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Characterizing binge drinking among U.S. military Veterans receiving a brief alcohol intervention

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ABSTRACT

Background: Brief web-based alcohol interventions (BAIs) are effective for reducing binge drinking in college students and civilian adults, and are increasingly being applied to U.S. military populations. However, little is known about factors associated with binge drinking in Veteran populations and therefore some concern remains on the generalizability of studies supporting BAIs for addressing binge drinking in this population. This study sought to better understand the characteristics (e.g., demographic, coping related mental health factors, prior exposure to traumatic events, and factors assessing motivation to change alcohol use) of a predominantly male sample of binge drinking Veterans receiving a BAI from a VA provider.

Methods: A primarily male (93.5%) sample (N = 554) of Veterans completed a BAI consisting of brief assessment and personalized feedback.

Results: We found that Veterans who were younger, used drugs/alcohol to cope with symptoms of PTSD and depression (e.g., nightmares and flashbacks and sleep difficulties), and had experienced sexual assault, had higher self-reported peak blood alcohol concentration and a higher likelihood for a binge drinking episode in the last 90 days.

Conclusions: BAIs may be a promising approach for addressing binge drinking in Veterans. However, binge drinking among a sample of mostly male Veterans receiving a BAI may be associated with a complex set of factors that are less prevalent in the college student population and thus studies demonstrating the efficacy of BAIs with Veterans are needed.

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The negative consequences of binge drinking are well documented and include increased mental and physical health problems, frequent injuries, and comorbid illicit drug use (Timko, Sutkowi, Pavao, & Kimerling, 2008; Lande, Marin, Chang, & Lande, 2008; Bradley et al., 2001). Binge drinking is typically defined as 5 or more drinks for men (4 or more for women) in a two hour period (National Institute on Alcohol Abuse and Alcoholism (NIAAA), 2004, p. 3; Lange and Voas, 2001; Neighbors, Larimer, & Lewis, 2004; Substance Abuse and Mental Health Services Administration (SAMHSA), Office of Applied Studies, 2008). The National Institutes on Alcohol Abuse and Alcoholism (NIAAA) National Advisory Council recently proposed a different measure of binge drinking based on peak Blood Alcohol Content (BAC). According to their definition, an episode of binge drinking is one that brings a person's blood alcohol concentration to .08 gram percent or above (National Institute on Alcohol Abuse and Alcoholism (NIAAA), 2004, p. 3). BAC is an indicator of a heavy drinking episode as it can be associated with meaningful consequences such as those imposed by drinking and driving laws (Beirness, Foss, & Vogel-Sprott, 2004; Lange & Voas, 2001).

Research suggests that binge drinking is more likely among U.S. Army personnel of younger age and deployed in an area of combat (Lande et al., 2008). Military personnel aged 18–25 are almost twice as likely to drink heavily compared to their civilian peers (Bray et al., 2002; Ferrier-Auerbach et al., 2009). These findings are consistent with research showing significant increases in harmful drinking in active duty military personnel, and specifically Operation Iraqi Freedom/Operation Enduring Freedom (OIF/OEF) returnees (Seal, Bertenthal, Miner, Sen, & Marmar, 2007). Mental health factors such as symptoms of post traumatic stress disorder (PTSD) and depression have been linked to binge drinking in female Veterans (Bradley et al., 2001). Similarly, a recent study by Ferrier-Auerbach et al. (2009) found evidence of an association between PTSD symptoms and increased frequency of binge drinking in U.S. National Guard soldiers. The primary goal of this paper is to explore whether factors found to be associated with binge drinking in U.S. active duty military personnel and female Veterans extend to a sample of predominantly male Veterans receiving a web-based brief alcohol intervention (BAI).

A growing body of research shows that BAIs are effective in reducing binge drinking among college students (Kypri et al., 2004; Kypri, Langley, Saunders, Cashell-Smith, & Herbison, 2008; Butler & Correia, 2009; Neighbors et al., 2004) and civilian adults, (Hester, Squires, & Delaney, 2005) and may be helpful for addressing binge

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drinking among U.S. military active duty personnel (Williams, Herman-Stahl, Calvin, Pemberton, & Bradshaw, 2009). BAIs typically consist of two main components—a brief (5-minute) assessment and personalized feedback. The assessment component collects information on frequency and quantity of alcohol use, frequency of binge drinking, potential consequences of engaging in harmful drinking patterns, and motivation (or readiness) to engage in treatment (Butler & Correia, 2009; Squires & Hester, 2002; Hester et al., 2005). The assessment data are then used to generate a personalized feedback report that provides age- and gender-matched normative comparisons of alcohol use, a description of self-reported consequences of alcohol use, and feedback on the person's degree of motivation to change alcohol or substance use (Williams et al., 2009).

The BAI used in this study was developed by researchers at the Veterans Affairs Palo Alto Health Care System. It was designed to be administered by VA providers working with U.S. Veterans suspected to be using alcohol in a risky or harmful manner. The BAI was released and marketed widely through the Veterans Health Administration (VHA) in May 2008.

This study explores the pre-treatment characteristics of a nationwide sample of Veterans being seen in outpatient mental health settings receiving a BAI. First, we examine the extent to which VA providers are using the BAI as intended—whether Veterans receiving the BAI met criteria for alcohol misuse using gender-specific recommended cut off scores of the Alcohol Use Disorders Identification Test—Consumption Items (AUDIT-C) (Bradley et al., 2006; Bradley et al., 2003). The clinical application of the BAI was left to the discretion of VA providers working in outpatient mental health settings, therefore this aim will help us characterize alcohol use among a sample of patients presenting for this intervention.

Second, we explore pre treatment characteristics associated with binge drinking in a predominantly male sample of Veterans presenting for a BAI. More specifically, we explore the relationship between binge drinking and demographic characteristics (e.g., age), coping related mental health factors (e.g., using alcohol to cope with symptoms of PTSD and depression), prior exposure to traumatic events (e.g., combat and sexual assault), and factors assessing motivation to change alcohol use in this sample of Veterans. We hypothesize that increased peak blood alcohol concentration and probability of engaging in a binge drinking episode during a prior 90-day period will be associated with (a) younger age, (b) using substances to cope with uncomfortable emotional experiences, including symptoms of PTSD and depression, (c) prior exposure to traumatic events (e.g., combat exposure), and (d) increased motivation to change alcohol use.

1. Methods

1.1. Sample

Between May 2008 and December 2009, the BAI was administered to a total of 1030 Veterans nationwide. VA counselors working in a variety of outpatient mental health settings used their clinical judgment to select individual Veterans who they thought might benefit from the intervention. The primary clinical indication for referral to the BAI was the presence of either documented or suspected alcohol or substance use problems. Results obtained from the AUDIT-C screening measure that is embedded in the BAI confirmed that 100% of the Veterans who were selected by their clinicians to interact with the tool did in fact screen positive for alcohol misuse. However, given that the administration of the BAI was left to the discretion of VA providers, the total population of Veterans who might have been deemed “eligible” for the BAI, but did not receive it, cannot be estimated.

In an effort to exclude records that may have been generated by clinicians who only used the system on a trial basis and/or non-clinically (e.g., to explore the contents of the program), we restricted our analyses to patients of VA clinicians who used the tool to generate feedback for three or more Veterans. This inclusion criterion reduced our sample to 554 encounters with unique patients. A total of 47 VA providers were associated with the 554 patient encounters entered into the BAI, with a mean average of 8.4 (SD = 20.8) patient entries per provider.

1.2. Typical alcohol consumption

The AUDIT-C (Babor & Grant, 1989) is used in the BAI to determine whether a Veteran meets criteria for alcohol misuse. Annual screening for alcohol was implemented throughout VHA in 2004 to identify alcohol misusers for the purpose of providing brief alcohol counseling or referral to specialty care which has become a VHA priority (Bradley et al., 2006). The AUDIT-C consists of three items: (a) “How often do you have a drink containing alcohol?” (b) “How many standard drinks containing alcohol do you have on a typical day?” and (c) “How often do you have six or more drinks on one occasion?” We used recommended AUDIT-C cut off scores of ≥ 3 for women and ≥ 4 for men (Bradley et al., 2006; Bradley et al., 2003) to identify Veteran participants screening positive for alcohol misuse.

1.3. Peak blood alcohol concentration (BAC)

Peak BAC is a self-reported estimate of the highest BAC level for a specific time period of alcohol use. Veterans are asked to think back over the past 90 days and to remember a day where they drank the most. Once the day is chosen, Veterans indicate the number of standard drinks that they consumed on that day, the time they had their first drink, and time they had their last drink. This information, in conjunction with their weight and gender, is used to calculate an estimate of their peak BAC during that time period. The BAI calculates peak BAC using Widmark (1981): Principles and Applications of Medico Legal Alcohol Determination. English translation of the 1932 German edition. Our outcomes included both level of peak BAC and whether peak BAC reported by the participant met criteria for an episode of binge drinking. Following recent NIAAA guidelines (National Institute on Alcohol Abuse and Alcoholism (NIAAA), 2004; Beirness et al., 2004), we used a self-reported drinking episode resulting in a peak BAC of .08 or greater as our definition of binge drinking.

1.4. Consequences of alcohol use

Drinking-related consequences were assessed using the Short Index of Problems (SIP) (Woolard et al., 2004). The SIP consists of 15 items measuring consequences of alcohol use in five domains: Physical, Interpersonal, Social Responsibility, Intrapersonal, and Impulse Control consequences.

1.5. Risk factors for unsafe drinking

The BAI used in this study identifies 12 “risk factors” in an individual's personal history that can make any level of alcohol consumption problematic. Such risk factors include pre-existing medical conditions exacerbated by alcohol consumption (e.g. hepatitis C, diabetes, and traumatic brain injury), previous exposure to traumatic events (e.g. combat experience or sexual assault), or a history of using substances to cope with mental health symptoms. Although this study focused on a subset of these risk factors found to be associated with binge drinking as measured by peak BAC, the full list of these risk factors includes: combat status; sexual assault; trouble remembering things; trouble achieving and/or maintaining an erection; hepatitis C; diabetes; taking medication for a psychiatric or mental health concern; using drugs and/or alcohol to cope with

nightmares/flashbacks/sleep, stress or depression, and to relax in social situations; a blow to the head that resulted in a loss of consciousness; and difficulty controlling anger. Veterans provided a Yes/No answer to each of the 12 items.

1.6. Motivation/confidence to change substance use

Two questions were included in the BAI to assess Veterans' readiness or motivation to change their substance use—(a) "On a scale of 0–10, with 0 being not at all important, and 10 being most important, how important is it for you to make a change in your use of drugs/alcohol?" and (b) "On a scale of 0–10 with 0 being not at all confident, and 10 being absolutely confident, how confident are you that you could make a change in your use of drugs or alcohol if you decided to do so?" These questions are based on the concept of "readiness ruler" (Squires & Hester, 2004) which is used to indicate a person's level of readiness for changing their substance use behavior. This assessment was integrated into this BAI to help VA providers gauge how likely a patient is to respond positively to a brief intervention (Heather, Smailes, & Cassidy, 2008). These questions were also used to help promote "change talk" on the part of the patient which has been shown to predict reductions in alcohol use (Gaume, Gmel, & Daeppen, 2008). Change talk is speech (e.g., comments on intention to change) expressed by the patient that helps move them towards making a change in their substance use (Miller & Rollnick, 2002).

2. Data analysis

2.1. General linear model

To test our hypothesis, we utilized a hierarchical multiple regression and logistic regression to examine four blocks of variables—participant age; three items assessing coping related mental health factors (using drugs and/or alcohol to cope with nightmares/flashbacks/sleep, stress or depression, and to relax in social situations); two items assessing prior exposure to traumatic events (combat exposure and sexual trauma); and two items assessing motivation to change alcohol use (importance of changing and confidence in ability to change). All variables within a block were entered simultaneously. The significance of the entire block was tested in hierarchical regression model and adjusted R^2 and incremental changes in adjusted R^2 are provided for each block. Standardized coefficients for the regression analyses are presented in Table 3.

3. Results

3.1. Participant characteristics

Twelve participants who completed the BAI but did not provide complete data for calculating peak BAC were dropped from the sample, resulting in a total sample size of 542 Veterans. Descriptive data for the study sample are presented in Table 1. The majority of our sample was male (93.5%) and above the age of 50 (58.9%). The mean average self-reported peak BAC was .11 (SD = .11). To address our first aim, we examined the percentage of our sample screening positive for alcohol misuse using gender specific cut off scores for men (AUDIT-C ≥ 4) and women (AUDIT-C ≥ 3). All men and women included in our sample screened positive for alcohol misuse and on average, these individuals were drinking twice as much as the NIAAA gender-specific daily drinking limits (NIAAA, 2010). Thus, this BAI was being used by VA providers as intended—with Veterans engaging in alcohol misuse.

Almost half of our sample reported combat experience (46.5%), with 9.2% of Veterans reporting a history of sexual assault. A large percentage of Veterans indicated that they used drugs/alcohol to (a) cope with nightmares or flashbacks or to help with sleep (41.1%); (b) cope with feeling stressed out or depressed (59.4%); or (c) relax or feel more at ease in social situations (64.6%). In general, they indicated a relatively low level of importance to changing their substance use with a mean score of 4.7 (SD = 3.7). In contrast, they expressed a relatively higher level of confidence in their ability to change their substance use if they were to do so (mean score of 7.5; SD = 3.0). These findings indicate that our sample, in general, were relatively uninterested in changing their substance use, but were confident they could make a change if they decided to do so.

Table 1
Descriptive data on Veteran users (N = 542).

	n (%)	Mean (SD)	Min, max
Gender			
Male	507 (93.5%)		
Female	35 (6.5%)		
Age			
18–25	41 (7.6%)		
26–34	66 (12.2%)		
35–49	116 (21.4%)		
>50	319 (58.9%)		
Alcohol use patterns			
Audit-C			
Male (score ≥ 4)	507 (100%)	7.7 (2.6)	
Female (score ≥ 3)	35 (100%)	5.5 (2.1)	
Peak BAC		.11 (.11)	.00, .47
Binge episode			
Yes	258 (48%)		
No	284 (52%)		
Average drinks per day			
Male		3.9 (3.2)	.43, 14.29
Female		2.3 (2.5)	.43, 12.86
Risk factors for unsafe drinking			
Use drugs and/or alcohol to cope/relax in			
Nightmares/flashbacks/sleep	223 (41.1%)		
Stress or depression	322 (59.4%)		
Social situations	350 (64.6%)		
Combat status	252 (46.5%)		
Sexual assault	50 (9.2%)		
Motivation to change substance use			
Importance of changing use		4.7 (3.7)	0, 10
Confidence in making changes		7.5 (3.0)	0, 10

3.2. Multivariate relationships

Results from the multivariate regression analyses are shown in Table 3.

3.2.1. Block 1: Age

Age was entered into the first block of variables and found to be negatively associated with self-reported peak BAC levels, $R^2_{adj} = .05$, $F(1, 540) = 28.66$, $p < .01$, indicating that younger Veterans were more likely to report higher peak BACs. Similar results were observed in the logistic model predicting the occurrence of a binge drinking episode (1 = yes, 0 = no). Specifically, being of younger age increased the odds of reporting a binge drinking episode in the last 90 days (odds ratio, OR .64, 95% confidence interval CI, .53 to .77).

3.2.2. Block 2: Coping

Next, we entered three items assessing coping related mental health factors—using drugs and/or alcohol to cope with (a) nightmares/flashbacks/sleep, (b) stress/depression, and (c) to relax in social situations. When entered as a block, these variables explained a relatively modest but statistically significant amount of variance in

Table 2
Point biserial and Pearson correlation coefficients between predictor variables and outcomes.

	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)
(a) Binge episode										
(b) Peak BAC	.76**									
(c) Age	−.21**	−.22**								
(d) Nightmares/flashbacks/sleep	.19**	.22**	−.10*							
(e) Stress/depression	.24**	.26**	−.07	.38**						
(f) Social situations	.11**	.16**	−.12**	.31**	.39**					
(g) Combat status	.09*	.05	−.21**	.20**	.06	.07				
(h) Sexual assault	.11*	.19**	−.14**	.19**	.19**	.09*	−.02			
(i) Importance to change	.22**	.27**	−.04	.25**	.49**	.25**	−.06	.12**		
(j) Confidence to change	−.13*	−.17**	.06	−.15**	−.21**	−.06	.01	−.13*	−.08	

Note. Binge episodes were coded 0 for Non Binge and 1 for Binge.
* p<.05.
** p<.01.

peak BAC, R^2_{adj} .12, F (3, 537) = 19.21, p<.01. Of these three variables, the two variables assessing use of drugs and alcohol to (a) cope with nightmares/flashbacks/sleep and (b) stress/depression emerged as significantly associated with increased peak BAC.

Similar results were observed in the logistic model. Two items assessing coping with nightmares/flashbacks/sleep (OR 1.55, CI, 1.46 to 2.29) and stress/depression (OR 2.36, CI, 1.57 to 3.55) were significantly associated with the increased occurrence of a binge drinking episode in the last 90 days. Taken together, these results show that Veterans who report using substances to cope with symptoms of PTSD and depression report a higher peak BAC and higher likelihood of a recent binge drinking episode. The third coping item (i.e., to relax in social situations) was not found to be associated with these outcomes.

3.2.3. Block 3: Prior trauma

A history of self-reported military combat and sexual trauma was entered in as a third block. However, only sexual trauma was entered into the linear model given that the correlation coefficient between combat exposure and peak BAC was not statistically significant (see Table 2). The inclusion of prior exposure to sexual assault resulted in a small but statistically significant improvement in model prediction for peak BAC (R^2_{adj} = .13, F (1, 536) = 16.84, p<.01). In contrast, both variables were entered as a third block in the logistic model and were not found to be associated with the occurrence of a binge drinking episode.

3.2.4. Block 4: Motivation to change

In our fourth and final block, we entered two items assessing Veterans' motivation to take steps toward changing substance use—(a) importance of making a change and (b) confidence in their ability to make a change. Results showed that both variables were significantly associated with peak BAC and added to the model's overall explanatory power, R^2_{adj} = .16, F (2, 534) = 15.16, p<.01. Veterans who reported that changing their substance use was important and who indicated a lower level of confidence in changing their substance use were more likely to report a drinking episode in the last 90 days resulting in a higher peak BAC.

In contrast, the logistic model identified the importance to change variable as the only variable (of the two variables assessing readiness) significantly associated with the occurrence of a binge drinking episode. This result suggests that as Veterans' rating of self-reported

Table 3
Standardized regression coefficients predicting peak blood alcohol concentration levels and binge drinking (N = 542).

Variable	Peak BAC					Binge drinking episode			
	B	(SE)	ß	Adj R^2	ΔAdj R^2	B	(SE)	Odds ratio	95% CI
Block 1				.05**					
Age	−.03	.01	−.22**			−.45	.10	.64**	.53, .77
Block 2				.12**	.08**				
Age	−.02	.01	−.20**			−.43	.10	.65**	.54, .79
Nightmares/flashbacks/sleep	.03	.01	.12**			.44	.20	1.55*	1.46, 2.29
Stress/depression	.04	.01	.20**			.86	.21	2.36**	1.57, 3.55
Social situations	.01	.01	.02			−.09	.21	.92	.61, .1.39
Block 3				.13**	.01*				
Age	−.02	.01	−.19**			−.41	.10	.66**	.55, .81
Nightmares/flashbacks/sleep	.02	.01	.11*			.40	.21	1.50	.99, 2.23
Stress/depression	.04	.01	.18**			.84	.21	2.32**	1.54, 3.51
Social situations	.01	.01	.02			−.08	.21	.92	.61, 1.39
Combat status	–	–	–			.11	.19	1.11	.77, 1.61
Sexual assault	.04	.02	.11*			.22	.33	1.25	.66, 2.37
Block 4				.16**	.03**				
Age	−.02	.01	−.18**			−.40	.10	.67**	.55, .82
Nightmares/flashbacks/sleep	.02	.01	.09			.33	.21	1.39	.92, 2.08
Stress/depression	.02	.01	.09			.52	.23	1.69*	1.07, 2.66
Social situations	.00	.01	.02			−.10	.21	.90	.59, 1.38
Combat status	–	–	–			.20	.19	1.22	.83, 1.78
Sexual assault	.04	.02	.09*			.17	.33	1.18	.62, 2.26
Importance to change	.01	.00	.17**			.08	.03	1.09**	1.03, 1.15
Confidence to change	−.00	.00	−.10*			−.06	.03	.95	.89, 1.00

Binge episodes were coded 0 for Non Binge and 1 for Binge.
* p<.05.
** p<.01.

importance to change substance use increases, their likelihood of reporting a binge drinking episode in the last 90 days significantly increases. However, this finding should be interpreted with caution as the size of the effect for this variable was extremely small.

4. Discussion

Our findings indicate that the BAI is being utilized in clinical practice by VA healthcare providers with an appropriate patient population—Veterans who screen positive for alcohol misuse. Indeed, 100% of our sample was engaging in alcohol misuse as measured by the AUDIT-C. We also found that approximately half of the Veterans in our study (48%) had engaged in a self-reported binge drinking episode in the last 90 days, as measured by a peak BAC of .08 and above (National Institute on Alcohol Abuse and Alcoholism (NIAAA), 2004). Together, these findings indicate that the BAI is not only being used with Veterans with suspected (and confirmed) alcohol misuse, but with a Veteran population that is commonly reporting a pattern of alcohol use (i.e., binge drinking) that has been found to be particularly responsive to BAIs. The efficacy of BAIs was originally established with binge drinking college students (e.g., Kypri et al., 2008; Kypri et al., 2004) and has only recently begun to be applied to U.S. military personnel (Williams et al., 2009). These results add to the growing body of evidence showing that binge drinking is prevalent among U.S. military Veterans (Bradley et al., 2001) and active duty military personnel (Lande et al., 2008). Thus, BAIs may be an appropriate intervention tool for Veterans given the prevalence of binge drinking among this population and particularly for younger Veterans who are most likely to binge drink.

Our results suggest that binge drinking is relatively common among Veterans who screen positive for alcohol misuse in VA outpatient mental health settings. Furthermore, our results suggest that these Veterans may binge drink to cope with the uncomfortable emotional experiences associated with psychiatric disorders and/or traumatic experiences. These findings are consistent with prior research documenting higher levels of binge drinking among younger Veterans (Lande et al., 2008) and specifically among those individuals in the 18–25 age range (Bray et al., 2002). The results obtained from the primarily male sample in this study extends the results of prior research which has found that binge drinking in female military Veterans is associated with increased symptoms of PTSD and depression (Bradley et al., 2001).

Interestingly, combat status was not found to be associated with either peak BAC or the likelihood of a binge drinking episode. However, bivariate correlations suggested that combat status had a weak but statistically significant association with the occurrence of a binge episode in this sample. We explored this association given the findings of Lande et al. (2008) which showed that binge drinking is more likely to occur in U.S. military personnel assigned to area of combat operations. Our results did not support this conclusion.

Finally, Veterans reporting higher peak BAC levels were more likely to indicate that changing their substance use was important to them, but reported lower confidence in their ability to take steps towards change. These results were partially replicated in our logistic model predicting the likelihood of a binge drinking episode in the last 90 days. We found that a higher self-reported level of importance to change substance use was associated with an increased occurrence of a binge drinking episode in the last 90 days; however, confidence in ability to take steps toward change was not associated with this outcome. This suggests that alcohol misusing Veterans recognize that their alcohol consumption is problematic and that a change in their use of alcohol is warranted, but also recognizes that they may need some assistance in taking steps toward change.

Several limitations of this study are worth noting. First, a cross-sectional design was used in this study which limits the extent to which we can conclude that study variables function as predictors of peak BAC. Future studies utilizing longitudinal data are needed to confirm the relationships found in this study. Second, we gathered data on peak BAC through self-report (over the last 90 days) which may be subject to various biases such as the under- and overestimation of the amount of alcohol used and the time frame in which it was consumed. Given the substantial challenges involved in measuring BAC of study participants during an actual drinking event, future studies may attempt to gather data on BAC closer (than 90 days) in proximity to an actual drinking event. Third, assessment information collected on coping related mental health factors (e.g., coping with flashbacks and depression), prior exposure to trauma (i.e., sexual trauma and combat experience), and motivation to change was done by using only a few questions. This may limit the extent to which we can draw conclusions about the specific nature of the relationships between these factors, peak BAC, and likelihood of binge drinking among this mostly male sample of Veterans. Although the brevity of our assessment is characteristic of most BAIs, future studies should include more comprehensive, standardized assessments of these factors to better understand potential pathways by which they are related to binge drinking in a sample of Veteran populations. Finally, data were collected on a sample of Veterans receiving outpatient mental health services. VA counselors used their clinical judgment to select individual Veterans with either documented or suspected alcohol problems to receive the intervention. The nature of this sample may therefore limit the generalizability of our findings to the larger population of VA patients or U.S. Military Veterans. Future studies examining factors related to harmful alcohol use patterns in Veterans may wish to replicate and extend these findings in a larger more representative sample of the Veteran population.

The results of this study suggest that BAIs may be a promising approach for addressing binge drinking in Veterans. However, this suggestion is made with some caution as there is some concern about the generalizability of treatment effects to Veteran populations. This concern stems primarily from the finding that Veterans may engage in binge drinking for different reasons than college students. For example, social motivations (LaBrie, Hummer, & Pederson, 2007), and novelty of alcohol use and reward seeking (O'Connor & Colder, 2005) have been shown to be some of the primary reasons for college student alcohol use. These findings contrast with the results of this and other studies (e.g., Bradley et al., 2001) indicating that Veterans engage in binge drinking to cope with negative emotions associated with highly prevalent mental health problems (e.g., PTSD and depression). Given the potential differences in reasons for binge drinking in college students and U. S. military Veterans, studies demonstrating the efficacy of BAIs with Veteran populations are needed.

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Conflict of Interest

None.

Contributors

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References

Babor, T. F., & Grant, M. (1989). From clinical research to secondary prevention. International collaboration in the development of the Alcohol Use Disorders Identification Test(AUDIT). *Alcohol Health and Research World*, *13*, 371—374.

Butler, L. H., & Correia, C. J. (2009). Brief alcohol intervention with college student drinkers: Face-to-face versus computerized feedback. *Psychology of Addictive Behavior*, *23*(1), 163—167.

Beirness, D. J., Foss, R. D., & Vogel-Sprott, M. (2004). Drinking on campus: Self-reports and breath tests. *Journal of Studies on Alcohol and Drugs*, *65*, 600—604.

Bradley, K. A., Bush, K. R., Davis, T. M., Dobie, D. J., Burman, M. L., Rutter, C. M., et al. (2001). Binge drinking among female Veterans affairs patients: Prevalence and associated risks. *Psychology of Addictive Behaviors*, *15*(4), 297—305.

Bradley, K. A., Bush, K. R., Epler, A. J., Dobie, D. J., Davis, T. M., Sporleder, J. L., et al. (2003). Two brief alcohol-screening tests from the Alcohol Use Disorders Identification Test (AUDIT). *Archives of Internal Medicine*, *163*, 821—829.

Bradley, K., Williams, E. C., Achtmeyer, C. E., Volpp, B., Collins, B. J., & Kivlahan, D. R. (2006). Implementation of evidence-based alcohol screening in the Veterans Health Administration. *The American Journal of Managed Care*, *12*(10), 597—606.

Bray, R. M., Hourani, L. L., Rae, K. L., Dever, J. A., Brown, J. M., Vincus, A. A., et al. (2002). Department of Defense of Health Related Behaviors Among Military Personnel. No. DAMD17-00-2-0057. Retrieved January 13, 2010 from. http://www.tricare.mil/main/news/dodsurvey.htm

Ferrier-Auerbach, A. G., Kehle, S. M., Erbes, C. R., Arbisi, P. A., Thuras, P., & Polusny, M. A. (2009). Predictors of alcohol use prior to deployment in National Guard Soldiers. *Addictive Behaviors*, *34*, 625—631.

Gaume, J., Gmel, G., & Daeppen, J. B. (2008). Brief alcohol interventions: Do counsellors' and patients' communication characteristics predict change? *Alcohol and Alcoholism*, *43* (1), 62.69.

Heather, N., Smailes, D., & Cassidy, P. (2008). Development of a Readiness Ruler for use with alcohol brief interventions. *Drug and Alcohol Dependence*, *98*(3), 235—240.

Hester, R. K., Squires, D. D., & Delaney, H. D. (2005). The Drinker's Check-up: 12-month outcomes of a controlled clinical trial of a stand-alone software program for problem drinkers. *Journal of Substance Abuse Treatment*, *28*, 159—169.

Kypri, K., Langley, J. D., Saunders, J. B., Cashell-Smith, M. L., & Herbison, P. (2008). Randomized controlled trial of web-based alcohol screening and brief intervention in primary care. *Archives of Internal Medicine*, *168*(5), 530—536.

Kypri, K., Saunders, J. B., Williams, S. M., McGee, R. O., Langley, J. D., Cashell-Smith, M., et al. (2004). Web-based screening and brief intervention for hazardous drinking: A double-blind randomized controlled trial. *Addiction*, *99*, 1410—1417.

LaBrie, J. W., Hummer, J. F., & Pederson, E. R. (2007). Reasons for drinking in the college student context: The differential role and risk of the social motivator. *Journal of Studies on Alcohol and Drugs*, *68*(3), 393—398.

Lande, R. G., Marin, B. A., Chang, A. S., & Lande, G. R. (2008). Survey of alcohol use in the U.S. Army. *Journal of Addictive Diseases*, *27*(3), 115—121.

Lange, J. E., & Voas, R. B. (2001). Defining binge drinking quantities through resulting blood alcohol concentrations. *Psychology of Addictive Behaviors*, *15*(4), 310—316.

Miller, W. R., & Rollnick, S. (2002). *Motivational interviewing: Preparing people for change* (2nd ed.). New York: Guilford Press.

National Institute on Alcohol Abuse and Alcoholism (NIAAA). *NIAAA council approves definition of binge drinking.* NIAAA Newsletter, No. 3, Winter 2004.

National Institute on Alcohol Abuse and Alcoholism (NIAAA), (2010). Retrieved December 16, 2010, from http://www.niaaa.nih.gov/faqs/general-english/Pages/default.aspx#safe_level

Neighbors, C., Larimer, M. E., & Lewis, M. A. (2004). Targeting misconceptions of descriptive drinking norms: Efficacy of a computer-delivered personalized feedback intervention. *Journal of Consulting and Clinical Psychology*, *72*(3), 434—437.

O'Connor, R. M., & Colder, C. R. (2005). Predicting alcohol patterns in first-year college students through motivational systems and reasons for drinking. *Psychology of Addictive Behaviors*, *19*(1), 10—20.

Seal, K. H., Bertenthal, D., Miner, C. R., Sen, S., & Marmar, C. (2007). Bringing the war back home. Mental health disorders among 103 788 US Veterans returning from Iraq and Afghanistan seen at Department of Veterans Affairs Facilities. *Archives of Internal Medicine*, *167*(12), 476—482.

Squires, D. D., & Hester, R. K. (2002). Development of a computer-based, brief intervention for drinkers: The increasing role for computers in the assessment and treatment of addictive behaviors. *The Behavior Therapist*, *25*(3), 59—65.

Squires, D. D., & Hester, R. K. (2004). Using technical innovations in clinical practice: The drinker's check-up software program. *Journal of Clinical Psychology/In session*, *60*, 159—169.

Substance Abuse and Mental Health Services Administration (SAMHSA), Office of Applied Studies (2008). *Results from the 2007 National Survey on Drug Use and Health: National Findings (NSDUH Series H-34, DHHS Publication No. SMA 08-4343).* Rockville, MD.

Timko, C., Sutkowi, A., Pavao, J., & Kimerling, R. (2008). Women's childhood and adult adverse experiences, mental health, and binge drinking: The California Women's Health Survey. *Substance Abuse Treatment, Prevention, and Policy*, *3*, 15.

Widmark, E. M. P. (1981). *Principles and applications of medico legal alcohol determination. English translation of the 1932 German edition with permission of Urban Schwarzenberg.* Biomedical Publications: Davis.

Williams, J., Herman-Stahl, M., Calvin, S. L., Pemberton, M., & Bradshaw, M. (2009). Mediating mechanisms of military web-based alcohol intervention. *Drug and Alcohol Dependence*, *100*, 248—257.

Woolard, R., Kenna, G., Longabaugh, R., Karolczuk, K., Nirenberg, T., Minugh, A., et al. (2004). Alcohol assessment validity and reliability of (SIP-ER) *Short Index of Problems*. *Academic Emergency Medicine*, *11*(5), 546.