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BRIEF REPORT

Hardiness Protects Against Problematic Alcohol Use in Male, but Not Female, Soldiers

Jessica A. Kulak
Buffalo State College

D. Lynn Homish, Rachel A. Hoopsick, and Jennifer Fillo
University at Buffalo

Paul T. Bartone
National Defense University

Gregory G. Homish
University at Buffalo

Military service members are at high risk for problematic substance use compared with the general population; deployment and combat exposure further increases this risk. It is thus critical to identify resiliency factors that can buffer the negative effects of military experiences and potentially prevent problematic alcohol use. The current research examines the extent to which psychological hardiness predicts lower risk of problematic alcohol use and explores potential sex differences in this association. Data are from Operation: SAFETY, an ongoing study of U.S. Army Reserve/National Guard soldiers. Negative binomial regression models examined the relation between baseline hardiness, assessed by the 15-item Dispositional Resiliency Scale, and problematic alcohol use at the 1-year follow-up, assessed by the Alcohol Use Disorders Identification Test ($N = 260$), controlling for baseline combat exposure (Combat Exposure subscale, Deployment Risk and Resilience Inventory-2) and baseline quantity and frequency of alcohol use. To examine the impact of hardiness on men and women, models were stratified by sex. In final, adjusted models, hardiness predicted lower risk of problematic alcohol use (adjusted risk ratio = 0.98; $p < .05$) for male soldiers and was unrelated to alcohol use for female soldiers (adjusted risk ratio = 1.01; $p > .05$). Post hoc analyses explored the impact of each dimension of hardiness (i.e., commitment, control, and challenge) on problematic alcohol use. Hardiness assessment may complement existing screening tools to identify high-risk populations; interventions to promote hardiness may help in preventing problematic alcohol use, particularly among male soldiers.

Keywords: problematic alcohol use, resilience, psychological hardiness, military, sex differences

Individuals working in high-stress occupations, especially those with exposure to traumatic events, are at an increased risk of substance use (Kaufmann, Rutkow, Spira, & Mojtabai, 2013). In particular, substance use is one of the most common health problems among military personnel, with studies reporting substance use disorder in 11% of military service members using Veterans Affairs health care (Seal et al., 2011). Alcohol use disorder, specifically, is also prevalent, with a recent meta-analysis reporting a pooled prevalence of 14.5% among Reserve component service members, compared with 11.7% among active-duty service

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Jessica A. Kulak, Department of Health, Nutrition, and Dietetics, Buffalo State College; D. Lynn Homish, Department of Community Health and Health Behavior, University at Buffalo; Rachel A. Hoopsick, Department of Family Medicine, University at Buffalo; Jennifer Fillo, Department of Community Health and Health Behavior, Clinical and Research Institute on Addiction, University at Buffalo; Paul T. Bartone, Institute for National Strategic Studies, National Defense University; Gregory G. Homish, Department of Community Health and Health Behavior, University at Buffalo.

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Correspondence concerning this article should be addressed to Jessica A. Kulak, Department of Health, Nutrition, and Dietetics, Buffalo State College, 1300 Elmwood Avenue, Buffalo, NY 14222. E-mail: kulakja@buffalostate.edu

members (Cohen, Fink, Sampson, & Galea, 2015). There is robust evidence demonstrating a relationship between deployment and/or combat exposure and problematic alcohol use in military populations (Bray & Hourani, 2007; Fillo, Heavey, Homish, & Homish, 2018; Green, Beckham, Youssef, & Elbogen, 2014; Hoge, Auchterlonie, & Milliken, 2006; Hoopsick, Vest, Homish, & Homish, 2018; Jacobson et al., 2008; Milliken, Auchterlonie, & Hoge, 2007; Wright, Foran, Wood, Eckford, & McGurk, 2012). Indeed, studies have found evidence for both new-onset and increased heavy drinking, binge drinking, and associated problems following deployment (Jacobson et al., 2008; Seal et al., 2011). These increases in drinking are thought to be a maladaptive coping response to internalizing symptoms, including depression, anxiety, and posttraumatic stress disorder (Wright et al., 2012). As a result, much of the literature on alcohol use among military service members to date has focused on identifying predeployment factors and deployment-related experiences, such as combat exposure (Jacobson et al., 2008), military sexual trauma (Fillo et al., 2018), and service members' perceptions of their combat experiences (Vest, Homish, Hoopsick, & Homish, 2018) that may increase individual risk of alcohol use. However, it is also important to investigate factors that may be protective for high-stress groups like the military.

Previous literature suggests that there may be important protective factors that buffer the effects of combat exposure on mental health and alcohol use (Brailey, Vasterling, Proctor, Constans, & Friedman, 2007; Goldmann et al., 2012; Polusny et al., 2011; Vest et al., 2018). For example, studies have identified individual protective factors, such as how military service members perceive combat threats (Vest et al., 2018), and interpersonal factors, such as marital functioning (Vest et al., 2018). Limited evidence also suggests the important role of resilience (Bartone, Hystad, Eid, & Brevik, 2012; Bartone, Johnsen, Eid, Hystad, & Laberg, 2016; Rudzinski, McDonough, Gartner, & Strike, 2017) and represents an alternative strengths-based approach to substance use research (Rudzinski et al., 2017). Strengths-based approaches, or resiliency paradigms, shift emphasis from negative factors that contribute to poor outcomes to focus on enhancing positive factors (Zimmerman, 2013). Further research is needed to better understand the role of resiliency, especially for high-risk military subgroups like Reserve and National Guard service members.

Resiliency theory suggests that resilient individuals are able to overcome hardship (i.e., bounce back), despite facing stressful situations (Richardson, 2002; Wooten, 2013). Resiliency has been conceptualized and assessed in a variety of ways (Connor & Davidson, 2003; Duckworth & Quinn, 2009; Eskreis-Winkler, Shulman, Beal, & Duckworth, 2014). Dispositional resiliency, or psychological hardiness, is the way in which a person approaches and interprets experiences. This construct is often described in terms of three separate, but closely related, dispositional tendencies: (a) commitment, (b) control, and (c) challenge (Bartone, Ursano, Wright, & Ingraham, 1989). Individuals higher in hardiness tend to have a high sense of commitment to life and work, have greater feelings of control, are generally more open to change and life challenges, and tend to interpret stressful experiences as a normal aspect of life (Bartone, 1999).

Previous research suggests that hardiness is particularly important to consider in military populations. Specifically, work by Bartone (1999) demonstrated that psychological hardiness protects against the effects of war-related stressors (e.g., threat of enemy attack, exposure to death, caring for the traumatically injured) among Army Reserve soldiers. Hardiness has been shown to buffer the impact of deployment-related stressors on mental health symptoms (Wooten, 2012) and acts as a mediator between avoidance coping and posttraumatic stress disorder symptoms (Thomassen, Hystad, Johnsen, Johnsen, & Bartone, 2018). Importantly, hardiness has also been shown to be inversely related to alcohol abuse (Bartone et al., 2012; Bartone et al., 2016; Eisen et al., 2014) and moderates the relationship between stress and problematic alcohol use (Morgan, Brown, & Bray, 2018).

Notably, responses to stressful or traumatic life events may differ among men and women. For example, Tedeschi and Calhoun (1996) found that women reported greater positive growth (e.g., in relating to others, appreciation of life) in response to trauma compared with men. Research with a peacekeeping military sample also reports that women derive more benefits (e.g., better at dealing with stress, recognizing the importance of family) from deployment compared with men (Britt, Adler, & Bartone, 2001). The effects of psychological hardiness, specifically, may also differ by sex; however, findings have been mixed. In a sample of police officers, hardiness had a stronger protective effect against psychological distress for women compared with men (Andrew et al., 2013). In contrast, findings from a community sample of university employees demonstrated that hardiness moderated the effects of stress on illness for men but not women (Klag & Bradley, 2004). It is unclear whether these differences in hardiness between men and women will exist among a military sample or in the context of problematic alcohol use.

Taken together, previous research demonstrates the utility of examining psychological hardiness among military populations but underscores the need for additional research, especially with respect to potential sex differences. Previous work has examined the influence of hardiness on alcohol use among mixed samples in active duty and Reserve service members (Eisen et al., 2014; Green et al., 2014). However, we are unaware of any work focusing specifically on differences in alcohol use outcomes by sex exclusively among Reserve and National Guard service members. Reserve and National Guard components make up a large proportion of the U.S. military (38.3%; Defense Manpower Data Center, 2017), but their experiences have been examined far less frequently than those of active-duty personnel. Research focused on this population is particularly important, given that Reserve and National Guard service members are at greater risk for substance abuse compared with their active-duty counterparts (Cohen et al., 2015; Griffith, 2010; Milliken et al., 2007), despite having similar deployment and/or combat experiences (Cohen et al., 2015; Thomas et al., 2010). The potential effect of hardiness on problematic alcohol use, among Reserve and National Guard service members, and how it may differ by sex, represents an important area of research that has not been fully explored.

The Current Study

This research aims to fill this critical gap in the literature by examining (a) the extent to which higher levels of hardiness may buffer service members from future problematic alcohol use and (b) potential sex differences in these associations among a sample of previously deployed U.S. Army Reserve and National Guard

(USAR/NG) soldiers. Given that women often respond to stressful situations with more positive growth compared with men (Britt et al., 2001; Tedeschi et al., 1996), and the differential effects of hardiness on psychological outcomes among law enforcement personnel (Andrew et al., 2013), we hypothesize that the protective effects of hardiness will be stronger for women compared with men.

Method

Participants and Procedure

Data were drawn from Operation: SAFETY, an ongoing longitudinal study focused on the health of USAR/NG soldiers and their spouses/partners. Soldiers and their partners were recruited from units across New York state and were screened on six inclusion criteria: (a) the couple is married or living as if married; (b) one member of the couple is a current Army Reserve soldier or National Guard soldier; (c) the soldier is between the ages of 18 and 45 years; (d) both partners are able to speak and understand English; (e) both partners are willing and able to participate; and (f) both partners have had at least one alcoholic beverage in the past year. Additional details on the study methods have been described elsewhere (Devonish et al., 2017; Heavey, Homish, Devonish, Goodell, & Homish, 2017; Hoopsick, Fillo, Vest, Homish, & Homish, 2017). The University at Buffalo as well as the Army Human Research Protections Office, Office of the Chief, Army Reserve, and the Adjutant General of the National Guard approved the study protocol.

This work focused on a subsample of 260 current or previous soldiers who reported at least one deployment prior to the baseline assessment and completed both the baseline and 1-year follow-up assessments. The average age of male participants ($n = 229$) at baseline was 33.5 ($SD = 6.0$) years and 32.8 ($SD = 4.6$) years for females ($n = 31$). Most participants were non-Hispanic White (males: 81.2%, $n = 186$; females: 74.2%, $n = 23$), with some college education (males: 59.8%, $n = 137$; females: 45.2%, $n = 14$) or a college degree (males: 26.6%, $n = 61$; females: 51.6%, $n = 16$) at baseline. At baseline, the majority of participants (males: 76.9%, $n = 176$; females: 77.4%, $n = 24$) were married, with the remainder living as if married.

Measures

Problematic alcohol use. The Alcohol Use Disorders Identification Test (AUDIT) assessed problematic alcohol use at first follow-up (Saunders, Aasland, Babor, de la Fuente, & Grant, 1993). The AUDIT consists of 10 items rated on a 4-point scale from 0 (*never*) to 4 (*daily or almost daily*), with scores ranging from 0 to 40. The current analyses used AUDIT total scores at first follow-up assessment as the outcome ($\alpha_{males} = 0.76$; $\alpha_{females} = 0.80$).

Alcohol use. Quantity and frequency of alcohol use were assessed, at baseline, using an adapted version of the Alcohol Quantity Frequency Index (Straus & Bacon, 1953). This measure consisted of two items calculated as the percentage of days that alcohol was consumed in the last 12 months multiplied by the number of drinks typically consumed during a drinking episode. Higher scores indicate greater drinking.

Hardiness. The 15-item Dispositional Resiliency Scale (Bartone, 1999; Bartone, 2007) assessed hardiness at baseline. The measure includes subscales for commitment, control, and challenge, and participant responses range from 0 (*not true at all*) to 3 (*completely true*), with scores ranging from 0 to 45. Example items include: "Most of my life gets spent doing things that are meaningful" (commitment); "by working hard you can nearly always achieve your goals" (control); "I enjoy the challenge when I have to do more than one thing at a time" (challenge). The measure has good internal consistency reliability ($\alpha_{males} = 0.79$; $\alpha_{females} = 0.78$).

Combat exposure. The combat exposure subscale of the Deployment Risk and Resilience Inventory-2 assessed combat exposure from the most recent deployment prior to baseline (Eisen et al., 2012). It measures the frequency with which participants encountered 17 objective events or circumstances on their most recent deployment with responses ranging from 1 (*never*) to 6 (*daily*). Higher scores indicate greater combat exposure. Reliability for this scale was high in this sample ($\alpha_{males} = 0.94$; $\alpha_{females} = 0.90$).

Sex. Participants self-reported their sex at baseline.

Analytic Approach

Descriptive statistics were used to characterize the sample. Negative binomial regression models examined the relation between hardiness at baseline and problematic alcohol use (AUDIT) at 1-year follow-up. Because the association between combat exposure and substance use has been previously established (Bray et al., 2007; Green et al., 2014; Seal et al., 2011), models controlled for baseline combat exposure (Gardner, Mulvey, & Shaw, 1995). Combat exposure was grand mean centered to enhance the interpretability of the model intercept without changing the significance of the main effects. Additionally, models controlled for quantity and frequency of alcohol use at baseline. Adjusted risk ratios (ARR) and 95% confidence intervals (CI) are reported. To examine whether the impact of hardiness differed by sex, adjusted models were run stratified by sex. Post hoc analyses additionally explored the differences by sex in the impact of each of the three dimensions of hardiness (i.e., commitment, control, and challenge) on problematic alcohol use.

Results

Descriptive Results

On average, males had an AUDIT score of 5.1 ($SD = 4.1$) at baseline and 4.8 ($SD = 4.1$) at follow-up; females had a mean score of 3.4 ($SD = 3.1$) at baseline and 3.0 ($SD = 2.8$) at follow-up. Approximately 19% of men ($n = 44$) and 6% of women ($n = 2$) had alcohol use scores at follow-up that were at or above the cutpoint of 8, indicative of problematic drinking (Babor, Higgins-Biddle, Saunders, & Monteiro, 2001). Whereas all soldiers had deployed at least once prior to baseline, almost half of males (44.1%; $n = 101$) and more than one third of females (35.5%; $n = 11$) had deployed two or more times. One male soldier (0.4%) was deployed during baseline study collection. Baseline, uncentered combat exposure scores were 32.7 ($SD = 16.6$) for males and 23.1 ($SD = 8.7$) for females. Most soldiers

(86.0% of males, 77.4% of females) reported some experience with combat-related, objective events or circumstances on their most recent deployment. Baseline mean hardiness scores were 31.5 (SD = 5.6; range 16–44) for males and 31.8 (SD = 4.4; range 23–41) for females. Hardiness scores for the sample ranged from 16 to 44, which is consistent with those of other military samples (Bartone et al., 2016).

Focal Analyses

Analyses examined the extent to which hardiness, at baseline, predicted problematic alcohol use at the 1-year follow-up. In the unadjusted model, greater levels of hardiness were associated with less problematic alcohol use for males (risk ratio = 0.98; CI = 0.96, 0.99, $p < .01$), although not for females (risk ratio = 1.04; CI = 0.98, 1.11, $p = .16$). In adjusted models, results also revealed differential significant main effects of hardiness by participant sex (Tables 1 and 2). Adjusted models controlled for average levels of combat exposure and quantity and frequency of alcohol use at baseline. In adjusted models, greater hardiness was predictive of less problematic alcohol use for males (ARR = 0.98; 95% CI = 0.97, 0.99; $p < .05$; Table 1) but not for females (ARR = 0.1.01; 95% CI = 0.95, 1.06; $p = .81$; Table 2).

Dimensions of Hardiness

Looking at the hardiness facets, the results for the dimension of commitment was consistent with the findings for hardiness overall. Higher levels of commitment were associated with lower levels of problematic alcohol use among males ($p < .01$) but were unrelated to problematic alcohol use for females ($p = .80$; Table 3). The hardiness dimensions of control and challenge at baseline were not significantly related to problematic alcohol use for either males or females at follow-up (see Table 3).

Discussion

Given that more than 1 million individuals are enlisted in a Reserve component (trained and qualified to be called to active duty) of the U.S. military (Office of the Deputy Assistant Secretary of Defense, 2016), it is critical to develop a greater understanding of the factors that contribute to resiliency in this population. To date, there is no literature examining the role of hardiness on alcohol use exclusively among Reserve and National Guard service members, despite the promising role hardiness may play in buffering problematic alcohol use. Our findings, consistent with other evidence (Bartone et al., 2012; Bartone et al., 2016; Eisen et al., 2014), demonstrate a protective effect of baseline hardiness on problematic alcohol use among males at 1-year follow-up.

This research contributes to the literature by evaluating potential sex differences in the effects of hardiness. Findings revealed that greater hardiness was protective against problematic alcohol use among men but was unrelated to women's problematic alcohol use. Although previous research on the effects of hardiness by sex are mixed (Andrew et al., 2013; Klag et al., 2004), seeing no effect for females was somewhat unexpected, given that females have shown more positive growth compared with males and exhibit protective factors following trauma, such as the ability to relate to others and/or experience increased appreciation for life (Britt et al., 2001; Tedeschi et al., 1996); our study, however, did not assess changes in resilience. Furthermore, a study looking at hardiness and sex differences among law enforcement personnel found that the commitment dimension of hardiness had a stronger protective effect against psychological distress for women than men (Andrew et al., 2013). This was somewhat in opposition to our findings, in which higher levels of commitment were protective against problematic alcohol use among males but not females. The difference in findings may be attributable to differences between military and civilian occupational groups. Consistent with our findings, Klag et al. (2004) found that hardiness buffered the effects of stress on illness for males but not for females. These authors suggest the difference between sexes may be due to the development of this measure among a sample of males (Klag et al., 2004; Kobasa, 1979), and it may be unintentionally incorporating gender biases into the existing subscales (Klag et al., 2004).

It is also possible that the protective effects of hardiness for females are being washed out by other constructs not examined here, such as the healthy warrior effect. According to this idea, military service members with poorer mental health are less likely to be deployed (Wilson et al., 2009); thus, these individuals would not be captured in this sample of previously deployed service members. This may leave a relatively homogenous sample of combat-exposed female service members with not enough variability among them to delineate the effects of hardiness on problematic alcohol use, although this is speculative. The healthy warrior effect may also be a factor effecting the males in our sample, although the women in this sample did have a more narrow range of hardiness scores compared with the men. For men, the sample may have been large enough ($n = 229$), and therefore

Table 1
Adjusted Main Effects Model for Problematic Alcohol Use at One-Year Follow-Up Among Previously Deployed Current/Former Male USAR/NG Soldiers

Main effects	ARR	95% lower	95% upper
Hardiness (baseline)	**0.98***	**0.97**	**0.99**
Combat exposure (baseline)	1.00	1.00	1.01
Alcohol QFI (baseline)	**1.41*****	**1.27**	**1.56**

Note. USAR/NG = U.S. Army Reserve and National Guard; ARR = adjusted risk ratio; QFI = Quantity Frequency Index. Boldface indicates statistical significance.
* $p < .05$. *** $p < .001$.

Table 2
Adjusted Main Effects Model for Problematic Alcohol Use at One-Year Follow-Up Among Previously Deployed Current/Former Female USAR/NG Soldiers

Main effects	ARR	95% lower	95% upper
Hardiness (baseline)	1.01	0.95	1.06
Combat exposure (baseline)	0.98	0.95	1.02
Alcohol QFI (baseline)	**1.60****	**1.23**	**2.09**

Note. USAR/NG = U.S. Army Reserve and National Guard; ARR = adjusted risk ratio; QFI = Quantity Frequency Index. Boldface indicates statistical significance.
** $p < .01$.

Table 3
Adjusted Risk Ratio Models for Problematic Alcohol Use at One-Year Follow-Up, by Dimension of Hardiness, Among Previously Deployed Current/Former USAR/NG Soldiers

Variables	Commitment ARR (95% CI)	Control ARR (95% CI)	Challenge ARR (95% CI)
Males			
Hardiness dimension (baseline)	**0.95**** **(0.91, 0.98)**	0.98 (0.94, 1.01)	0.98 (0.95, 1.01)
Combat exposure (baseline)	1.00 (0.99, 1.01)	1.00 (1.00, 1.01)	1.00 (1.00, 1.01)
Alcohol QFI (baseline)	**1.40***** **(1.27, 1.55)**	**1.42***** **(1.28, 1.57)**	**1.42***** **(1.28, 1.58)**
Females			
Hardiness dimension (baseline)	1.02 (0.90, 1.15)	1.03 (0.89, 1.19)	1.00 (0.90, 1.10)
Combat exposure (baseline)	0.98 (0.95, 1.02)	0.98 (0.95, 1.02)	0.98 (0.95, 1.02)
Alcohol QFI (baseline)	**1.60**** **(1.23, 2.09)**	**1.60***** **(1.25, 2.06)**	**1.63**** **(1.27, 2.09)**

Note. USAR/NG = U.S. Army Reserve and National Guard; ARR = adjusted risk ratio; 95% CI = 95% confidence interval; QFI = Quantity Frequency Index. Boldface indicates statistical significance.
** $p < .01$. *** $p < .001$.

more diverse, to examine these differential effects. Finally, the effect for men and women may be related to this specific sample because there were a limited number of females who deployed ($n = 31$). Thus, the statistical power for female soldiers was low. Understanding the relation between hardiness and sex will be important to consider in future research efforts because the number of service women taking on deployment and combat roles continues to increase. Further research is needed to thoroughly examine these relations and the conditions under which they may occur.

With emerging evidence of the protective role of resilience, the need for resilience training programs is being recognized (Eisen et al., 2014). For example, the Warrior Resilience and Thriving program, developed by the U.S. Army, utilizes rational emotive behavior therapy to increase soldier resiliency (Jarrett, 2013). Whereas qualitative evidence supports the program's effectiveness, it did not assess hardiness using any formal metrics (e.g., Dispositional Resiliency Scale-15) (Jarrett, 2013). Given the significant findings in relation to the commitment dimension of hardiness, wherein greater commitment was protective against problematic alcohol use for males, future resilience training programs may want to focus on increasing the commitment component of hardiness specifically. It is important for any future resiliency training programs to conduct formalized process, impact, and outcome evaluations to best determine the program's success at increasing soldier resilience.

Widespread distribution of effective interventions could improve the health outcomes of service members (Eisen et al., 2014). Interventions that capitalize on the availability of advanced technology may be a promising avenue for the dissemination of resiliency training programs. A pilot study explored the use of a smartphone-based application (app) to deliver an intervention designed to promote resilience (Roy, Highland, & Costanzo, 2015); however, a measure of hardiness was not included in their project (Roy et al., 2015). Formalized measures of hardiness will be necessary to provide evidence of increasing this construct using smartphone and other advanced technologies.

Limitations

This research has some limitations. The exclusive use of USAR/NG soldiers limits generalizability to other branches of the military. However, this population makes up 60% of the Ready Reserve (Office of the Deputy Assistant Secretary of Defense, 2016) and are at increased risk for substance use problems (Seal, Bertenthal, Miner, Sen, & Marmar, 2007; Seal et al., 2011), and they represent a high-risk but understudied population. As previously mentioned, there was a small sample of female service members, resulting in reduced statistical power for female soldiers. Problematic alcohol use was not clinically verified, although the AUDIT is a well-validated tool for assessing problematic alcohol use. Despite these limitations, this study provides novel information on the protective effects of psychological hardiness on longitudinal problematic alcohol use among USAR/NG soldiers.

Conclusions

It is important to identify resilience factors that protect against stress and negative health outcomes commonly experienced by military service members. Our findings indicate that male USAR/NG soldiers may benefit from a protective effect of psychological hardiness against problematic alcohol use. Hardiness measures may complement existing screening tools to identify high-risk populations, but additional research is needed to better understand the relation between hardiness and problematic alcohol use, especially among female USAR/NG soldiers.

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