignment upon their return. Airmen completed study measures at three time points across the deployment cycle: pre-deployment (T1), in-theater (T2), and 6-9 months post-deployment (T3). A total of 164 Airmen, the sample of interest for the current study, participated at pre- and post-deployment and were successfully matched across time. In-theater data were not analyzed for the current study because alcohol use by American troops in a deployed setting is strictly prohibited.

Of the 164 Airmen who provided both pre- and post-deployment data, a large majority (93%) were male with ages ranging from 19 to 46 years (M = 25.4, SD = 5.7). On average, Airmen within this matched sample had 13.4 years of education (SD = 1.7, range 12-20), with the majority (74%) either graduating from high school or earning their GED, and the remaining 26% earning an associate's degree or higher. Seventy-

seven percent of the service members had deployed at least once previously, with 22% having two or more prior deployments. A majority (67%) of the Airmen identified as Caucasian, 11% as African American, 12% as Hispanic, 7% as Asian, and 1% Native American.

Measures

Alcohol use. The Alcohol Use Disorders Identification Test (AUDIT; Babor, Higgins-Biddle, Saunders, & Monteiro, 2001) was developed by the World Health Organization as a screening tool to identify hazardous and harmful alcohol consumption. The AUDIT consists of 10 questions total with three questions assessing alcohol consumption (e.g., "How often do you have a drink containing alcohol?"), three questions assessing drinking behavior and dependence (e.g., "How often during the last year have you found that you were not able to stop drinking once you had started?"), and four questions assessing alcohol-related problems (e.g., "How often during the last year have you been unable to remember what happened the night before because you had been drinking?"). Eight items are scored on a five-point scale with scores of 0, 1, 2, 3, and 4; two items are scored on a three-point scale with scores of 0, 2, and 4. Item responses are added to arrive at a total score between 0 and 40, with a score at or above 8 indicating hazardous and harmful alcohol use with possible alcohol dependence. Indeed, using 8 as a cutoff yields the following sensitivity/specificity values by scale: hazardous consumption/recurrent intoxication – .96/.74; abnormal drinking behavior (i.e., at least one element of dependence at specified minimum frequency) – .97/.79; alcohol-related problems in the last year – .92/.83; and combined index of hazardous and

harmful alcohol use – .90/.92. In general, studies have demonstrated that the AUDIT is more sensitive than it is specific (Allen, Litten, Fertig, & Babor, 1997). For the subsample of Airmen who completed measures at both pre- and post-deployment (n = 164), the AUDIT demonstrated good internal consistency (α = .83 and .84, respectively) and mean inter-item correlations (r = .32 and .35, respectively).

Combat experiences. Combat exposure was assessed using a 22-item measure tapping stressful experiences that may occur during combat. Items for the scale were adapted from the 20-item Peacekeeping Experiences Scale described by Adler, Dolan, and Castro (2000). Service members indicated whether they experienced a combat-related event during their most recent deployment and, if so, rated the emotional impact of the incident. Examples of items from this scale include "seeing dead or seriously injured Americans," "being shot at," and "having hostile reactions from civilians you were trying to help." Items are rated on a five-point scale with the following response options: 1 (*did not experience*), 2 (*no impact*), 3 (*a little impact*), 4 (*moderate impact*), and 5 (*extreme impact*). For the subsample of Airmen who had both pre- and post-deployment data (n = 164), the combat exposure scale demonstrated excellent internal consistency (α = .90) and mean inter-item correlation (r = .28).

Intimate relationship health. The Marital Satisfaction Inventory – Brief form (MSI-B; Whisman, Snyder, & Beach, 2009) assesses for intimate relationship distress through the use of 10 true-false items. Items for the MSI-B were selected from the original Marital Satisfaction Inventory – Revised (MSI-R; Snyder, 1997) by determining the two items from each of the five scales deemed to be most applicable for most

couples (i.e., Global Distress, Time Together, Sexual Dissatisfaction, Affective Communication, and Problem-Solving Communication) that demonstrated the highest item-total correlations. Half of the items are coded as discordant if answered true and half are coded as discordant if answered false resulting in a total score ranging from 0 to 10, with higher scores representing greater relationship discord. Prior research has shown that the use of a cut score ≥ 4 produces high sensitivity and specificity (.87 and .84, respectively). In the original standardization sample, the MSI-B demonstrated good test-retest reliability (6-week r = .78) and internal consistency (α = .81; mean inter-item r = .30). The current sample demonstrated similar internal consistency (α = .88 and .91 at pre- and post-deployment, respectively) and mean inter-item correlations (r = .45 and .49 at pre- and post-deployment, respectively).

Social support. The Multidimensional Scale of Perceived Social Support (MSPSS; Zimet, Dahlem, Zimet, & Farley, 1988) is a 12-item measure designed to assess the perceived adequacy of social support from family, friends, and one's significant other. Each social support subscale (i.e., family, friends, and significant other) has four corresponding items which are rated on a seven-point Likert scale ranging from 1 (*very strongly disagree*) to 7 (*very strongly agree*) with total scores ranging from 12 to 84. In the original standardization study, the measure demonstrated good internal consistency for the significant other, family, and friends subscales (α = .91, .87, and .85, respectively), with α = .85 for the total scale (Zimet et al., 1988). Good test-retest reliability for the significant other, family, and friends subscales over a two to three month period was also found (r = .72, .85, and .75, respectively) with r = .85 for

the full scale. For the current study, the four items from the significant other subscale were removed to obtain an 8-item measure tapping social support outside the context of an intimate relationship with possible total scores ranging from 8 to 56. The resulting 8-item measure demonstrated good internal consistency ($\alpha = .91$; mean inter-item correlation $r = .55$) at post-deployment.

PTSD. The PTSD Checklist (PCL; Weathers, Litz, Herman, Huska, & Keane, 1993) was developed at the National Center for PTSD as a brief, self-report inventory for assessing the 17 symptoms of PTSD as outlined in the *Diagnostic and Statistical Manual of Mental Disorders, fourth edition* (*DSM-IV*; American Psychiatric Association, 1994); items correspond to the three clusters of PTSD: reexperiencing (Criterion B), avoidance/numbing (Criterion C), and hyperarousal (Criterion D). In the current study, the military version of the measure (PCL-M; Weathers et al., 1993) was used which asks respondents to consider the impact of their exposure to "stressful military experiences" and to rate each item based upon how much they had been "bothered by the problem in the last month" on a five-point scale ranging from 1 (*not at all*) to 5 (*extremely*), with total scores ranging from 17 to 85. The PCL-M demonstrates excellent internal consistency ($\alpha = .96$) and test-retest reliability ($r = .96$; Weathers et al., 1993) and correlates highly with other standardized measures of PTSD (Forbes, Creamer, & Biddle, 2001). For the subsample of 164 Airmen who completed measures at both pre- and post-deployment, the PCL-M demonstrated good internal consistency ($\alpha = .87$ and .95, respectively) and mean inter-item correlations ($r = .32$ and .52, respectively).

Depression. The 9-item Patient Health Questionnaire (PHQ-9; Kroenke, Spitzer, & Williams, 2001) assesses the nine criteria for depression as outlined in the *DSM-IV* through the use of a four-point scale ranging from 0 (*not at all*) to 3 (*nearly every day*). Respondents are asked to indicate how frequently they experienced the symptoms during the past two weeks to arrive at a score ranging from 0 to 27. Suggested cut points correspond to levels of severity as follows: ≥ 5 (*mild*), ≥ 10 (*moderate*), ≥ 15 (*moderately severe*), and ≥ 20 (*severe*) with scores greater than 10 having a sensitivity and specificity of .88 for major depressive disorder in the original validity study (Kroenke et al., 2001). The PHQ-9 demonstrates excellent internal consistency ($\alpha = .89$) and test-retest reliability ($r = .84$; Kroenke et al., 2001). For the subsample of Airmen who completed measures at both pre- and post-deployment, the PHQ-9 demonstrated fair internal consistency at pre-deployment ($\alpha = .71$) and good internal consistency post-deployment ($\alpha = .88$). Mean inter-item correlations for the scale were .24 and .44 for pre- and post-deployment, respectively.

CHAPTER III

RESULTS

The relations between prospective and concurrent predictors of interest and alcohol misuse at both pre-deployment and post-deployment as well as change in alcohol misuse from pre- to post-deployment were evaluated using simple linear regression and binary logistic regression analyses. Means and standard deviations for each of the predictors of problem drinking at pre-deployment and post-deployment are presented in Tables 1 and 2, respectively. Descriptive statistics for the predictors as they relate to change in alcohol misuse (i.e., an increase versus either a decrease or no change from pre- to post-deployment) are provided in Table 3. Summaries of the univariate standardized results for predicting alcohol misuse at pre-deployment and post-deployment using linear and logistic regression are shown in Figures 1 and 2, respectively.

Univariate Linear Regression

Linear regression is used to predict continuous outcomes from continuous predictor variables such that one's performance on an outcome measure may be estimated given information about other relevant factors. The ability to predict a person's outcome based upon other variables has clinical utility as it allows clinicians and researchers to estimate the severity of a negative outcome (e.g., alcohol misuse) based upon scores from self-report measures or the person's standing on associated features of the disorder (e.g., PTSD or depression).

Prior to conducting regression analyses with the current dataset, AUDIT scores and predictor variables were standardized such that each factor would have a mean of 0 and standard deviation of 1. The variables were standardized in order to facilitate interpretation and direct comparisons of factors with different metrics.

Pre-deployment predictors of alcohol misuse. Of the continuous sociodemographic variables examined, only age significantly predicted concurrent alcohol misuse at pre-deployment (β = -.17, $t(158) = 2.12$, $p < .05$) and explained 3% of the variance in pre-deployment alcohol misuse ($R^2 = .03$, $F(1, 158) = 4.49$, $p < .05$). Age also prospectively predicted alcohol misuse at post-deployment (β = -.18, $t(150) = 2.33$, $p < .05$), accounting for 4% of the variance in post-deployment alcohol misuse ($R^2 = .04$, $F(1, 150) = 5.44$, $p < .05$).

Intrapersonal factors such as PTSD and depression demonstrated more consistent concurrent associations with pre-deployment alcohol misuse. Indeed, Airmen's reported PTSD severity significantly predicted concurrent pre-deployment alcohol misuse (β = .41, $t(162) = 5.71$, $p < .001$) which explained 17% of the variance in alcohol misuse scores at pre-deployment ($R^2 = .17$, $F(1, 162) = 32.58$, $p < .001$); Airmen's reported depression severity also demonstrated a significant association to concurrent pre-deployment alcohol misuse (β = .25, $t(161) = 3.22$, $p < .01$) and accounted for 6% of the variance in alcohol misuse scores at pre-deployment ($R^2 = .06$, $F(1, 161) = 10.34$, $p < .01$).

Intimate relationship distress, an interpersonal factor, was also a significant predictor of concurrent pre-deployment alcohol misuse (β = .19, $t(95) = 2.15$, $p < .05$)

and explained 5% of the variance in alcohol misuse scores at pre-deployment ($R^2 = .05$, $F(1, 95) = 4.62$, $p < .05$).

Post-deployment predictors of alcohol misuse. Similar to pre-deployment findings, post-deployment PTSD and depression predicted post-deployment alcohol misuse ($\beta = .33$, $t(154) = 4.31$, $p < .001$ and $\beta = .33$, $t(153) = 4.29$, $p < .001$, respectively) and explained 11% of the variance of alcohol misuse at post-deployment ($R^2 = .11$, $F(1, 154) = 18.53$, $p < .001$ and $R^2 = .11$, $F(1, 153) = 18.38$, $p < .001$, respectively).

Additionally, intimate relationship distress again predicted concurrent post-deployment alcohol misuse ($\beta = .39$, $t(81) = 4.33$, $p < .001$), accounting for 19% of post-deployment alcohol misuse ($R^2 = .19$, $F(1, 81) = 18.72$, $p < .001$). Taken a step further, ANOVAs examining relationship status at post-deployment demonstrated a consistent significant main effect for relationship status on post-deployment alcohol misuse when examining partnered Airmen whose relationships were categorized as distressed, nondistressed, or dissolved at post-deployment ($F(2, 74) = 11.95$, $p < .001$). Tukey post-hoc comparisons of the three groups indicated that the distressed ($M = .28$, $SD = 1.02$) and dissolved groups ($M = .30$, $SD = .88$) had significantly higher alcohol misuse than the nondistressed group ($M = -.60$, $SD = .56$, $p < .01$). When Airmen who were not partnered at the beginning of the study were included in ANOVA analyses, similar results were found with an overall significant main effect for relationship status on post-deployment alcohol misuse ($F(3, 152) = 6.31$, $p < .001$). For these analyses, Tukey post-hoc comparisons again revealed that Airmen in the nondistressed group ($M =$

-.60, *SD* = .56) had significantly less alcohol misuse than Airmen who were never partnered (*M* = .11, *SD* = 1.08), in a distressed relationship (*M* = .28, *SD* = 1.03), or who had experienced the dissolution of an intimate relationship (*M* = .30, *SD* = .88, $p < .01$).

Finally, regardless of whether combat exposure was examined in terms of the total number of potential traumatic events, the impact of these events (as rated on a 5-point scale), or the average of these impact scores, it did not serve as a significant predictor of post-deployment alcohol misuse (all *p*s > .05).

Increase in alcohol misuse from pre- to post-deployment. Participants' change in alcohol misuse from pre- to post-deployment was evaluated through the use of a change score. This change score was calculated by subtracting Airmen's post-deployment AUDIT total score from their pre-deployment score.

Results indicated that increase in alcohol misuse was not significantly related to any of the continuous sociodemographic variables (all *p*s > .05). However, intimate relationship distress at post-deployment predicted an increase in alcohol misuse from pre- to post-deployment ($\beta = .24$, $t(81) = 2.82$, $p < .01$) and explained 9% of the variance in this increase ($R^2 = .09$, $F(1, 81) = 7.96$, $p < .01$). Moreover, relationship status at post-deployment for those who were partnered at pre-deployment demonstrated a significant main effect on increased alcohol misuse ($F(2, 74) = 5.42$, $p < .01$) with Airmen in nondistressed relationships (*M* = -.27, *SD* = .47) having significantly less alcohol misuse than those who experienced the dissolution of their intimate relationship (*M* = .37, *SD* = .90, $p < .01$). Comparisons between the distressed group (*M* = 16, *SD* =

.92) and the nondistressed and dissolved groups were not statistically significant at $p <$ .05.

PTSD as measured at pre- and post-deployment prospectively and concurrently predicted an increase in alcohol misuse from pre- to post-deployment (β = -.22, $t(154) = 2.51$, $p < .05$ and $\beta = .22$, $t(154) = 2.76$, $p < .01$, respectively); depression measured at post-deployment concurrently predicted an increase in alcohol misuse across the deployment cycle ($\beta = .26$, $t(153) = 3.20$, $p < .001$).

Consistent with findings regarding concurrent post-deployment alcohol misuse, combat exposure was not found to significantly predict an increase in alcohol misuse from pre- to post-deployment (all ps > .05).

For each of the aforementioned linear regression analyses, scatterplots were derived and subjected to visual inspection to confirm the linearity of the relation between variables. In no case did visual inspection indicate a nonlinear relationship.

Univariate Logistic Regression

Building upon results from linear regression, logistic regression can be used to predict categorical outcomes from either continuous or categorical predictors, thereby allowing one to predict which of two categories a person is likely to belong to given certain other information. The ability to predict a person's membership in one category versus another has important clinical applications. Specifically, logistic regression can be used to generate models from which predictions can be made regarding one's likelihood of engaging in risky behaviors and experiencing adverse outcomes based upon his or her standing on other variables of interest.

In order to utilize logistic regression analyses with the current dataset, pre- and post-deployment total AUDIT scores were first dichotomized. Given support from extant literature that AUDIT scores $\geq$ 8 indicate "hazardous and harmful alcohol use, as well as possible alcohol dependence" (Babor et al., 2001, p. 19), a cut score of 8 was used to dichotomize drinking behavior such that scores below 8 represented drinking within recommended limits whereas scores of 8 or above indicated alcohol misuse.

After dichotomizing the total AUDIT scores, binary logistic regression analyses were conducted with predictor variables treated as continuous whenever possible, with the obvious exception of some sociodemographic factors such as gender, ethnicity, and relationship status.

Pre-deployment predictors of alcohol misuse. Overall, the sociodemographic factors hypothesized to be predictive of alcohol misuse were not significant within this sample. Analyses examining education, gender, ethnicity, and parental status consistently resulted in *p*-values > .05. Although pay grade significantly predicted alcohol misuse at pre-deployment ($\chi^2(1, n = 72) = 4.50, p < .05$), this was only the case when the variable was dichotomized such that enlisted personnel (i.e., E-1 to E-6) formed one category and senior non-commissioned officers (NCOs; i.e., E-7 and above) and officers (i.e., O-1 and above) formed the other category. Pay grade was no longer significant when dichotomized with lower enlisted personnel (i.e., E-1 to E-3) in one category and all NCOs (i.e., E-4 and above) and officers in the other ($\chi^2(1, n = 72) = .62, p > .05$). Hence, this finding may be driven by the relatively low number of senior NCOs and officers ($n = 8$) relative to lower-enlisted personnel ($n = 64$) within the sample

coupled with a low response rate for the pay grade item rather than a true statistical difference. Although age at pre-deployment was a significant prospective predictor of alcohol misuse at post-deployment when dichotomized between 28 and 29 years old ($\chi^2(1, n = 152) = 5.19, p < .05$), this finding did not hold when age was treated as a continuous variable ($\beta = -.05$, Wald = 3.25, $e^{\beta} = .73$, $p > .05$).

Next, intrapersonal factors were examined. Both PTSD and depression were concurrent predictors of alcohol misuse at pre-deployment ($\beta = .71$, Wald = 12.48, $e^{\beta} = 2.03$, $p < .001$ and $\beta = .33$, Wald = 3.71, $e^{\beta} = 1.39$, $p = .05$, respectively). Examination of the exponentiation of the β coefficient (e^{β}), a representation of the odds ratio associated with a one unit change in the predictor, revealed that having at least moderate levels of PTSD and depression at pre-deployment resulted in 2.03 and 1.39 greater odds of experiencing concurrent alcohol misuse. Additionally, a relatively robust interpersonal finding was the concurrent predictive ability of relationship distress as measured by the MSI-B ($\beta = .47$, Wald = 3.96, $e^{\beta} = 1.61$, $p < .05$) with Airmen who endorsed pre-deployment intimate relationship distress having nearly twice the odds of experiencing concurrent alcohol misuse compared to those who did not. Within this sample, none of the factors analyzed at pre-deployment (i.e., sociodemographic variables, PTSD, depression, relationship distress), with the exception of age dichotomized between 28 and 29 years old, served as prospective predictors for alcohol misuse at post-deployment.

Post-deployment predictors of alcohol misuse. Post-deployment relationship distress significantly predicted post-deployment alcohol misuse (β = .94, Wald = 12.79, e^{β} = 2.55, $p < .05$) such that an Airman who endorsed relationship distress at post-deployment would have 2.55 greater odds of engaging in concurrent alcohol misuse than one who was not experiencing relationship distress. Additionally, one's relationship status at post-deployment – specifically, being in a distressed or dissolved relationship versus one that was nondistressed – significantly predicted concurrent alcohol misuse ($\chi^2(1, n = 77) = 16.43$, $p < .001$). The interpersonal factor of general social support from friends, family, and significant other was also evaluated at post-deployment. Social support was not a significant concurrent predictor of alcohol misuse at post-deployment for friends, family, and significant other (β = -.31, Wald = 3.56, e^{β} = .73, $p > .05$) or friends and family alone (β = -.23, Wald = 1.97, e^{β} = .79, $p > .05$).

Consistent with pre-deployment results, intrapersonal factors were related to concurrent alcohol misuse at post-deployment. Again, both PTSD and depression at post-deployment were significant concurrent predictors of alcohol misuse (β = .56, Wald = 10.38, e^{β} = 1.76, $p < .01$ and β = .47, Wald = 7.26, e^{β} = 1.60, $p < .01$, respectively) with the odds of engaging in concurrent alcohol misuse being 1.76 and 1.60 for PTSD and depression, respectively.

Finally, similar to initial linear regression analyses, exposure to combat-related stressors was evaluated in several ways to determine its concurrent relation to alcohol misuse at post-deployment. Regardless of its operationalization, combat exposure did not serve as a significant predictor of post-deployment alcohol misuse (all ps > .05).

Increase in alcohol misuse from pre- to post-deployment. Examining participants' change in level of alcohol misuse from pre- to post-deployment was conducted through the calculation of a dichotomized change score that took into account whether the individual had increased his or her propensity for engaging in alcohol misuse versus either decreasing alcohol use or drinking about the same from pre- to post-deployment. Specifically, the "increase" group consisted of Airmen who went from "low" to "high" alcohol misuse from pre- to post-deployment ($n = 43$), whereas the "no increase" group consisted of 113 Airmen who (a) stayed low ($n = 74$), (b) stayed high ($n = 27$), or (c) went from high to low ($n = 12$).

Results showed that increase in alcohol misuse was not significantly related to any of the sociodemographic variables (all ps > .05). However, relationship distress at post-deployment significantly predicted an increase in alcohol misuse ($\beta = .60$, Wald = 4.89, $e^{\beta} = 1.83$, $p < .05$) with 1.83 greater odds of shifting from drinking within recommended limits to engaging in risky drinking behaviors for those Airmen who endorsed intimate relationship distress compared to those who did not. Similarly, relationship status at post-deployment (being in a distressed or dissolved relationship versus one that was non-distressed) significantly predicted an increase in alcohol misuse ($\chi^2(1, n = 77) = 9.99$, $p < .01$). Consistent with results for post-deployment alcohol misuse, social support from friends, family, and one's significant other was not a significant predictor of increased alcohol misuse across the deployment cycle ($\beta = -.15$, Wald = .75, $e^{\beta} = .86$, $p > .05$), nor was support from one's friends and family alone ($\beta = -.05$, Wald = .09, $e^{\beta} = .95$, $p > .05$).

Although both PTSD and depression concurrently predicted alcohol misuse at both pre- and post-deployment, neither one predicted increase in alcohol misuse across the deployment cycle. Moreover, consistent with results noted earlier, combat exposure, regardless of its operationalization, did not significantly predict increase in alcohol misuse from pre- to post-deployment.

Odds Ratio Analyses

Odds ratios represent the effect size of the association between two conditions (condition A and condition B) and can be used to compare the relative likelihood of the occurrence of a particular outcome (e.g., alcohol misuse) given the presence of a particular factor (e.g., relationship distress, PTSD, depression). Thus, odds ratios reflect the ratio of condition A (e.g., alcohol misuse) given the presence of condition B (e.g., relationship distress) divided by the probability of condition A not given condition B. Through the calculation of odds ratios, one can determine whether exposure to certain factors constitutes a risk for developing a specific outcome. Additionally, the magnitude of various risk factors for the outcome can be assessed such that an odds ratio value of 1 indicates that exposure to the variable does not affect the odds of the outcome, a value greater than 1 indicates that exposure increases the odds of the outcome, and a value less than 1 indicates that exposure decreases the odds of the outcome.

For the current study, logistic regression analyses were run with dichotomized outcome variables (i.e., alcohol misuse at pre-deployment, alcohol misuse at post-deployment, and increase in alcohol misuse from to pre- to post-deployment), thereby setting the stage for subsequent odds ratio analyses. However, in order to

conduct odds ratio analyses using the previously analyzed continuous variables, it was necessary that these predictor variables first be dichotomized. Thus, those variables that had previously been determined to be significant predictors of pre- and post-deployment alcohol misuse as well as increase in alcohol misuse were dichotomized according to recommendations from extant literature. Specifically, the PCL-M was dichotomized such that scores $\geq$ 32 indicated moderate or higher levels of PTSD symptomatology (Bliese et al., 2008); the PHQ-9 was dichotomized such that scores $\geq$ 10 indicated moderate or higher levels of depressive symptoms (Kroenke et al., 2001); and the MSI-B was dichotomized using scores $\geq$ 4 to indicate a distressed versus non-distressed relationship (Whisman et al., 2009). The impact of relationship status on alcohol misuse was evaluated further by integrating relationship status with distress level (i.e., satisfied versus distressed or dissolved). Additionally, age at pre-deployment was dichotomized to compare those Airmen who were $\leq$ 28 years old to those who were $\geq$ 29 years old. Results of the odds ratio analyses are summarized in Tables 4, 5, and 6.

At pre-deployment, relationship distress significantly predicted concurrent alcohol misuse ($\chi^2(1, n = 97) = 4.61, p < .05$). Indeed, Airmen who endorsed intimate relationship distress at pre-deployment were at 3.15 times greater odds of engaging in alcohol misuse than those who were satisfied. At post-deployment, relationship distress continued to predict concurrent alcohol misuse ($\chi^2(1, n = 83) = 16.81, p < .001$); Airmen who endorsed relationship distress at post-deployment had 8.00 times greater odds of engaging in alcohol misuse than those who did not. Moreover, relationship distress significantly predicted increase in alcohol misuse across the deployment cycle ($\chi^2(1, n =$

83) = 10.06, $p < .01$), with Airmen in distressed relationships at post-deployment being at 7.08 times greater odds to shift from drinking within recommended limits to engaging in alcohol misuse.

The impact of intimate relationship factors was examined further in the context of relationship status at post-deployment. Either experiencing the dissolution of a relationship or remaining in a distressed relationship significantly predicted concurrent alcohol misuse at post-deployment ($\chi^2(1, n = 77) = 16.43, p < .001$). Airmen who experienced the dissolution of a relationship or remained in a distressed relationship were at 8.82 greater odds to misuse alcohol at post-deployment than those who reported a non-distressed relationship. Relationship status also predicted change in alcohol misuse across the deployment cycle. Again, remaining in a distressed relationship or dissolving a relationship significantly predicted an increase in alcohol misuse across time ($\chi^2(1, n = 77) = 9.99, p < .01$). Airmen who either dissolved a relationship or remained in a distressed relationship were at 9.17 times greater odds to increase their alcohol use from pre- to post-deployment compared to Airmen who did not experience such relationship difficulties.

In addition to relationship distress, alcohol misuse at both pre- and post-deployment was significantly related to concurrent psychological factors. At pre- and post-deployment, PTSD significantly predicted concurrent alcohol misuse ($\chi^2(1, n = 164) = 5.49, p < .05$ and $\chi^2(1, n = 156) = 11.92, p < .01$, respectively). Airmen endorsing at least moderate levels of PTSD symptomatology at pre-deployment experienced 4.05 greater odds of engaging in alcohol misuse whereas the same endorsement at

post-deployment resulted in 3.13 times greater odds of engaging in concurrent alcohol misuse. Pre-deployment depression did not significantly predict alcohol misuse when depression levels were dichotomized. However, depressive symptoms did significantly predict alcohol misuse at post-deployment ($\chi^2(1, n = 155) = 4.81, p < .05$), such that an Airman experiencing at least moderate symptoms of depression was at 2.20 times greater odds to engage in alcohol misuse than one not experiencing such symptoms.

Multivariate Analyses

Although univariate analyses demonstrated the significance of various predictors of concurrent alcohol misuse at pre-deployment and post-deployment as well as increase in alcohol misuse across the deployment cycle, such analyses do not allow for comparing the relative impact of such predictors. Given the numerous factors that were significantly related to alcohol misuse at post-deployment, a multivariate regression model assessed significant post-deployment predictors of alcohol misuse using relationship distress, PTSD symptoms, and depressive symptoms. All predictors were entered into the model simultaneously to allow for comparative analysis of their relative predictive power. Post-deployment relationship distress remained a strong significant predictor of post-deployment alcohol misuse after controlling for the effects of both PTSD and depressive symptoms at post-deployment ($\beta = .28$, Wald = 11.76, $e^{\beta} = 1.33$, $p < .01$; see Table 7). By contrast, neither PTSD nor depressive symptoms remained significant predictors of alcohol misuse after controlling for relationship distress.

CHAPTER IV

SUMMARY AND CONCLUSIONS

The present study sought to identify predictors of alcohol misuse in an active-duty sample of USAF Security Forces Airmen using a longitudinal design targeting concurrent and prospective factors as well as predictors of increase in alcohol misuse. Consistent with extant literature, univariate analyses revealed that the presence of psychological symptoms significantly predicted alcohol misuse at both pre- and post-deployment (Jacobson et al., 2008; Thomas et al., 2010). Specifically, both PTSD and depressive symptoms significantly predicted concurrent alcohol misuse at both pre- and post-deployment with the odds of engaging in alcohol misuse at post-deployment being 2.20 times more likely for Airmen who reported at least moderate levels of depressive symptoms and 3.13 times more likely for those endorsing similar levels of PTSD symptomatology.

Although numerous studies have demonstrated an association between combat exposure and alcohol misuse (Bray & Hourani, 2007; Goldberg, Eisen, True, & Henderson, 1990; Hoge et al., 2006; Kulka et al., 1990; Marx et al., 2009; Schlenger et al., 2007; Seal et al., 2007), combat exposure was largely unrelated to Airmen's alcohol misuse post-deployment. Despite examining combat exposure in a variety of ways (i.e., the number, the average impact, and the total impact of combat-related experiences), the relation between combat exposure and alcohol misuse at post-deployment as well as increase in alcohol use from pre- to post-deployment was consistently nonsignificant.

Prior cross-sectional and longitudinal studies have demonstrated consistent links between alcohol misuse and sociodemographic variables, but the current study did not support such findings. Indeed, few of the sociodemographic variables evaluated predicted concurrent or prospective alcohol misuse at either pre- or post-deployment. Pay grade only predicted concurrent alcohol misuse at pre-deployment when dichotomized such that senior NCOs and officers were placed in one category with enlisted personnel in another; age prospectively predicted alcohol misuse at post-deployment when dichotomized between the ages of 28 and 29. When dichotomized to include more Airmen in each group (i.e., lower enlisted versus NCOs and officers or enlisted versus officers), pay grade no longer predicted concurrent alcohol misuse. Similarly, age, when measured continuously, no longer predicted alcohol misuse, indicating that significant findings were likely driven by strategic dichotomization versus robust statistical differences in predictive power for each group. Gender, education, ethnicity, and parenting status, despite prior support for their predictive power in extant literature (Ames & Cunradi, 2004; Bray & Hourani, 2007; Bray et al., 2003; Jacobson et al., 2008; Spera et al., 2011), also did not significantly predict alcohol misuse at either pre- or post-deployment and did not predict an increase in alcohol misuse across the deployment cycle.

Although sociodemographic factors and combat exposure were largely unrelated to alcohol misuse in the current sample, relationship distress demonstrated a consistent association to alcohol misuse across time. Indeed, relationship distress predicted concurrent alcohol misuse at both pre- and post-deployment as well as Airmen's

increase in alcohol misuse across the deployment cycle. The most striking feature of these findings is their overall effect size. The odds ratio is the most widely used statistic used in risk factor research and is the primary index of effect size employed to demonstrate increased risk for disease in epidemiological studies (Bland & Altman, 2000). Chen, Cohen, and Chen (2010) have proposed that odds ratios may be interpreted similarly to Cohen's *d* such that odds ratio values of 1.68, 3.47, and 6.71 are roughly equivalent to Cohen's *d* values of 0.2 (small), 0.5 (medium), and 0.8 (large), respectively. Airmen reporting relationship distress at pre-deployment were 3.15 times more likely to engage in concurrent alcohol misuse (a medium effect size) whereas those who endorsed a distressed relationship at post-deployment were 8.00 times more likely to engage in concurrent alcohol misuse (a large effect size). Moreover, reporting relationship distress at post-deployment resulted in a 7.08 times greater likelihood that Airmen would increase their drinking such that they would shift from drinking within recommended limits to misusing alcohol from pre- to post-deployment.

The impact of relationship distress was further explored through Airmen's relationship status at post-deployment. When relationship distress and dissolution were both taken into account, the effect sizes were even greater. Indeed, Airmen who dissolved a relationship or remained in a distressed relationship were 8.82 times more likely to engage in concurrent alcohol misuse at post-deployment and 9.17 times more likely to begin misusing alcohol from pre- to post-deployment.

Findings from the current study highlight the need for early, comprehensive screening of Airmen at both pre- and post-deployment to assess for those factors that

may contribute to alcohol misuse across the deployment cycle. Currently, the National Defense Authorization Act (2009) requires that service members undergo regular mental health assessments (i.e., 60 days prior to deployment, 30 days before or after return from deployment, 90-180 days after return from deployment, and at least once annually) that are completed in three stages. The first stage (Stage 1) screens for major life stressors, mental health service utilization, medications, alcohol misuse, PTSD, depression, and other concerns or questions using self-report surveys (i.e., Alcohol Use Disorders Identification Test – Consumption [AUDIT-C]; Bush, Kivlahan, McDonell, Fihn, & Bradley, 1998; Primary Care PTSD Screen [PC-PTSD]; Prins et al., 2004; 2-item Patient Health Questionnaire [PHQ-2]; Kroenke, Spitzer, & Williams, 2003). If a service member screens positive for PTSD or depression, he or she must participate in Stage 2 which requires the completion of lengthier, standardized follow-up questionnaires (i.e., PTSD Checklist – Civilian Version [PCL-C]; Weathers et al., 1993 and 8-item Patient Health Questionnaire [PHQ-8]; Kroenke et al., 2009). Finally, at Stage 3, all service members deployed in connection with a contingency operation are required to participate in a "person-to-person" mental health assessment to discuss specific concerns or questions they may have. Although the mental health assessments ask questions regarding service members' interpersonal difficulties at both Stage 1 (e.g., "…have you experienced any major life stressors that are a cause of significant concern or make it difficult for you to do your work, take care of things at home, or get along with other people?" "Are you interested in receiving assistance for a family or relationship concern?") and Stage 3 (e.g., "Is there anyone who might listen and understand what

you're going through?") and briefly assess for alcohol consumption using a 3-item screener, such measures are insufficient given the robust association between relationship distress and alcohol misuse. Indeed, the current study showed that PTSD and depression had only small to moderate effect sizes whereas the effect size for relationship distress was large. Hence, current assessments are overlooking an important factor relevant to the assessment of alcohol misuse in partnered Airmen that could easily be remedied through the inclusion of a brief measure of relationship distress at Stage 1 with the potential for a lengthier assessment at Stage 2. For example, the 3-item Kansas Marital Satisfaction Scale (KMSS; Schumm et al., 1986) would be well-suited for inclusion in the Stage 1 screening process whereas the 10-item MSI-B (Whisman et al., 2009) could provide incremental information regarding relationship distress at Stage 2.

Given the robust effect of relationship distress as a predictor of alcohol misuse in this study coupled with the high comorbidity of relationship distress and alcohol misuse documented in previous studies (see Marshal, 2003, for a review), it is likely that partnered Airmen with relationship problems could benefit from a couple-based intervention that targets both relationship distress and alcohol misuse.

One such intervention, alcohol behavioral couple therapy (ABCT; McCrady & Epstein, 2009; in press), is the most widely studied couple-based intervention for substance use disorders. ABCT combines motivational enhancement to change drinking behaviors, behavioral skills training to facilitate abstinence, and support to help the partner cope with drinking-related situations and encourage abstinence with behavioral couple therapy (BCT) interventions such as contingency management, communication,

and problem-solving techniques for improving a couple's relationship functioning. This form of treatment has been found to be more effective than individual therapy with regard to improving relationship distress as well as decreasing the frequency and consequences of alcohol use (Powers et al., 2008). Moreover, ABCT is also more cost effective and outperforms individual treatment in reducing interpersonal violence and improving child adjustment (Fals-Stewart et al., 2005).

The current study builds upon extant literature regarding alcohol misuse across the deployment cycle, but does so within a distinct sample of active-duty USAF Security Forces. Although the use of a unique sample is a strength of this study, it may also be considered a limitation. In general, Airmen have lower drinking rates than service members from other branches of the military (Bray et al., 2009), presumably due to differences in the culture surrounding military drinking behaviors (i.e., ease of access to alcohol on military bases, ritualized drinking opportunities, inconsistent policies regarding alcohol use, and alcohol use as an acceptable coping mechanism; Ames & Cunradi, 2004). However, the current sample may represent a subculture within the Air Force that is more similar to the Army or Marine Corps given the requirements and inherent risks of the Security Forces' mission – particularly during this deployment to a high-threat environment.

Another potential limitation stems from the restricted range of the sample in terms of age, gender, ethnicity, and socioeconomic background. Indeed, the fact that the sample was relatively homogeneous may have contributed to the lack of significant findings for sociodemographic predictors. This range became further restricted when

examining data only from partnered Airmen. Moreover, the present study did not incorporate collateral partner report information which would have been useful to confirm or clarify data obtained from the Airmen.

An additional limitation arises from the use of cutoff values in deriving dichotomous categories for the purpose of running logistic regression and odds ratio analyses. Although the cut scores used to dichotomize the AUDIT and associated factors were based upon extant literature, even the best measures are not perfectly reliable and valid. Hence, whenever a cut score is used, some of the resulting categorizations will be incorrect (Dwyer, 1996). For example, an Airman who is not truly a risky drinker may be assigned to the risky category due to his or her earning a score of 8 versus 7 on the AUDIT, and vice versa.

Finally, although the use of standardized, comprehensive assessments was a strength of the study, the use of such measures is not without limitation. Indeed, evidence has shown that self-report data are often susceptible to response bias and social desirability (Mensch & Kandel, 1988). Hence, there may be concerns regarding the underreporting of certain traits and symptoms that could function as potential predictors of alcohol misuse. Moreover, additional information may have been collected regarding predictor variables had the use of clinical interviews been a feasible option for the study.

Despite the limitations of the current study, its longitudinal design allowed for the examination of both prospective and concurrent predictors across the deployment cycle which has implications for future research and policy. Primary among future directions is the improvement of existing screening protocols for active-duty service

members. Results from the current study suggest that measures assessing for relationship distress should be included in the mental health assessments administered through the DoD to more thoroughly screen for potential alcohol misuse. More comprehensive data from these mental health assessments regarding both intrapersonal and interpersonal factors may then be used to assign Airmen to either primary or secondary interventions specifically tailored to target alcohol misuse. In doing so, the DoD can ensure that risky drinking is addressed before it develops into a more serious problem that has the potential to affect not only the service member, but also his or her coworkers, friends, family, and loved ones.

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APPENDIX

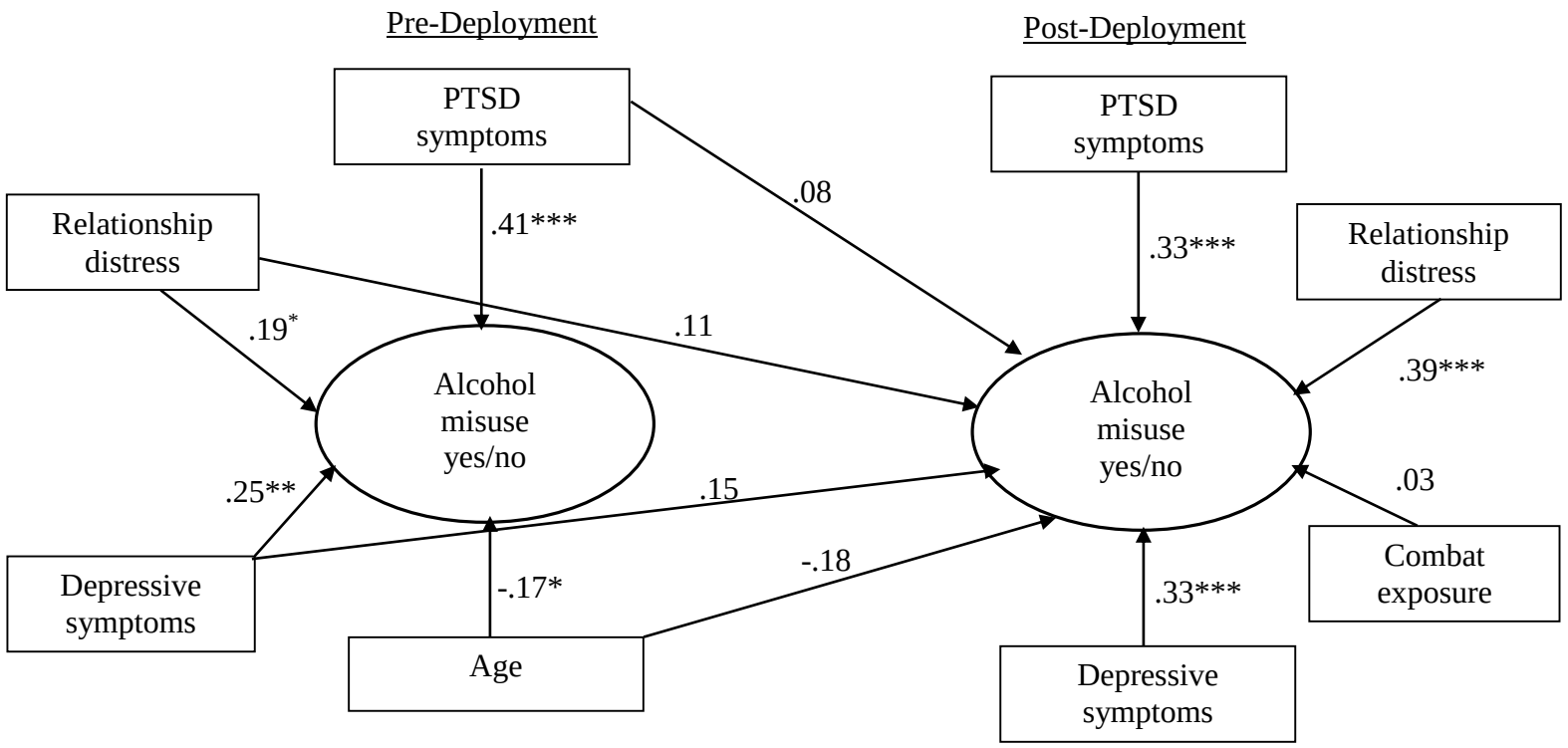

Figure 1. Linear regression analyses of alcohol misuse across the deployment cycle. Each arrow represents a one predictor linear regression analysis using prospective and concurrent predictors with alcohol misuse as a continuous criterion variable. Standardized beta weights are displayed. *$p \leq .05$. **$p < .01$. ***$p < .001$.

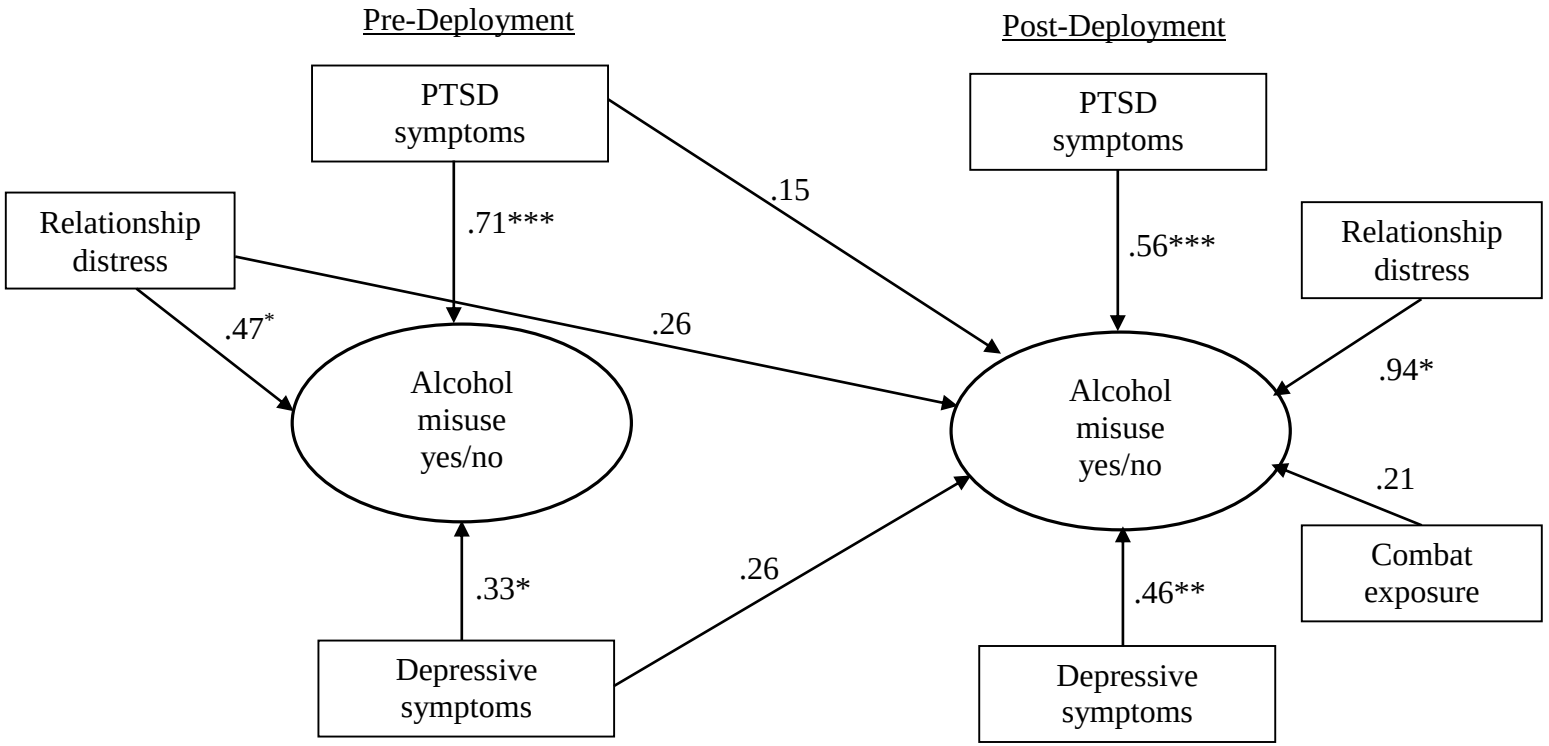

Figure 2. Logistic regression analyses of alcohol misuse across the deployment cycle. Each arrow represents a one predictor logistic regression analysis using prospective and concurrent predictors with alcohol misuse as the dichotomous criterion variable. Standardized beta weights are displayed. *$p \leq .05$. **$p < .01$. ***$p < .001$.

Table 1

Means and Standard Deviations of Predictors by Level of Pre-Deployment Alcohol Misuse

	Sample	Relationship distress		PTSD symptoms		Depressive symptoms		Combat experiences
T1 Alcohol misuse	*n*	T1 *M (SD)*	T3	T1 *M (SD)*	T3	T1 *M (SD)*	T3	T3
Yes	41	3.67 (3.24)	-	25.15 (8.26)	-	3.05 (2.80)	-	-
No	123	2.09 (2.82)	-	20.72 (4.72)	-	2.12 (2.50)	-	-
Total	164	2.38 (2.95)	-	21.82 (6.09)	-	2.36 (2.61)	-	-

Note: T1 = pre-deployment; T3 = post-deployment.

Table 2

Means and Standard Deviations of Predictors by Level of Post-Deployment Alcohol Misuse

	Sample	Relationship distress		PTSD symptoms		Depressive symptoms		Combat experiences
T3 Alcohol misuse	*n*	T1 *M (SD)*	T3 *M (SD)*	T1 *M (SD)*	T3 *M (SD)*	T1 *M (SD)*	T3 *M (SD)*	T3 *M (SD)*
Yes	70	2.77 (2.92)	6.39 (2.90)	22.04 (5.25)	39.91 (14.68)	2.80 (2.83)	7.77 (5.67)	12.99 (4.89)
No	86	2.02 (2.95)	3.34 (3.56)	21.34 (5.59)	31.65 (15.27)	2.10 (2.44)	5.22 (5.52)	11.88 (5.73)
Total	156	2.33 (2.94)	4.55 (3.62)	21.65 (5.43)	35.36 (15.52)	2.41 (2.64)	6.37 (5.71)	12.39 (5.37)

Note: T1 = pre-deployment; T3 = post-deployment.

Table 3

Means and Standard Deviations of Predictors by Increase in Alcohol Misuse from Pre- to Post-Deployment

	Sample	Relationship distress		PTSD symptoms		Depressive symptoms		Combat experiences
Increase in alcohol misuse	*n*	T1 *M (SD)*	T3 *M (SD)*	T1 *M (SD)*	T3 *M (SD)*	T1 *M (SD)*	T3 *M (SD)*	T3 *M (SD)*
Increase	43	2.46 (2.90)	6.15 (2.81)	20.93 (4.07)	37.93 (14.67)	2.40 (2.63)	7.00 (5.61)	12.47 (4.62)
Decrease or Same	113	2.28 (2.98)	4.05 (3.72)	21.93 (5.86)	34.38 (15.78)	2.42 (2.65)	6.13 (5.76)	12.35(5.66)
Total	156	2.33 (2.94)	4.55 (3.62)	21.65 (5.43)	35.36 (15.52)	2.41 (2.64)	6.37 (5.71)	12.39 (5.37)

Note: T1 = pre-deployment; T3 = post-deployment.

Table 4

Odds Ratio Analyses with Pre-Deployment Alcohol Misuse

T1 Alcohol misuse	T1 Relationship distress		T1 PTSD symptoms		T1 Depressive symptoms	
	Yes	No	Yes	No	Yes	No
Yes	8	10	6	35	2	39
No	16	63	5	118	3	119
Odds Ratio	3.15		4.05		2.03	

Note: T1 = pre-deployment.

Table 5

Odds Ratio Analyses with Post-Deployment Alcohol Misuse

T3 Alcohol misuse	T3 Relationship distress		T3 Relationship status		T3 PTSD symptoms		T3 Depressive symptoms		T1 Age Dichotomized (≤ 28, ≥29)	
	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No
Yes	27	6	25	5	43	27	26	44	59	10
No	18	32	17	30	29	57	18	67	58	25
Odds Ratio	8.00		8.82		3.13		2.20		2.54	

Note: T1 = pre-deployment; T3 = post-deployment.

Table 6

Odds Ratio Analyses with Increase in Alcohol Misuse from Pre- to Post-Deployment

Increase in alcohol misuse	T3 Relationship distress		T3 Relationship status	
	Yes	No	Yes	No
Yes	17	3	15	2
No	28	35	27	33
Odds Ratio	7.08		9.17	

Note: T3 = post-deployment.

Table 7

Multivariate Predictors of Post-Deployment Alcohol Misuse

	Post-deployment alcohol misuse (yes/no)		
Model 1 (concurrent predictors)	β *(SE)*	Wald's χ^2	e^{β}
T3 Relationship distress	.28* (.08)	11.76	1.33
T3 PTSD symptoms	.06 (.03)	3.65	1.06
T3 Depressive symptoms	-.14 (.83)	2.02	.87

Note: T3 = post-deployment. *$p < .01$. β is the coefficient for the constant. *SE* is the standard error around the coefficient for the constant. Wald's χ^2 is a chi-square value of significance. The exponentiation of the B coefficient (e^{β}) represents the odds ratio associated with one unit change in the predictor.