



Association of belief in the "firewater myth" with strategies to avoid alcohol consequences among American Indian and Alaska Native college students who drink

Author: Vivian M. Gonzalez & Monica C. Skewes

This article may not exactly replicate the final version published in the APA journal. It is not the copy of record. The final version of record was published in [Psychology of Addictive Behaviors](#) and can be found at <https://dx.doi.org/10.1037/adb0000367>.

Gonzalez, Vivian M. , and Monica C. Skewes. "Association of belief in the "firewater myth" with strategies to avoid alcohol consequences among American Indian and Alaska Native college students who drink." *Psychology of Addictive Behaviors* 32, no. 4 (May 2018): 1-9. DOI:10.1037/adb0000367.

Made available through Montana State University's [ScholarWorks](#)
scholarworks.montana.edu



Association of Belief in the “Firewater Myth” with Strategies to Avoid Alcohol Consequences Among American Indian and Alaska Native College Students Who Drink

Vivian M. Gonzalez and

Department of Psychology, University of Alaska Anchorage

Monica C. Skewes

Department of Psychology, Montana State University

Abstract

Belief in an American Indian/Alaska Native (AI/AN) specific biological vulnerability (BV) to alcohol problems (aka the “*firewater myth*”) is associated with worse alcohol outcomes among AI/AN college students who drink, despite also being associated with greater attempts to reduce drinking. The current study examined how belief in a BV may have affected how 157 AI/AN college students who drink (a) attempted to moderate their alcohol use and avoid alcohol-related problems using abstinence-based and harm reduction strategies, and (b) attitudes toward these strategies as a means of addressing alcohol problems. Contrary to our hypotheses, belief in a BV was not found to be associated with use of harm reduction strategies or with how effective students believed these strategies to be. However, greater belief in a BV was associated with lower self-efficacy for the use of harm reduction strategies among more frequent heavy episodic drinkers. This is concerning, as the use of harm reduction strategies was associated with less frequent heavy episodic drinking in this sample. In contrast, belief in a BV was positively associated with the use of abstinence-based strategies and with how effective these strategies were perceived to be. However, for individuals with average or greater belief in a BV, abstinence-based strategies were associated with greater alcohol consequences. The results suggest that for AI/AN students who drink, belief in a BV may be influencing the strategies used to moderate alcohol use and avoid alcohol-related harm, as well as attitudes toward these strategies, in ways that do not appear helpful.

Keywords

American Indian; Alaska Native; abstinence; stereotype; protective behavioral strategies

American Indians and Alaska Natives (AI/ANs) have high rates of abstinence from alcohol relative to non-AI/ANs (Cunningham, Solomon, & Muramoto, 2016); however, there is also evidence of higher rates of severe alcohol use disorders, as well as greater alcohol-related morbidity and mortality for AI/ANs (Centers for Disease Control and Prevention, 2008;

Grant et al., 2015; Vaeth, Wang-Schweig, & Caetano, 2017; Whitesell, Beals, Crow, Mitchell, & Novins, 2012). Although there are a number of hypothesized mechanisms explaining these alcohol-related health disparities, including historical trauma (e.g., Brave Heart, 2003), more research is needed to better understand risk and protective factors, as well as how best to intervene.

Alcohol use and harm reduction among college students

Although few studies have focused on AI/AN college students, in a survey conducted in Alaska, AI/AN students reported greater alcohol-related consequences than non-AI/ANs (Skewes & Blume, 2015). This is particularly concerning as college students have markedly high rates of heavy drinking, serious alcohol consequences, and alcohol use disorders (Courtney & Polich, 2009; Hingson, Zha, & Weitzman, 2009; Hingson & White, 2014). Fortunately, there are effective interventions that help students reduce their alcohol use and consequences, including harm reduction interventions (Fachini, Aliane, Martinez, & Furtado, 2012).

Harm reduction is a public health approach that focuses on changing unsafe drinking behaviors and reducing alcohol consequences without requiring abstinence (Larimer et al., 1998; Marlatt & Witkiewitz, 2002). This approach is particularly useful in a college population, as many students who drink are likely not motivated to be abstinent. In a study with college students, emerging adults who were hazardous drinkers reported more positive attitudes toward harm reduction compared to abstinence-focused intervention strategies (Skewes & Gonzalez, 2013), and existing harm reduction interventions for college student drinking have demonstrated effectiveness (Fachini et al., 2012). However, AI/AN people have not been adequately represented in clinical trials of these treatments, nor have they been represented in the research or theory underlying these interventions. AI/AN peoples' history with alcohol, and the alcohol-related stigma and stereotypes that developed as this history unfolded, may affect AI/AN students' attitudes toward alcohol interventions. These attitudes, in turn, may affect the success of harm reduction interventions targeted at AI/AN college students who drink.

AI/AN history with alcohol and attitudes toward drinking

Alcohol use was very limited among AI/ANs prior to colonization (Abbott, 1996; Beauvais, 1998). Its use was facilitated and encouraged by European settlers to provide an upper hand in negotiations (Beauvais, 1998), leading to alcohol problems and stereotypes regarding AI/ANs and alcohol (Mail, 2002). The notion that AI/ANs were biologically different from Europeans in regard to their physiological response to alcohol and vulnerability to alcohol problems resulted in a law prohibiting the sale of liquor to AI/AN peoples, which was in effect from 1832 to 1953 (Kovas, McFarland, Landen, Lopez, & May, 2008). Although different tribal groups had different initial experiences with alcohol, all share a painful history of colonization (Whitbeck et al., 2004). As alcohol was used as a tool of colonization, it is not surprising that many AI/ANs have negative attitudes toward alcohol, as well as favorable views of abstinence.

Rates of abstinence are high among AI/ANs (Cunningham et al., 2016), and many tribes have chosen to implement stricter alcohol control policies than those adopted by their respective state laws (Berman, Hull, & May, 2000; Kovas et al., 2008). In addition to prohibition as an indicator of attitudes toward alcohol, there is also direct evidence of negative attitudes toward alcohol, even among AI/ANs who drink (Yuan et al., 2010). For example, in a study conducted with Navajo participants, having even one drink was seen as “a bad thing to do” by the majority of both non-drinkers and drinkers (May & Smith, 1988). Further, the majority of participants agreed that American Indians have a unique physical weakness to alcohol, and 94% agreed that “Indians have a problem with alcohol.” These negative attitudes may stem from concerns regarding alcohol-related consequences, stereotypes regarding AI/ANs and alcohol, or belief in an AI/AN vulnerability to alcohol problems (Daisy, Thomas, & Worley, 1998).

Belief in a biological vulnerability

The “*firewater myth*” is a term that has been used to represent the notion that AI/ANs are more susceptible to the effects of alcohol and more vulnerable to alcohol problems due to biological or genetic differences (La Marr, 2003; Leland, 1976; Mail & Johnson, 1993; Schaefer, 1981). Although genetics play a clear role in the risk for an alcohol use disorder (Köhnke, 2008), there is little evidence that biological risk factors play a *greater* role in alcohol use disorders among AI/ANs compared to other racial groups (Ehlers & Gizer, 2013; Ehlers, Liang, & Gizer, 2012; Garcia-Andrade, Wall, & Ehlers, 1997; Gizer, Edenberg, Gilder, Wilhelmsen, & Ehlers, 2011; Mail & Johnson, 1993). Still, many believe that a biological vulnerability (BV) to alcohol problems is responsible for alcohol-related health disparities affecting AI/AN communities, and this belief has important implications for alcohol attitudes and drinking behavior among AI/ANs.

Like the disease model of alcoholism, the idea of a BV attributes alcohol misuse to factors that are internal, global, and stable, which may foster hopelessness regarding one’s ability to control one’s drinking (Walters, 2002). Consistent with this notion, in a prior study with AI/ANs who drink, we found that belief in a BV was associated with lower self-efficacy to resist drinking heavily (Gonzalez & Skewes, 2016). As self-efficacy is a significant predictor of controlled drinking (Oei, Fergusson, & Lee, 1998; Oei & Morawska, 2004), this finding has important implications for harm reduction interventions in AI/AN populations. Further, while belief in a BV was associated with greater efforts to control drinking, it also was associated with greater heavy episodic drinking, alcohol consequences, and guilt for consuming even small amounts of alcohol. These findings are consistent with the drinking restraint model, which suggests a cycle of attempts to control drinking and lapses in this control in the form of excessive drinking (Bensley, 1991; Southwick Bensley, 1989). This cycle can be attributed to the *limit violation effect*, which occurs when self-imposed drinking limits are exceeded, resulting in negative affect, which then triggers more drinking (Collins, 1993; Muraven, Collins, Morsheimer, Shiffman, & Paty, 2005a; Muraven, Collins, Morsheimer, Shiffman, & Paty, 2005b). Belief in a BV may exacerbate these harmful drinking patterns among people who are not motivated to be abstinent, as is the case for many college student drinkers.

Current study

We previously found that belief in a BV to alcohol problems was associated with greater alcohol consumption and consequences among non-abstinent AI/AN college students (Gonzalez & Skewes, 2016), despite also being associated with greater attempts to control drinking. The current study sought to examine potential moderators of these effects in the same sample. Specifically, we examined how belief in a BV was associated with (a) the use of harm reduction strategies (HRS) and abstinence-based strategies (ABS) to avoid alcohol-related consequences; (b) the effectiveness of these strategies in reducing alcohol use and consequences; and (c) students' attitudes toward these strategies, including perceived effectiveness and self-efficacy for their use. We hypothesized that in addition to being associated with lower self-efficacy to use harm reduction strategies, belief in a BV would be associated with less use of HRS, which are likely deemed ineffective for a disease-based attribution like the notion of a BV. We hypothesized that instead of using HRS (also known in the literature as protective behavioral strategies) as a means of avoiding alcohol-related harm, AI/AN students with greater belief in a BV would make more attempts to establish abstinence as a means of avoiding alcohol-related harm. We further hypothesized that among those with greater belief in a BV (a) there would be an attenuation of any benefits associated HRS use and (b) that ABS use would be associated with greater heavy episodic drinking and alcohol consequences, consistent with an abstinence violation effect.

Method

Participants

Data for the current study were drawn from a larger study on factors affecting non-abstinent AI/AN students' attitudes toward abstinence and harm reduction alcohol interventions (Gonzalez & Skewes, 2016). Participants were 157 Alaska Native or American Indian women (70.1%, $n = 110$) and men (29.9%, $n = 47$) attending one of two large, open enrollment universities in different regions of Alaska (campus A, $n = 119$; campus B, $n = 38$). Approximately 81% of participants reported being Alaska Native, 16% reported being American Indian, and 3% reported being both Alaska Native and American Indian. Participants' mean age was 27.11 years ($SD = 9.16$), with a range from 18 to 61 years of age; 72.6% of the sample was under 30 years old. Although the age range in this sample was higher than the typical mean age for a U.S. college student sample, it was representative of the average age for college students in Alaska. The majority (73.2%) were full-time students.

Procedures

The study protocol was approved by the Institutional Review Boards of both universities where the study was conducted. Participants were recruited via email solicitations, fliers, in-class announcements, and advertisements in the school newspapers. Advertisements directed potential participants to a webpage that screened for eligibility. Inclusion criteria included self-identifying as (a) AI/AN; (b) a college student; (c) age 18 or older; and (d) a current drinker, defined as having consumed one or more standard alcoholic drinks in the 30 days prior to screening. Eligible individuals were scheduled for a single in-person data collection

session on their respective campus, where study materials were presented in random order on laptop computers. Participants were compensated with a \$25 Visa gift card for their time.

Measures

Attitudes toward and use of harm reduction and abstinence-based strategies

—The Treatment Attitudes Scale (TAS; Skewes & Gonzalez, 2013) consists of 46 items assessing participants' attitudes toward techniques that primarily are associated with either harm reduction or abstinence-based alcohol interventions. Examples of abstinence-based items include: "Completely stay away from things that remind you of drinking," and "Completely avoid people who drink." The harm reduction items include strategies used in a well-supported harm reduction intervention for college students (BASICS; Dimeff et al., 1999) and other similar interventions (e.g., "When you drink, try and space your drinks out").

When completing the TAS participants are first provided with the following directions: "There are many ways to manage problematic alcohol use. Imagine that you have an alcohol problem. Below are different types of things that you could do to try to change your problem. Rate how effective you think each strategy would be if you had an alcohol problem." Items are rated for perceived effectiveness on a five-point scale from 1 (*not at all likely to be effective*) to 5 (*very likely to be effective*). Next, participants are instructed to rate the same 46 items in regard to their own self-efficacy to utilize each strategy on a five-point scale from 1 (*not at all confident*) to 5 (*extremely confident*).

The Use of Intervention Techniques Scale (UITs) is a companion instrument to the TAS that was created to assess participants' actual use of ABS and HRS. Items are identical to the TAS; however, participants are instructed to consider how they currently drink and asked to rate how often they use each strategy to avoid drinking too much or having negative consequences associated with their drinking. Items are rated from 1 (*I never use this strategy*) to 5 (*I almost always use this strategy*).

For this study, in order to ensure equivalence in the subscales, exploratory factor analyses using principal axis factor extraction with oblimin (oblique) rotation were conducted separately for TAS effectiveness, TAS self-efficacy, and UITs items. Scree plots suggested two or three factor solutions. However, the two factor solution representing ABS and HRS produced the best simple structure across all three scales; therefore, a two-factor model was retained (see Supplemental Table 1 for factor loadings across scales). Items with cross loadings (i.e., factor loadings of .32 or higher on both factors; Costello & Osborne, 2005) or loadings below .36 across the three scales were eliminated. One item with a loading below the cut-off was retained (item 1, see Supplemental Table 1) to allow for direct comparison between the HRS and ABS subscales across the UITs and TAS. This resulted in 18 ABS items and 16 HRS items for each subscale. For the TAS effectiveness subscale, ABS factor loadings ranged from .84 to .37 (coefficient alpha = .92), and HRS factor loadings ranged from .79 to .37 (coefficient alpha = .89). For the TAS self-efficacy subscale, ABS factor loadings ranged from .88 to .44 (coefficient alpha = .93) and HRS factor loadings ranged from .79 to .41 (coefficient alpha = .89). For the UITs, ABS factor loadings ranged from .89

to .38 (coefficient alpha = .94) and HRS factor loadings ranged from .76 to .41 (with the factor loading of .30 noted above as the only exception; coefficient alpha = .88).

Alcohol use—Frequency of heavy episodic drinking was measured using two items modified from the National Institute of Alcohol Abuse and Alcoholism's (NIAAA) alcohol consumption question set (Gonzalez, Reynolds, & Skewes, 2011; NIAAA, 2003). First, participants were provided with a handout that defined and depicted a standard drink (e.g., 12 oz. of beer, 5 oz. of wine, 8 to 9 oz. of malt liquor, or 1.5 oz. of 80-proof liquor). Participants then were asked to report the number of days on which they engaged in heavy episodic drinking (i.e., ≥ 4 standard drinks for a female or ≥ 5 standard drinks for a male on one occasion or sitting) during a typical month in the past year, with separate questions inquiring about drinking in social and in solitary contexts. Responses were summed to represent frequency of heavy episodic drinking during a typical month in the past year, regardless of context.

Alcohol consequences—The Young Adult Alcohol Consequences Questionnaire (YAACQ; Read, Kahler, Strong, & Colder, 2006) is a 48-item self-report inventory of problems associated with alcohol use. Items are rated dichotomously as present (1) or absent (0) in the past year, and summed to yield a total score representing past-year alcohol consequences. The YAACQ has demonstrated high test-retest reliability, as well as good convergent, concurrent, and predictive validity with college students (Kahler, Strong, & Read, 2005; Read, Merrill, Kahler, & Strong, 2007). In this sample, the alpha coefficient for the total scale was .96.

Belief in an AI/AN biological vulnerability to alcohol problems—The Revised Firewater Myth Scale (RFMS; Gonzalez & Skewes, 2016) includes a total of 14 items that refer to beliefs about AI/ANs embedded among 21 distractor items that refer to other ethnic or racial groups (e.g., African American, Hispanic, White/European American). These distractor items capitalize on common American stereotypes regarding alcohol and other ethnic groups (for example, alcohol problems among people of Irish descent), as well as items that are accurate based on epidemiological surveys (e.g., higher rates of abstinence among African Americans, lower rates of drinking problems among Asian Americans). For this study, the RFMS biological vulnerability (BV) subscale was used to measure belief in an AI/AN specific BV to alcohol problems. This subscale consists of nine items rated from 1 (*strongly agree*) to 6 (*strongly disagree*). Example items include: "Alaska Natives and American Indians are more likely to have a genetic vulnerability to problems with alcohol," and "Alaska Natives and American Indians metabolize alcohol differently than non-Native people." After appropriate reverse scoring, items are summed to yield a total score, with higher scores indicating greater belief in an AI/AN BV to alcohol problems. Cronbach's alpha for this scale was .85.

Analyses

Prior to analyses, data were screened following the procedures outlined in Tabachnick and Fidell (2014). In order to approximate a normal distribution and reduce the influence of outliers, heavy episodic drinking and use of ABS scores were square-root transformed. Two

invariant responders and three multivariate outliers on the measures used in the current study were eliminated, resulting in the final sample of 157. Missing data were minimal, ranging from 0% to 3.2% across measures, and were the result of computer or administration errors rather than owing to participants choosing to omit ratings. Given both of these factors, we chose to use pairwise deletion for missing data. Sample size across analyses ranged from 150 to 155.

A repeated measures analysis of covariance (ANCOVA) was used to examine which strategy type AI/AN students utilized most frequently, based on mean scores on the ABS and HRS subscales of the UITS. Then, to examine the association of strategy use with alcohol consumption, a negative binomial regression was conducted with frequency of heavy episodic drinking as the dependent variable. For this count regression, the raw, untransformed heavy episodic drinking variable was used. Age, gender, and campus were included as covariates in the model, along with mean centered ABS use and HRS use. In order to examine whether belief in a BV interacted with strategy type when heavy episodic drinking was the outcome variable, mean centered belief in a BV was included in the model, along with interaction terms for belief in a BV by HRS use and belief in a BV by ABS use. Interaction terms for this analysis, as well as those described below, were the cross-products of the appropriate mean centered variables. Significant interactions were probed at one standard deviation above and below the mean on the moderator variable.

To examine whether belief in a BV moderated the association of either ABS or HRS use with alcohol consequences, separate hierarchical multiple regressions were conducted for each strategy. In both models predicting alcohol consequences, age, gender, and campus were entered in the first step. Mean centered heavy episodic drinking (HED), belief in a BV, and strategy (HRS or ABS) utilization were entered into the second step. In the third step, the following two-way interactions were included: $BV \times HED$, $BV \times Strategy$, and $Strategy \times HED$.

Finally, to examine whether belief in a BV was associated with attitudes toward strategy type, four separate hierarchical multiple regressions were conducted using TAS mean scores for perceived effectiveness of ABS, perceived effectiveness of HRS, self-efficacy for using ABS, and self-efficacy for using HRS as the dependent variables. Demographic and campus variables were included in the first step of the analyses, followed by mean centered belief in a BV and frequency of heavy episodic drinking in the second step, and an interaction term for $BV \times HED$ in the third step.

Results

Descriptive information

Means, standard deviations, and intercorrelation of the study variables are presented in Table 1. Belief in a BV was normally distributed and 50.3% endorsed belief in a BV with a mean score of “slight agreement” (4) or higher. Mean frequency of monthly heavy episodic drinking was 4.37 ($SD = 5.96$). In this sample, 22.6% reported no heavy drinking episodes in the past 30 days, 30.3% reported one or two episodes, 14.2% reported three or four episodes,

13.5% reported five or six episodes, and 11.6% reported between seven and 12 episodes, and 7.7% reported 13 or more episodes.

Use of strategies to avoid alcohol problems

Use of ABS and HRS—Participants reported significantly more frequent use of HRS ($M = 3.14$, $SD = .81$) than ABS ($M = 1.99$, $SD = .82$; $F(1, 151) = 12.31$, $p < .001$, $\eta^2 = .08$). Use of ABS and HRS showed a moderate correlation ($r = .35$, $p < .001$), suggesting participants' use of these strategies were not mutually exclusive.

In the multiple regression analysis examining use of ABS, only greater belief in a BV was significantly associated with greater use of ABS ($\beta = .18$, $p = .039$, $f^2 = .03$). However, in the analysis examining use of HRS, belief in a BV was not found to be associated with use of HRS ($\beta = -.03$, $p = .669$, $f^2 = .001$). Of the covariates, only gender showed a significant effect, with women reporting more HRS use than men ($\beta = .33$, $p < .001$, $f^2 = .12$).

Association of ABS and HRS use with alcohol consumption—In the negative binomial regression analysis examining the simultaneous association of ABS and HRS with alcohol consumption, use of HRS was negatively associated heavy episodic drinking (incidence rate ratio [IRR] = .70, $p = .018$). As a participant's mean use of harm reduction strategies increased by one point, their rate of heavy episodic drinking decreased by approximately 30%. In contrast, no significant association was found between use of ABS and heavy episodic drinking (IRR = 1.45, $p = .333$). With regard to model covariates, neither age, gender, nor campus were found to be significantly associated with heavy episodic drinking. Belief in a BV was positively associated with frequency of heavy episodic drinking (IRR = 1.25, $p = .016$), but no significant interaction was found between belief in a BV and use of either ABS (IRR = 1.73, $p = .077$) or HRS (IRR = 1.15, $p = .287$). This suggests that belief in a BV did not influence the association of either strategy type with heavy episodic drinking.

Association of strategies and belief in a BV with alcohol consequences—A multiple regression analysis was conducted to examine the association of heavy episodic drinking, belief in a BV, and the use of ABS with alcohol consequences. This analysis also examined whether these variables interacted to affect alcohol consequences (see Table 2). Beyond the strong association of heavy episodic drinking with alcohol consequences, there was a significant interaction of ABS with heavy episodic drinking. A probe of this interaction revealed that as use of ABS for avoiding alcohol problems increased from low ($\beta = .39$, $p < .001$), to average ($\beta = .58$, $p < .001$), to high ($\beta = .77$, $p < .001$), so did the association of heavy episodic drinking with alcohol consequences (see Figure 1). Further, greater belief in a BV was associated with a stronger association between the use of ABS and alcohol consequences (see Figure 2). A probe of this interaction revealed that for individuals low in belief in a BV, there was no significant association found between the use of ABS and experiencing alcohol consequences ($\beta = .04$, $p = .517$). However, for individuals with an average ($\beta = .19$, $p = .001$) or a high belief in a BV ($\beta = .35$, $p < .001$), more use of ABS was associated with greater alcohol consequences.

In the multiple regression analysis examining the effect of HRS, heavy episodic drinking, and belief in a BV on alcohol use consequences, the use of HRS was not found to be significantly associated with alcohol consequences ($\beta = .03, p = .639, f^2 = .002$). The interaction term for HRS and heavy episodic drinking suggests a small association, but it did not reach statistical significance ($\beta = -.12, p = .093, f^2 = .03$). Belief in a BV was significantly associated with alcohol consequences, as previously shown in the ABS analysis; however, it did not moderate the associations of HRS use ($\beta = -.12, p = .840, f^2 = .005$) or heavy episodic drinking ($\beta = .04, p = .581, f^2 = .003$) with alcohol consequences.

Perceived effectiveness of ABS and HRS

Greater belief in a biological vulnerability was associated with rating ABS to be more effective ($\beta = .29, p < .001, f^2 = .09$). In contrast, more frequent heavy episodic drinking was associated with rating ABS as less effective ($\beta = -.21, p = .010, f^2 = .05$). Although there was a small association, the interaction of biological vulnerability with heavy episodic drinking ($\beta = .14, p = .084, f^2 = .02$) or for model covariates was not statistically significant.

Contrary to our hypothesis, belief in a biological vulnerability was not found to be significantly associated with participants' ratings of the effectiveness of HRS ($\beta = -.01, p = .890, f^2 < .001$). Likewise, heavy episodic drinking ($\beta = -.04, p = .637, f^2 = .001$), the interaction of biological vulnerability with heavy episodic drinking ($\beta = -.05, p = .597, f^2 = .002$), and model covariates were not found to be significant.

Self-efficacy for use of ABS and HRS

In the multiple regression analysis examining self-efficacy for ABS, only age was significant, with older participants having greater self-efficacy for the use of ABS ($\beta = .17, p = .044, f^2 = .03$). However, significance was not found for other model covariates, belief in a BV ($\beta = .12, p = .154, f^2 = .02$), heavy episodic drinking ($\beta = -.09, p = .294, f^2 = .01$), or the interaction of BV with heavy episodic drinking ($\beta = .09, p = .263, f^2 = .01$).

In the multiple regression analysis examining self-efficacy for HRS, women reported greater self-efficacy than men ($\beta = .16, p = .046, f^2 = .03$), and greater frequency of heavy episodic drinking was associated with lower self-efficacy for HRS ($\beta = -.18, p = .037, f^2 = .03$). There was no significant main effect found for belief in a BV and self-efficacy for HRS ($\beta = -.08, p = .323, f^2 = .007$). However, there was a significant interaction between belief in a BV and heavy episodic drinking ($\beta = -.18, p = .031, f^2 = .04$). A probe of this interaction revealed that for individuals with greater frequency of heavy episodic drinking, greater belief in a BV was associated with lower self-efficacy for the use of HRS ($\beta = -.27, p = .024$). However, there was no significant association found between belief in a BV and self-efficacy for the use of HRS for individuals with low ($\beta = .08, p = .457$) or average ($\beta = -.10, p = .245$) frequency of heavy episodic drinking.

Discussion

The current study examined the influence of belief in a BV on the use and effectiveness of harm reduction and abstinence-based strategies for avoiding alcohol problems, as well as attitudes toward these strategies. Contrary to our hypotheses, belief in a BV was not found to

be significantly associated with use of HRS or with how effective students believed HRS to be in helping one to overcome problems with alcohol. However, as hypothesized, there was a small association between belief in a BV and lower self-efficacy for using HRS. Specifically, for students with greater frequency of heavy episodic drinking, greater belief in a BV was associated with lower self-efficacy for using HRS. This is consistent with our previous finding that belief in a BV was associated with lower self-efficacy to resist drinking heavily in tempting situations (Gonzalez & Skewes, 2016), but extends this finding to suggest that this belief may be specifically undermining self-efficacy to use HRS, which include moderation strategies that would aid in the avoidance of heavy drinking. This is concerning as the use of HRS appeared to be helpful in this sample, with greater HRS use associated with less frequent heavy episodic drinking.

Consistent with our hypotheses, the findings suggest that belief in a BV may be influencing the use of ABS. Small associations were found between greater belief in a BV and greater use of ABS, as well as perceiving ABS to be more effective. However, use of ABS did not appear to be effective in helping to reduce alcohol consequences in this sample. In fact, greater use of ABS was associated with greater alcohol consequences, and the association between heavy drinking and alcohol consequences was stronger for students who endorsed greater use of ABS; these associations demonstrated moderate effect sizes. However, the association of ABS use with alcohol consequences was only found among those with average or high belief in a BV and was not found among those low in belief in a BV. Thus, belief in a BV appeared to be influential in the use of ABS, as well as potentially being associated with worse alcohol consequences when ABS were used. It is noteworthy that BV was not rare in this sample, with slightly more than half of the sample agreeing that AI/AN people have a BV.

In terms of self-efficacy for ABS, the only significant predictor was age, with older students indicating somewhat greater self-efficacy. While belief in a BV appeared to undermine self-efficacy for HRS, it was not found to be associated with self-efficacy for ABS. In a previous study with a general student sample, hazardous drinkers had significantly lower self-efficacy for ABS compared to non-hazardous drinkers (Skewes & Gonzalez, 2013), but we did not find the same pattern of results in this AI/AN student sample. It may be that the high rates of abstinence among AI/AN students (Skewes & Blume, 2015) reflect a social and environmental context that makes abstinence-based strategies more tenable for AI/AN students than for college students in general. Although the results of this study raise concern regarding whether ABS strategy use among AI/AN students who are not abstinent are potentially harmful when coupled with belief in a BV.

Theory suggests an explanation for the pattern of results shown in this research. The findings are consistent with the drinking restraint model and the limit/abstinence violation effect (Marlatt, 1985). It is unclear whether participants in this study who used ABS and believed in a BV were actually committed to establishing or maintaining abstinence, as opposed to feeling that they *should* be abstinent given their perceived vulnerability to alcohol problems, and therefore used these strategies intermittently. This potential intermittent or inconsistent use of ABS can be inferred given that all participants in this study were non-abstinent. Further studies are needed to more directly examine the limit or

abstinence violation effect among AI/AN students who drink, including whether greater belief in a BV leads to greater negative affect or shame associated with normative college drinking and greater subsequent drinking as a result, perhaps followed by a renewed effort at abstinence.

Although ABS are indicated for hazardous drinkers who wish to achieve or maintain abstinence, ABS are unlikely to be successful as a means of avoiding alcohol-related harm among individuals who do drink, and may encourage a pattern of general abstinence punctuated by heavy drinking episodes. Use of ABS in this study was not found to be associated with alcohol consumption, suggesting that there was no positive net effect of using these strategies among non-abstinent students. Theory suggests that harm reduction or moderation management strategies should be more effective as a means of avoiding harm among active drinkers. Belief in a BV may influence drinking goals and how AI/AN students attempt to go about achieving these goals in a way that is counterproductive for avoiding alcohol-related harm and moderating drinking. Thus, addressing belief in a BV, as well how this belief may influence strategies used to change one's drinking behavior, may be particularly important for prevention and treatment efforts. Related to this issue, aiding students in clarifying their drinking goals and how they go about achieving these goals would be beneficial.

There are a number of limitations that should be considered when interpreting the results of this study. This study was limited to AI/AN college students in Alaska, the majority of whom were Alaska Native, who were not abstinent from alcohol. It may be that belief in a BV is protective for students who are successful at achieving abstinence. It also is unknown whether these findings would generalize to AI/ANs who are not college students, or to AI/AN students in other parts of the country. Further, women were overrepresented in the sample, although it should be noted that AI/AN women (64%) outnumber men (36%) at the institutions where the study was conducted. Another important limitation of this study was the cross-sectional design. Future studies are needed to examine the issue of directionality using a prospective research design. It is possible that having greater alcohol problems led to greater belief in a BV and greater use of ABS as a result. A longitudinal, within-subjects design may reveal that the use of ABS is beneficial despite the between-group results found in this study.

Additionally, as the present research is grounded in the research literature and methods of Western psychology, it may be missing important factors that should be considered in future intervention trials targeted at AI/AN drinkers. For example, future studies should measure historical trauma and examine its unique influence on alcohol treatment attitudes and on drinking behavior. Also, the collectivist nature of AI/AN cultures may play an important role in drinking and other health behaviors. As such, future research is needed to examine attitudes and behaviors not only among the individual but also among his or her social network, and even among the community in which the individual resides. Finally, the effects of the belief in the "firewater myth" on alcohol outcomes or methods used by AI/AN students to avoid alcohol-related consequences is a new area of study and replication of the current study's findings is needed.

In conclusion, the high rates of alcohol use disorder in the general population, and particularly among young adults (Grant et al., 2015), demonstrates that moderating drinking and avoiding alcohol-related harm is difficult for many. Our results suggest that for AI/AN students who drink, belief in a BV may be an added challenge that appears to influence strategies used to moderate alcohol use and avoid alcohol-related harm, as well as attitudes toward these strategies, in ways that do not appear helpful. Taken together, results from this study suggest that AI/AN students who are experiencing alcohol-related harm may benefit from culturally tailored interventions that address belief in a BV, facilitate self-efficacy for change, and provide options for effective strategies to avoid negative alcohol consequences, including harm reduction and moderation management.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

Acknowledgments

This research was supported by funds provided through the University of Alaska Anchorage Innovate Award to Vivian M. Gonzalez and Monica C. Skewes, as well as the National Institute of General Medical Sciences of the National Institutes of Health under Award Numbers 5P20GM104417-02 and U54GM115371. The content is solely the responsibility of the authors and does not necessarily represent the official views of the National Institutes of Health. Some of the content in this paper was presented by the authors at the 2017 meeting of the Research Society on Alcoholism.

We would like to thank members of our community advisory board who provided feedback and insights that aided in the interpretation of the findings, as well as providing feedback on this manuscript: Maria Crouch, Ali Marvin, and Tracy Stewart.

References

- Abbott PJ. American Indian and Alaska Native aboriginal use of alcohol in the United States. *American Indian and Alaska Native Mental Health Research*. 1996; 7(2):1–13.
- Beauvais F. American Indians and alcohol. *Alcohol Health & Research World*. 1998; 22(4):253–259.
- Bensley LS. Construct validity evidence for the interpretation of drinking restraint as a response conflict. *Addictive Behaviors*. 1991; 16(3–4):139–150. DOI: 10.1016/0306-4603(91)90006-4
- Berman M, Hull T, May P. Alcohol control and injury death in Alaska Native communities: Wet, damp and dry under Alaska's local option law. *Journal of Studies on Alcohol*. 2000; 61(2):311–319.
- Brave Heart MYH. The historical trauma response among Natives and its relationship with substance abuse: A Lakota illustration. *Journal of Psychoactive Drugs*. 2003; 35:7–13.
- Brave Heart MYH, Lewis-Fernandez R, Beals J, Hasin DS, Sugaya L, Wang S, Blanco C. Psychiatric disorders and mental health treatment in American Indians and Alaska Natives: Results of the national epidemiologic survey on alcohol and related conditions. *Social Psychiatry and Psychiatric Epidemiology*. 2016; 51(7):1033–1046. DOI: 10.1007/s00127-016-1225-4
- Centers for Disease Control Prevention (CDC). Alcohol-attributable deaths and years of potential life lost among American Indians and Alaska Natives--United States, 2001--2005. *MMWR. Morbidity and Mortality Weekly Report*. 2008; 57(34):938–941. mm5734a3 [pii].
- Collins RL. Drinking restraint and risk for alcohol abuse. *Experimental and Clinical Psychopharmacology*. 1993; 1(1–4):44–54. DOI: 10.1037/1064-1297.1.1-4.44
- Costello AB, Osborne JW. Best practices in exploratory factor analysis: Four recommendations for getting the most from your analysis. *Practical Assessment, Research, & Evaluation*. 2005; 10:1–9.
- Courtney KE, Polich J. Binge drinking in young adults: Data, definitions, and determinants. *Psychological Bulletin*. 2009; 135(1):142–156. DOI: 10.1037/a0014414

- Cunningham JK, Solomon TA, Muramoto ML. Alcohol use among Native Americans compared to Whites: Examining the veracity of the 'Native American elevated alcohol consumption' belief. *Drug and Alcohol Dependence*. 2016b; 160:65–75.
- Daisy, F., Thomas, LR., Worley, C. Alcohol use and harm reduction within the Native community. In: Marlatt, GA., Marlatt, GA., editors. *Harm reduction: Pragmatic strategies for managing high-risk behaviors*. New York, NY US: Guilford Press; 1998. p. 327-350.
- Dimeff, LA., Baer, JS., Kivlahan, DR., Marlatt, GA. Brief alcohol screening and intervention for college students (BASICS): A harm reduction approach. New York, NY US: Guilford Press; 1999.
- Ehlers CL, Gizer IR. Evidence for a genetic component for substance dependence in Native Americans. *The American Journal of Psychiatry*. 2013; 170(2):154–164. [doi]. DOI: 10.1176/appi.ajp.2012.12010113
- Ehlers CL, Liang T, Gizer IR. ADH and ALDH polymorphisms and alcohol dependence in Mexican and Native Americans. *The American Journal of Drug and Alcohol Abuse*. 2012; 38(5):389–394. DOI: 10.3109/00952990.2012.694526
- Fachini A, Aliane PP, Martinez EZ, Furtado EF. Efficacy of brief alcohol screening intervention for college students (BASICS): A meta-analysis of randomized controlled trials. *Substance Abuse Treatment, Prevention, and Policy*. 2012; 7 Article ID 40. doi: 10.1186/1747-597X-7-40
- Garcia-Andrade C, Wall TL, Ehlers CL. The firewater myth and response to alcohol in Mission Indians. *The American Journal of Psychiatry*. 1997; 154(7):983–988. DOI: 10.1176/ajp.154.7.983
- Gizer IR, Edenberg HJ, Gilder DA, Wilhelmsen KC, Ehlers CL. Association of alcohol dehydrogenase genes with alcohol-related phenotypes in a Native American community sample. *Alcoholism: Clinical and Experimental Research*. 2011; 35(11):2008–2018. DOI: 10.1111/j.1530-0277.2011.01552.x
- Gonzalez VM, Reynolds B, Skewes MC. Role of impulsivity in the relationship between depression and alcohol problems among emerging adult college drinkers. *Experimental and Clinical Psychopharmacology*. 2011; 19(4):303–313. DOI: 10.1037/a0022720
- Gonzalez VM, Skewes MC. Association of the firewater myth with drinking behavior among American Indian and Alaska Native college students. *Psychology of Addictive Behaviors*. 2016; 30(8):838–849. DOI: 10.1037/adb0000226
- Grant BF, Goldstein RB, Saha TD, Chou SP, Jung J, Zhang H, Hasin DS. Epidemiology of DSM-5 alcohol use disorder: Results from the National Epidemiologic Survey on Alcohol and Related Conditions III. *JAMA Psychiatry*. 2015; 72(8):757–766. DOI: 10.1001/jamapsychiatry.2015.0584
- Hingson RW, Zha W, Weitzman ER. Magnitude of and trends in alcohol-related mortality and morbidity among U.S. college students ages 18–24, 1998–2005. *Journal of Studies on Alcohol and Drugs*. 2009; (Supplement 16):12–20.
- Hingson R, White A. The burden of alcohol use: Excessive alcohol consumption and related consequences among college students. *Alcohol Research*. 2014; 35(2):201–218.
- Kahler CW, Strong DR, Read JP. Toward efficient and comprehensive measurement of the alcohol problems continuum in college students: The Brief Young Adult Alcohol Consequences Questionnaire. *Alcoholism: Clinical and Experimental Research*. 2005; 29(7):1180–1189. DOI: 10.1097/01.ALC.0000171940.95813.A5
- Knight JR, Wechsler H, Kuo M, Seibring M, Weitzman ER, Schuckit MA. Alcohol abuse and dependence among U.S. college students. *Journal of Studies on Alcohol*. 2002; 63(3):263–270.
- Köhnke, MD. Approach to the genetics of alcoholism: A review based on pathophysiology; *Biochemical Pharmacology*. 2008. p. 160-177. doi://dx.doi.org/10.1016/j.bcp.2007.06.021
- Kovas AE, McFarland BH, Landen MG, Lopez AL, May PA. Survey of American Indian alcohol statutes, 1975–2006: Evolving needs and future opportunities for tribal health. *Journal of Studies on Alcohol and Drugs*. 2008; 69(2):183–191.
- La Marr, CJ. doctoral dissertation. 2003. "Firewater myth": Fact, fantasy or self-fulfilling prophecy. Available from ProQuest Dissertations & Theses Global: The Sciences and Engineering Collection
- Larimer, ME., Marlatt, GA., Baer, JS., Quigley, LA., Blume, AW., Hawkins, EH. Harm reduction for alcohol problems: Expanding access to and acceptability of prevention and treatment services. In: Marlatt, GA., Marlatt, GA., editors. *Harm reduction: Pragmatic strategies for managing high-risk behaviors*. New York, NY: Guilford Press; 1998. p. 69-121.

- Leland, J. Firewater myths: North American Indian drinking and alcohol addiction. United States: Alcohol Research Documentation Inc; 1976.
- Mail PD, Johnson S. Boozing, sniffing, and toking: An overview of the past, present, and future of substance use by American Indians. *American Indian and Alaska Native Mental Health Research*. 1993; 5(2):1–33.
- Mail, PD. Multiple perspectives on alcohol and the American Indian. In: Mail, PD, Heurtin-Roberts, S. Martin, SE, Howard, J, Mail, PD, Heurtin-Roberts, S. Martin, SE., Howard, J., editors. *Alcohol use among American Indians: Multiple perspectives on a complex problem* (NIAAA research monograph no. 37). Bethesda, MD: National Institutes of Health, National Institute on Alcohol Abuse and Alcoholism; 2002. p. 3-23.
- Marlatt GA, Witkiewitz K. Harm reduction approaches to alcohol use: Health promotion, prevention, and treatment. *Addictive Behaviors*. 2002; 27(6):867–886. DOI: 10.1016/S0306-4603(02)00294-0
- May PA, Smith MB. Some Navajo Indian opinions about alcohol abuse and prohibition: A survey and recommendations for policy. *Journal of Studies on Alcohol*. 1988; 49(4):324–334.
- Muraven M, Collins RL, Morsheimer ET, Shiffman S, Paty JA. The morning after: Limit violations and the self-regulation of alcohol consumption. *Psychology of Addictive Behaviors*. 2005a; 19(3): 253–262. DOI: 10.1037/0893-164X.19.3.253
- Muraven M, Collins RL, Morsheimer ET, Shiffman S, Paty JA. One too many: Predicting future alcohol consumption following heavy drinking. *Experimental and Clinical Psychopharmacology*. 2005b; 13(2):127–136. DOI: 10.1037/1064-1297.13.2.127
- National Institute on Alcohol Abuse and Alcoholism. Task Force on Recommended Questions of the National Council on Alcohol Abuse and Alcoholism. Recommended Sets of Alcohol Consumption Questions. October 15–16.2003
- Oei TPS, Fergusson S, Lee NK. The differential role of alcohol expectancies and drinking refusal self-efficacy in problem and nonproblem drinkers. *Journal of Studies on Alcohol*. 1998; 59(6):704–711.
- Oei TPS, Morawska A. A cognitive model of binge drinking: The influence of alcohol expectancies and drinking refusal self-efficacy. *Addictive Behaviors*. 2004; 29(1):159–179. DOI: 10.1016/S0306-4603(03)00076-5
- Phinney JS, Ong AD. Conceptualization and measurement of ethnic identity: Current status and future directions. *Journal of Counseling Psychology*. 2007; 54(3):271–281. DOI: 10.1037/0022-0167.54.3.271
- Read JP, Kahler CW, Strong DR, Colder CR. Development and preliminary validation of the young adult alcohol consequences questionnaire. *Journal of Studies on Alcohol*. 2006; 67(1):169–177.
- Read JP, Merrill JE, Kahler CW, Strong DR. Predicting functional outcomes among college drinkers: Reliability and predictive validity of the young adult alcohol consequences questionnaire. *Addictive Behaviors*. 2007; 32(11):2597–2610. DOI: 10.1016/j.addbeh.2007.06.021
- Schaefer JM. Firewater myths revisited. reviewed of findings and some new directions. *Journal of Studies on Alcohol*. 1981; 9(Suppl):99–117.
- Skewes MC, Blume AW. Ethnic identity, drinking motives, and alcohol consequences among Alaska Native and non-Native college students. *Journal of Ethnicity in Substance Abuse*. 2015; 14(1):12–28. DOI: 10.1080/15332640.2014.958641
- Skewes MC, Gonzalez VM. Attitudes toward harm reduction and abstinence-only approaches to alcohol misuse among Alaskan college students. *International Journal of Circumpolar Health*. 2013; 72(1):21143–5. DOI: 10.3402/ijch.v72i0.21143
- Southwick Bensley L. The heightened role of external responsiveness in the alcohol consumption of restrained drinkers. *Cognitive Therapy and Research*. 1989; 13(6):623–636. DOI: 10.1007/BF01176072
- Tabachnick, BG., Fidell, LS. *Using multivariate statistics*. 6. Boston, MA: Allyn & Bacon; 2014.
- Vaeth PA, Wang-Schweig M, Caetano R. Drinking, alcohol use disorder, and treatment access and utilization among U.S. racial/ethnic groups. *Alcoholism: Clinical and Experimental Research*. 2017; 41(1):6–19. DOI: 10.1111/acer.13285
- Walters GD. Twelve reasons why we need to find alternatives to Alcoholics Anonymous. *Addictive Disorders & their Treatment*. 2002; 1(2):53–59. DOI: 10.1097/00132576-200206000-00003

- Whitbeck BL, Chen X, Hoyt DR, Adams GW. Discrimination, historical loss and enculturation: Culturally specific risk and resiliency factors for alcohol abuse among American Indians. *Journal of Studies on Alcohol and Drugs*. 2004; 65:409–418.
- Whitesell NR, Beals J, Crow CB, Mitchell CM, Novins DK. Epidemiology and etiology of substance use among American Indians and Alaska Natives: Risk, protection, and implications for prevention. *The American Journal of Drug and Alcohol Abuse*. 2012; 38(5):376–382. DOI: 10.3109/00952990.2012.694527
- Yuan NP, Eaves ER, Koss MP, Polacca M, Bletzer K, Goldman D. “Alcohol is something that been with us like a common cold”: Community perceptions of American Indian drinking. *Substance use & Misuse*. 2010; 45(12):1909–1929. DOI: 10.3109/10826081003682115

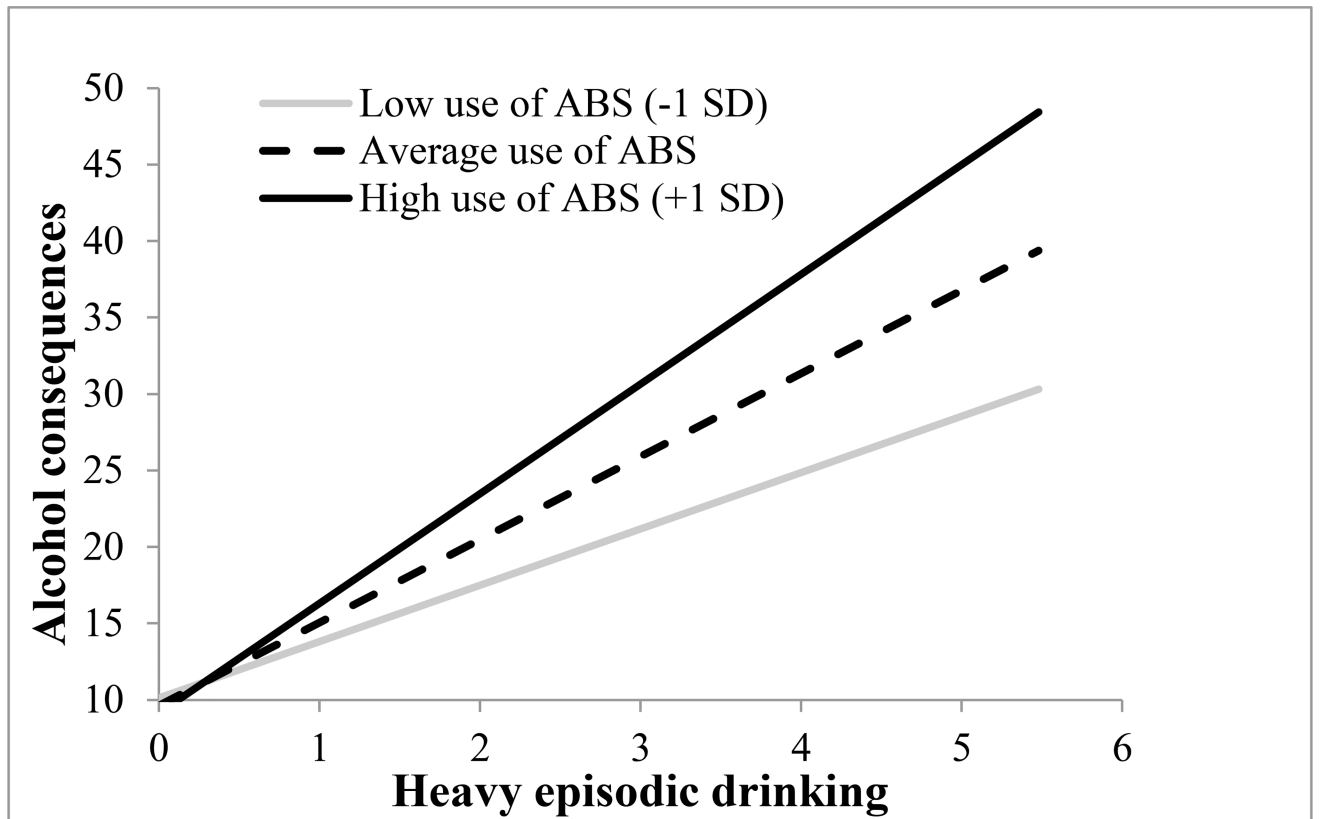


Figure 1. Relationship of heavy episodic drinking with alcohol consequences as a function of use of abstinence-based strategies (ABS). Heavy episodic drinking was square-root transformed prior to analyses.

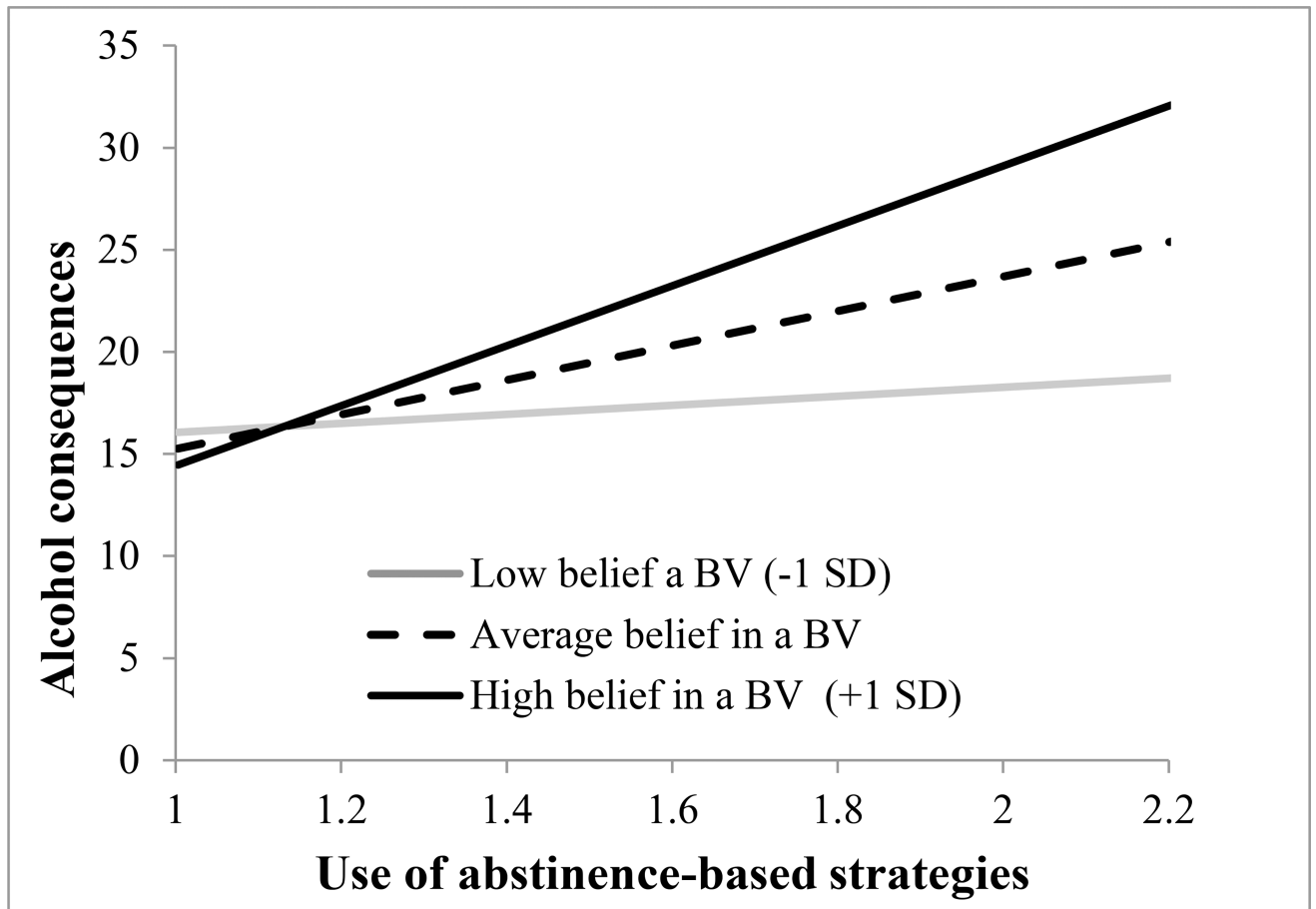


Figure 2. Relationship of use of abstinence-based strategies with alcohol consequences as a function of belief in an AI/AN biological vulnerability (BV) to alcohol problems. Use of abstinence-based strategies was square-root transformed prior to analyses.

Table 1

Means, Standard Deviations, and Intercorrelations of Study Variables

Variables	<i>M</i>	<i>SD</i>	1	2	3	4	5	6	7	8	9	10	11
1. Use of ABS ^a	1.99	.82	—										
2. Use of HRS	3.14	.81	.35***	—									
3. Perceived effectiveness ABS	3.56	.79	.32***	.05	—								
4. Perceived effectiveness HRS	3.66	.71	.02	.40***	.01	—							
5. Self-efficacy ABS	3.12	.85	.43***	-.07	.43***	-.11	—						
6. Self-efficacy HRS	3.64	.72	-.04	.31***	-.15	.53***	.20*	—					
7. Heavy episodic drinking/month ^a	4.37	5.96	.08	-.14	-.17*	-.03	-.08	-.20*	—				
8. Alcohol consequences	15.98	12.15	.24**	-.06	.00	.00	-.06	-.24**	.68***	—			
9. Belief in a BV	4.00	1.07	.15	-.09	.22**	-.03	.11	-.13	.19*	.30***	—		
10. Age	27.11	9.16	-.06	-.05	.11	-.11	.16**	.05	-.17*	-.13	.08	—	
11. Gender			.11	.35***	.06	.11	-.03	.16*	-.07	-.06	-.04	.00	—
12. Campus			-.04	-.04	-.08	-.01	-.02	-.01	-.05	-.01	.18*	.09	.04

Note: ABS = abstinence-based strategy. HRS = harm reduction strategy. BV = biological vulnerability. Gender was coded such that men = 0 and women = 1.

^aThis variable was transformed prior to analyses; however, the mean and standard deviation shown are for the untransformed variable.

* $p < .05$.

** $p < .01$.

*** $p < .001$.

Table 2

Multiple regression analysis predicting alcohol consequences from belief in a biological vulnerability to alcohol problems (i.e., the firewater myth), heavy episodic drinking, and the use of ABS to avoid alcohol consequences.

Predictor	R^2	β	f^2
Step 1	.02		
Age		-.14	.00
Gender		-.07	.02
Campus		.03	.00
Step 2	.49***		
Belief in a biological vulnerability		.16**	.05
Heavy episodic drinking		.63***	.81
Use of abstinence-based strategies		.16**	.06
Step 3	.05***		
BV \times HED		-.06	.01
ABS \times HED		.19**	.09
BV \times ABS		.16**	.06

Note: BV = biological vulnerability. HED = heavy episodic drinking. ABS = abstinence-based strategies. Gender was coded such that female = 1 and male = 0.

**
 $p < .01$.

 $p < .001$.