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Associations between a history of binge drinking during adolescence and self-reported responses to alcohol in young adult Native and Mexican Americans

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Abstract

BACKGROUND—Binge drinking during adolescence is common and may predict increased drinking in young adulthood and enhanced risk for alcohol dependence. Variation in level of response to the hedonic and adverse effects of alcohol is in part an inherited factor that may also influence its use, abuse and dependence. The present study investigated, in young adults, whether an association could be demonstrated between variation in self-reported responses to alcohol and a history of binge drinking during adolescence.

METHODS—Young adult (18–30 yrs, n=790) Native Americans and Mexican Americans were recruited from the community and completed a structured diagnostic interview. Response to alcohol was indexed using the expectation version of the Subjective High Assessment Scale (SHAS-E). An adolescent history of regular binge drinking was defined as drinking 5 or more drinks for boys and 4 or more drinks for girls per drinking occasion at least once a month during their highest drinking period prior to the age of 18.

RESULTS—An adolescent history of regular binge drinking was found to be associated with a lower level of self-reported responses to the negative aspects of alcohol intoxication (feeling terrible) as well as to the overall level of intoxication, but not to the positive impressions of intoxication (feeling great) on the SHAS-E. A history of regular adolescent binge drinking was also correlated with less feelings of the “terrible” and “total” effects of alcohol, as indexed by the SHAS-E, in a linear regression model that included several diagnostic and demographic variables such as a history of conduct disorder and current levels of drinking.

CONCLUSIONS—These data suggest that a history of adolescent binge drinking is associated with a reduction in the self-reported level of intoxication in young adulthood, a factor that could theoretically lead to increased risk for alcohol dependence.

Keywords

adolescence; alcohol; binge drinking; Native Americans; Mexican Americans

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INTRODUCTION

Recent data indicate that as many as 72% of high school seniors have tried alcohol at least once and nearly 30% have been drunk in the past 30 days (Johnston et al., 2009). There is also data to suggest that when adolescents and young adults drink, they consume larger amounts of alcohol than is typically seen in older adult drinkers and often report “binge drinking” (5 or more drinks for boys, 4 or more for girls per drinking occasion) (CDC, 2012; Patrick et al., 2013). Frequent binge drinking has been associated with an increase in health risk behaviors among high school students (Miller et al., 2007) as well as an increased risk for alcohol use disorders in adolescence and adulthood. Native American adolescents, in particular, have been shown to have the highest rate of past-month binge drinking when compared to a nationally representative sample of White and Mixed Race adolescents (Chen et al., 2012).

One reason binge drinking may be common in youth is that adolescents may be less sensitive to alcohol’s effects and thus need to drink more alcohol to obtain the desired subjective effects. Due to legal and ethical concerns, controlled laboratory studies aimed at directly investigating differences in sensitivity to alcohol in teens are limited. However, studies in animal models provide some evidence to support this hypothesis. For instance, it has been shown that adolescent rats often voluntarily consume 2 to 3 times more ethanol than adult rats (Brunell and Spear, 2005; Doremus et al., 2005; Vetter et al., 2007). Adolescent rats are less sensitive than adult rats to the effects of alcohol administration on a number of behavioral and electrophysiological measures (Doremus et al., 2003; Ehlers et al., 2014; Pian et al., 2008; Silveri and Spear, 1998, 2000; Varlinskaya and Spear, 2004). Adolescent rats are also more insensitive to the aversive properties of ethanol that elicit conditioned taste aversion as compared to adults (Anderson et al., 2010). Thus, existing data in rodents suggests that adolescent rodents drink more alcohol, have a lower level of response to administered alcohol on a number of behavioral measures of intoxication, and find alcohol less aversive than adults.

The potentially long lasting effect of adolescent alcohol exposure on sensitivity to alcohol administration during adulthood has also been investigated in animal models. Exposure to chronic intermittent ethanol during adolescence has been demonstrated to cause a “retention” of the adolescent phenotype of reduced level of response to ethanol in both behavioral (Slawecki, 2002; White et al., 2000a,b) and electrophysiological measures (Ehlers et al., 2014; Fleming et al., 2012, 2013; Slawecki, 2002). Some authors have suggested that adolescent ethanol exposure may “lock-in” the adolescent low level of response to ethanol and then sustain it into adulthood (Fleming et al., 2012). Since a number of studies in a variety of human populations suggest that level of response to alcohol may be one of the best biologically-based risk factors for the development of alcohol use disorders (Schuckit and Smith, 1996), it is reasonable to suggest that the “locked-in” adolescent phenotype for response to alcohol may, at least theoretically, put them at higher risk for heavy drinking and its consequences.

While mechanistic studies in animals have provided important clues to the role of developmental sensitivity to alcohol and its effects on drinking, these studies have not been

fully translated to human adolescents. Typically, studies investigating the level of response to alcohol have used an instrument called the Subjective High Assessment Scale (SHAS) to query a study participant as to how intoxicated they feel, at that moment, following the administration of alcohol in the lab (see Schuckit and Smith 1996). The estimated variation in level of response to alcohol can also be measured in epidemiologically based studies using an instrument called the Subjective High Assessment Scale-E (SHAS-E). The SHAS-E queries subjects as to how they might expect to feel following a standard dose of alcohol based on their previous drinking experience on 12 intoxication items, plus whether they felt “great” or “terrible” overall. This measure is particularly suited to large populations where direct tests of responses to alcohol drinking may not be feasible due to logistical factors, underage status, or ineligibility due to a diagnosis of alcohol use disorder. We have demonstrated, in previous studies that responses on the SHAS-E are significantly heritable (Ehlers et al., 2008). In the present study we used the SHAS-E to test whether a history of binge drinking during adolescence was associated with significant effects on self-reported responses to ethanol in young adults.

The present report is part of a larger study exploring risk factors for substance dependence among Native Americans and Mexican Americans residing in southwest California (Ehlers et al., 2004a,b, 2006, 2008, 2009, 2010a,b, 2011). Although use of alcohol varies among tribes, as a whole, Native Americans suffer high rates of alcohol and drug dependence and higher alcohol-related death rates than any other U.S. ethnic group and alcohol dependence rates up to five times that of the general U.S. population (see Beals et al., 2005; Ehlers et al., 2004a, 2006; Robin et al., 1998; Shalala et al., 1999). Hispanics are heterogeneous in national origin, and have a range of alcohol use disorders among different Hispanic national groups. Among Hispanic groups, the Hispanic Americans Baseline Alcohol Survey (HABLAS) found that being Puerto Rican or Mexican American was a risk factor for dependence on alcohol (Caetano et al., 2009). Drinking by some Hispanics also takes a heavy toll in their health consequences. For example, the National Center for Health Statistics found that white Hispanic men and women had the highest cirrhosis mortality rates of any ethnic group studied (Stinson et al., 2001). Therefore studying potential risk factors for the development of alcohol dependence in Mexican and Native Americans is important in order to address health disparities. The purpose of the present set of analyses was to determine if a history of binge drinking during adolescence was significantly associated with current self-reported levels of subjective responses to alcohol (both positive and negative), first in a population of Native American young adults, and then in a population of Mexican American young adults, using the SHAS-E.

MATERIALS AND METHODS

Participants

The participants were individuals of Native American and Mexican American descent that were recruited from the local community for larger studies investigating risk factors for substance dependence in these two ethnic groups. The Native Americans, who were of mixed heritage but at least one-sixteenth Native American, were recruited from eight geographically contiguous reservations with a total population of about 3,000 individuals.

They were recruited using a combination of a venue-based method (Kalton and Anderson, 1986; Muhib et al., 2001), and a respondent-driven procedure (Heckathorn, 1997), as described previously (see Ehlers et al., 2004a,b). Native American participants were recruited in a wide age range (18–85 yrs), however, the present set of analyses focused on only those individuals who were between 18 and 30 years of age at the time of interview. Mexican American participants were recruited using a commercial mailing list that provided the addresses of individuals with Hispanic surnames in 11 zip codes in San Diego County, all of which had a population that was over 20% Hispanic and were within 25 miles of the research site. The mailed invitation stated that potential participants must be of Mexican American heritage, be between the ages of 18 and 30 years, be residing in the United States legally, and be able to read and write in English. Based on the aims of the larger studies, for both ethnic groups, participants were excluded if they were pregnant, nursing, or currently had a major medical disorder that precluded them traveling to the research site. Participants were asked to refrain from alcohol or recreational drug use for 24 hours prior to testing, and their breath alcohol levels (via breathalyzer) had to be 0.00 g/dl to be included in the study.

Potential participants gave written informed consent, and responded to a screening questionnaire that was used to gather information on demographics, personal medical history, ethnicity and detailed measures of current and past substance abuse history, including adolescent binge drinking, using a time line follow back format (Schuckit, 1985). Family history of alcohol dependence was assessed using the Family History Assessment Module (FHAM). Each participant also completed an interview with the Semi-Structured Assessment for the Genetics of Alcoholism (SSAGA) (Bucholz et al., 1994) which was used to make DSM-IV diagnoses (American Psychiatric Association, 1994). Self-reported response to alcohol was assessed using the SHAS-E. The SHAS-E consists of 14 items rated on Likert scales ranging from 0 (normal) to 36 (extreme effect). The participants were asked to rate how they would expect to feel 30 minutes after drinking 3 standard drinks for the following items: buzzed, clumsy, dizzy, drunk, effects of alcohol, energy, good, high, nauseated, sleepy, talkative, uncomfortable, terrible overall and great overall. A total score that was a sum of all of the responses for the first 12 SHAS-E items was also calculated. The intersession reliability of the SHAS, from which the SHAS-E was constructed, is approximately 0.80 with a Cronbach's alpha of 0.96 overall (Schuckit et al., 2000). The items cluster together with an overall item-to-total correlation of 0.80 or higher and a Cronbach's alpha of 0.96. Values on the SHAS-E have been demonstrated to significantly ($p < 0.0001$) correlate with responses on the SHAS at 30 and 60 minutes following alcohol ingestion ($r^2 = 0.49$, 30 min, $r^2 = 0.51$, 60 min) (Schuckit and Smith, personal communication).

The data analyses were based on the study aims. The first aim was to determine if any associations existed between a history of binge drinking during adolescence and the SHAS-E items "overall great", "overall terrible" and "total". An adolescent history of binge drinking was defined as drinking 5 or more drinks for boys and 4 or more drinks for girls per drinking occasion at least once a month during their highest drinking period at or before the age of 18 years. Due to the U-shape distribution of the adolescent binge drinking data (Figure 1), the binge drinking variable was dichotomized. To determine the relationships between binge drinking and the SHAS-E variables, analyses of variance (ANOVAs) were calculated for the three outcome variables (SHAS-E great, SHAS-E terrible, SHAS-E total)

for those participants with a history of bingeing during adolescence and for those who did not have such a history, first in the Native American and then in the Mexican American dataset. Bonferroni correction was applied to control for multiple comparisons using ANOVA for the 3 outcomes, in the analyses of the Native Americans, Mexican Americans and combined sample. Significance was set at $p < 0.005$. The second aim of the study was to determine the significance of a history of adolescent bingeing on the three SHAS-E variables (terrible, great, total) in the context of several other potentially significant indicators in the larger combined (Native American and Mexican American) dataset. A backward stepwise linear regression analysis for the scores on the three SHAS-E items as outcome variables in the entire dataset was conducted while controlling for several diagnostic and demographic variables in the model. The backward stepwise regression removes the independent variable which is least significant (defined as the independent variable with the highest p -value > 0.10) in explaining the outcome variable in steps. The variables used in the model were obtained from the SSAGA, unless indicated, and included: a history of adolescent bingeing as described above (yes or no); gender (M vs. F); ethnicity (Native American vs. Mexican American heritage, by self report); having a first degree relative with alcohol dependence, defined as family history positive (FHP) vs. no first degree relative with alcohol dependence, defined as family history negative (FHN) (obtained from the FHAM); having a diagnosis of conduct disorder prior to age 15 years and/or adult antisocial personality disorder (yes or no), age at interview (years), years of education, currently married (yes or no), annual household income ($< \$20,000$ vs. $\geq \$20,000$), current drinking quantity (drinks per occasion), and current drinking frequency (drinking days per month). Differences between demographic variables, as seen in Table 1, in the binge drinkers and non-binge drinkers, were analyzed using ANOVA for continuous variables and Fisher's exact test for dichotomous variables.

RESULTS

The demographic characteristics, current drinking quantity, and current drinking frequency of the Native American ($n=406$) and Mexican American ($n=384$) young adult participants who did ($n=445$) or did not ($n=345$) experience binge alcohol drinking before the age of 18 are presented in Table 1. The participants in the full sample had a mean age of 22 yrs, were more likely to be female (58%), had 12 years education, had an annual household income of more than \$20,000, were not married, and were currently employed. Compared to participants who were not, participants who were regular binge drinkers during adolescence were significantly more likely to be: male, younger, not married, unemployed; and to have less annual household income, fewer years of education, higher current drinking quantity, and higher current drinking frequency. Figure 1 shows the distribution of the frequency of adolescent binge drinking, and the age of heaviest binge drinking per month in the two populations studied.

As seen in Figure 2, a history of adolescent regular binge drinking was found to be significantly associated with current responses on the SHAS-E. In the Native American participants a history of regular binge drinking during adolescence was associated with lower scores on the "terrible" scale ($F=11.07$, $df=1,405$, $p=0.001$) and on the "total" scale ($F=17.02$, $df=1,404$, $p<0.00001$), but not on the "great" scale ($F=0.14$, $df=1,405$, $p=0.71$).

The same pattern was observed for the Mexican Americans. Mexican American participants with a history of regular binge drinking during adolescence had lower scores on the “terrible” scale ($F=10.69$, $df=1,381$, $p=0.001$) and on the “total” scale ($F=10.13$, $df=1,383$, $p=0.002$), but not on the “great” scale ($F=0.08$, $df=1,381$, $p=0.78$) when compared to those without an adolescent history of binge drinking. When the Mexican and Native American groups were combined for analysis, the same pattern was seen: a history of regular binge drinking during adolescence was associated with lower scores on the SHAS-E “terrible” scale ($F=28.32$, $df=1,787$, $p<0.00001$) and on the “total” scale ($F=49.31$, $df=1,788$, $p<0.00001$), but not on the “great” scale ($F=1.01$, $df=1,787$, $p=0.32$). The effect size for the effect of bingeing on “terrible” was moderate at 0.37, for “great” was small at 0.07, and for “total” the effect size was medium at 0.48 (Cohen’s d). Thus, increasing the power by combining the data did not provide evidence to suggest that there is an association between “feeling great” after drinking and a history of binge drinking in adolescence.

The association between binge drinking and the SHAS-E could be potentially influenced by a number of demographic variables, as well as genetically and environmentally driven variables. As seen in Table 1, all of the demographic variables as well as current drinking quantity and current drinking frequency differed between participants with a history of adolescent binge drinking compared to those without such a history. Table 2 presents the results when each SHAS-E score (“total,” “terrible” and “great”) was assessed for its association with demographic variables, use, family history, and ASPD/CD using stepwise linear regression in the combined Native American and Mexican American dataset. A backward stepwise linear regression analyses was conducted using the three SHAS-E scores as the outcome variables. The independent variables entered into the model were: adolescent bingeing, current drinking frequency, current drinking quantity, gender, ethnicity, family history of alcohol dependence, having a lifetime diagnosis of antisocial personality disorder or conduct disorder (ASPD/CD), age at interview, number of years of education, marital status, and economic level.

Table 2 presents the results both for the full model and for the final model after backward stepwise regression. A lower SHAS-E “great” score in the final model revealed the following significant variables: male gender and fewer years of education. There was not a significant correlation between those two variables ($r=0.08$, Spearman’s ρ). No other variables were associated with a lower SHAS-E “great” in the final regression model. A lower SHAS-E “terrible” score in the final model was associated with binge drinking, younger age at interview, male gender, higher current drinking frequency, and higher current drinking quantity. A lower SHAS-E “total” score in the final model was associated with the following variables: adolescent binge drinking, male gender, not being married, fewer years of education, higher current drinking frequency, and higher current drinking quantity. Post-hoc Spearman’s ρ correlations revealed a strong correlation between the frequency and quantity of current drinking (0.60), a weak correlation between adolescent binge drinking and current frequency (0.20), and a weak correlation between adolescent binge drinking and current quantity (0.22). Thus, adolescent binge drinking was significantly associated with lower SHAS-E outcome “terrible” and “total” scores in a model that included several potentially important demographic variables, use, and diagnostic variables, including current

drinking levels. However, the only variables that were associated with feeling “great” after drinking, as indexed by the SHAS-E, were male gender and more years of education.

DISCUSSION

It appears that a number of genetic and environmental factors can lead to significant variation in the doses of a substance necessary to produce hedonic and/or adverse effects. In the present study, a history of regular adolescent binge drinking was found to be associated with a lower level of response to the negative aspects of alcohol intoxication (feeling terrible) as well as to the overall level of subjective intoxication, but not to the positive impressions of intoxication (feeling great), using the SHAS-E, in young adults (18–30 yrs). A history of regular adolescent binge drinking was also associated with less feeling of the “terrible” and “total” effects of alcohol, as indexed by the SHAS-E, in a multiple regression model that controlled for several diagnostic and demographic variables. These data suggest that a history of adolescent binge drinking can result in a reduction in the negative aspects of intoxication, and overall level of intoxication, in young adults, factors that could theoretically lead to increased drinking and increased risk for alcohol dependence.

The range of CNS effects of alcohol from mild intoxication to alcohol poisoning depends on the dose imbibed (see Schuckit, 1995). The level and valence of intoxication appears to depend on a number of genetic and environmental factors including a persons’ gender, age, weight, prior experience with alcohol, and level of tolerance (Schuckit, 1994). Several studies have found moderate heritability for level of response to alcohol. In one study, heritability was found to be 60% for a composite sensitivity measure that was used during an alcohol challenge in twins (Heath et al., 1999). Correlations of level of response to alcohol using body sway and the Subjective High Assessment Scale (SHAS) in an alcohol challenge paradigm using sibling pairs as participants was reported to be 0.36 (Wilhelmsen et al., 2003). The estimated heritability (h^2) for each of the 14 items on the SHAS-E, in this Native American population, were found to range from near to zero (energy) to .28 for “terrible” (see Ehlers et al., 2008). The only three phenotypes with significant heritability were sleepy, talkative, and terrible. This suggests that a significant portion of at least 3 items on the SHAS-E have a genetic component.

In general, people at higher genetic risk for alcoholism are less sensitive to the effects of alcohol, whereas people at lower genetic risk for alcoholism are more sensitive. Support for this theory is provided by many, but not all, studies examining the reaction to alcohol among children of alcoholics, who are at greatly elevated risk for developing alcoholism (Moss et al., 1989; O’Malley and Maisto, 1985; Pollock et al., 1986; Savoie et al., 1988; Schuckit, 1984). In addition, an 8-year follow-up of previously studied men with positive and negative family histories found that both a family history of alcoholism and a low response to alcohol were related to the development of alcohol-related problems (Schuckit and Smith, 1996). However, in the present study, a family history of alcohol dependence was not significantly associated with current level of response to alcohol in this young adult Native American and Mexican American sample, as indexed by the SHAS-E. This suggests that in this population the association between an adolescent history of regular binge drinking and current level of

response to alcohol is not significantly influenced by a person's family history of alcohol dependence.

Although the level of response to alcohol likely has a significant genetic component, it appears that at least half of the variance in response is environmentally-driven. One of the most likely causes of variance in positive and negative responses to alcohol is the quality and quantity of alcohol drinking experiences in an individual's drinking history. If an individual has a history of heavy drinking it may overshadow, "mask", or overcome that individual's genetically mediated level of response to alcohol. A number of behavioral and social factors can also influence whether an individual engages in binge drinking and those factors could then directly or indirectly influence level of response to alcohol. One hypothesis is that peer-influenced early drinking may disrupt the normal course of social and intellectual development leading to an increased risk for a number of social and psychological pathologies and lifestyles including heavy drinking and substance dependence (DeWit et al., 2000; York, 1999). It has also been suggested that substance dependence and psychopathology are in fact a reflection or result of a more general underlying susceptibility to disinhibitory behaviors or externalizing disorders (Iacono et al., 2002; Jessor and Jessor, 1977). In the present study we included in our analyses indicators of early disinhibitory behavior such as a history of conduct disorder or antisocial personality disorder. However, we did not find that a lifetime diagnosis of ASPD or CD was associated with level of response to alcohol in this population, suggesting that the association between an adolescent history of regular binge drinking and level of response to alcohol is not influenced by a personal history of these externalizing disorders.

While these are the first data to suggest an association between adolescent binge drinking and a lower level of response to alcohol in humans, this finding is partially supported by data in animal models. It has been shown that adolescent rats are less sensitive than adult rats to the effects of alcohol administration on a number of measures of level of response to intoxication (Doremus et al., 2003; Ehlers et al., 2014; Pian et al., 2008; Silveri and Spear, 1998, 2000; Varlinskaya and Spear, 2004). It also appears that adolescent rats are more insensitive to the aversive properties of ethanol that elicit conditioned taste aversion as compared to adults (Anderson et al., 2010). Exposure to chronic intermittent ethanol in adolescent rats, which models binge drinking in humans, has further been demonstrated to cause a "retention" of the adolescent phenotype of reduced level of response to ethanol in both behavioral (Slawecki, 2002; White et al., 2000a,b) and electrophysiological (Ehlers et al., 2014; Fleming et al., 2012, 2013; Slawecki, 2002) measures. Thus some authors have suggested that adolescent ethanol exposure may "lock-in" adolescent low level of response to ethanol and sustain it into adulthood (Fleming et al., 2012). The data from the present study also provide support for that hypothesis, in that age was found to have a significant positive correlation with levels of "feeling terrible" following drinking alcohol, while a history of binge drinking during adolescence was associated with a negative correlation with levels of feeling terrible following drinking alcohol. Thus, one interpretation of these findings is that early binge drinking may "lock in" or cause retention of an earlier phenotype.

In conclusion, these data represent the first association analysis of self-reported level of response to alcohol with a history of regular binge drinking during adolescence. The results of this study should, however, be interpreted in the context of several limitations. First, the findings may not generalize to other Native Americans or Mexican American young adults. Second, comparisons of association findings to non-Native American or non-Mexican populations may be limited by differences in a host of potential genetic and environmental variables. Some of the data collected was retrospective and thus may suffer from problems of inaccurate recall. A longitudinal study of the relationship between adolescent binge drinking and the SHAS-E would represent a more powerful study design. This study reports associations between adolescent binge drinking and responses on the SHAS-E, such associations may or may not be causative. Although the SHAS-E has been demonstrated to correlate with SHAS responses collected in an alcohol challenge paradigm, SHAS-E data is subject to the effects of rationalization of one's behavior and expectations of alcohol effects that may not be recalled accurately. Despite these limitations, this report represents an important step in an ongoing investigation to understand the developmental determinants associated with substance use disorders in these high-risk and understudied ethnic groups.

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Figure 1. Distribution of binge drinking during adolescence

Figure (left) shows the number of days per month that the participants (n = 790) reported binge drinking during adolescence (at or before age 18). Among participants who reported binge drinking during adolescence (n = 445), the age of heaviest binge drinking at or before age 18 is also shown (right).

Figure 2. Responses to Subjective High Assessment Scale-E (SHAS-E) outcome variables Great, Terrible and Total in participants according to binge drinking category.

This figure shows the scores on the SHAS-E Great, Terrible and Total scales in participants with a history of regular adolescent binge drinking (1/month) compared to participants without a history of regular binge drinking in adolescence (at or before age 18). Mean values $\pm$ SEM for the SHAS-E scores are presented for Mexican American participants, Native American participants, and all participants combined. Significant at $p < 0.005$

Table 1

Demographic and current drinking characteristics of Mexican American (n=384) and Native American (n=406) participants according to adolescent binge drinking category

Demographic and current drinking characteristics are presented for the Binge Drinkers and the Non-Binge Drinkers in Native Americans and Mexican Americans separately, as well as the overall group. The p-values reported are Fisher's dichotomous variables and Analysis of variance (ANOVA) for continuous variables.

Characteristic	Binge Drinkers			Non-Binge Drinkers		
	Mexican American (n=159)	Native American (n=286)	Overall (n=445)	Mexican American (n=225)	Native American (n=120)	Overall (n=345)
	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)
Gender						
Male	74 (46.5) ^a	135 (47.2) ^c	209 (47.0) ^f	81 (36.0)	41 (34.2)	122 (35.4)
Female	85 (53.5)	151 (52.8)	236 (53.0)	144 (64.0)	79 (65.8)	223 (64.6)
Married						
Yes	22 (13.8)	21 (7.3)	43 (9.7) ^e	42 (18.7)	12 (10.0)	54 (15.7)
No	137 (86.2)	265 (92.7)	402 (90.3)	183 (81.3)	108 (90.0)	291 (84.3)
Employed						
Yes	97 (61.0)	95 (34.5)	192 (44.2) ^f	156 (69.6)	50 (42.7)	206 (60.4)
No	62 (39.0)	180 (65.5)	242 (55.8)	68 (30.4)	67 (57.3)	135 (39.6)
Income \$20,000/yr						
Yes	121 (82.9)	144 (54.5)	265 (64.6) ^f	172 (80.0)	67 (65.7)	239 (75.4)
No	25 (17.1)	120 (45.5)	145 (35.4)	43 (20.0)	35 (34.3)	78 (24.6)
	Mean (SE)	Mean (SE)	Mean (SE)	Mean (SE)	Mean (SE)	Mean (SE)
Age (yrs)	23.3 (0.3) ^a	21.8 (0.2)	22.3 (0.2) ^f	24.3 (0.2)	22.6 (0.3)	23.7 (0.2)
Education (yrs)	13.1 (0.1) ^b	11.5 (0.1)	12.0 (0.1) ^f	13.7 (0.1)	11.6 (0.1)	13.0 (0.1)
Current Drinking Quantity (# drinks/occasion)	4.1 (0.3) ^a	8.4 (0.6) ^d	6.9 (0.4) ^f	3.2 (0.2)	4.8 (0.6)	3.7 (0.2)
Current Drinking Frequency (# times/month)	3.7 (0.4)	6.8 (0.5) ^d	5.7 (0.4) ^f	3.1 (0.3)	3.3 (0.6)	3.1 (0.3)

^a p<0.05 comparing Binge Drinkers vs. Non-Binge Drinkers in Mexican Americans;

^b p<0.01 comparing Binge Drinkers vs. Non-Binge Drinkers in Mexican Americans;

- ^c $p < 0.05$ comparing Binge Drinkers vs. Non-Binge Drinkers in Native Americans;
- ^d $p < 0.01$ comparing Binge Drinkers vs. Non-Binge Drinkers in Native Americans;
- ^e $p < 0.05$ comparing Binge Drinkers vs. Non-Binge Drinkers in All Participants;
- ^f $p < 0.01$ comparing Binge Drinkers vs. Non-Binge Drinkers in All Participants

Table 2

Multiple linear regression results for the full model and final model for SHAS-E outcome variables Total, Terrible and Great

Multiple linear regression was used to assess the association of bingeing during adolescence with the Subjective High Assessment Scale-E outcome variables Total, Terrible and Great. The following independent variables were entered into the initial model for each regression: age at interview, gender, lifetime diagnosis of antisocial personality disorder or conduct disorder (ASPD/CD), family history of alcohol dependence, ethnicity, income, marital status, number of years of education, current drinking quantity and current drinking frequency. Final models were determined using backward stepwise regression.

	Full Model			Variables retained in Final Model		
	B	S.E.	t	p-value	t	p-value
SHAS-E Great						
Age	0.18	0.11	1.61	0.11		
Female Gender	2.08	0.83	2.50	0.01	2.41	0.016
Antisocial Personality Disorder or Conduct Disorder	1.68	1.11	1.52	0.13		
Family history positive	0.58	0.84	0.70	0.49		
Native American Ethnicity	-1.24	1.01	-1.22	0.22		
Income \$20,000/yr	0.22	0.91	0.24	0.81		
Married	-0.94	1.28	-0.74	0.46		
Education (yrs)	0.31	0.27	1.16	0.25	2.25	0.025
Current drinking quantity (#drinks/occasion)	-0.09	0.07	-1.35	0.18		
Current drinking frequency (# times/month)	0.04	0.07	0.61	0.55		
Binge (1/month)	-0.34	0.88	-0.38	0.70		
SHAS-E Terrible						
Age	0.20	0.11	1.81	0.07	2.06	0.039
Female Gender	1.86	0.80	2.32	0.02	2.53	0.012
Antisocial Personality Disorder or Conduct Disorder	0.43	1.07	0.41	0.69		
Family history positive	1.04	0.81	1.30	0.20		
Native American Ethnicity	0.79	0.97	0.81	0.42		
Income \$20,000/yr	0.02	0.88	0.03	0.98		
Married	1.09	1.23	0.89	0.37		
Education (yrs)	0.05	0.26	0.18	0.85		
Current drinking quantity (#drinks/occasion)	-0.20	0.07	-3.01	0.00	-2.77	0.006
Current drinking frequency (# times/month)	-0.26	0.07	-3.99	0.00	-4.00	0.000

	Full Model			Variables retained in Final Model		
	B	S.E.	t	p-value	t	p-value
Binge (1/month)	-2.33	0.85	-2.74	0.01	-2.47	0.014
SHAS-E Total						
Age	1.38	0.95	1.45	0.148		
Female Gender	35.67	7.09	5.03	0.000	4.94	0.000
Antisocial Personality Disorder or Conduct Disorder	5.54	9.44	0.59	0.557		
Family history positive	7.39	7.12	1.04	0.300		
Native American Ethnicity	-14.26	8.59	-1.66	0.097		
Income \$20,000/yr	5.08	7.76	0.65	0.514		
Married	19.18	10.86	1.77	0.078	2.39	0.017
Education (yrs)	4.47	2.27	1.97	0.050	3.61	0.000
Current drinking quantity (#drinks/occasion)	-2.67	0.59	-4.54	0.000	-4.79	0.000
Current drinking frequency (# times/month)	-1.68	0.58	-2.90	0.004	-3.05	0.002
Binge (1/month)	-25.23	7.51	-3.36	0.001	-3.84	0.000