Acculturation and Alcohol Use Outcomes: Incremental Roles of Bicultural Orientations among
Asian American Undergraduate and Graduate Students

Savannah Pham and P. Priscilla Lui

Southern Methodist University

Author Note

Savannah Pham and P. Priscilla Lui, Department of Psychology, Southern Methodist University. Data file, syntax for analyses, measures, and preregistered hypotheses and data analytic plan are publicly available through the Open Science Framework (OSF) at: <https://osf.io/u75ba/>. Preliminary results from this investigation were presented at the American Psychological Association 127th Annual Convention entitled, “*Acculturation, Biculturalism, and Alcohol Use in Asian American Graduates and Undergraduates.*” Correspondence concerning this article should be directed to Savannah Pham (phams@smu.edu) and P. Priscilla Lui (plui@smu.edu), Department of Psychology, Southern Methodist University, PO Box 750442, Dallas, TX 75275.

Manuscript accepted for publication in *Cultural Diversity and Ethnic Minority Psychology* (November 17, 2019).

© 2019, American Psychological Association. This paper is not the copy of record and may not exactly replicate the final, authoritative version of the article. Please do not copy or cite without authors' permission. The final article will be available, upon publication, via its DOI: 10.1037/cdp0000318

Abstract

Objectives: There has been a steep increase in alcohol involvement and alcohol use disorder among Asian Americans in recent decades. Cultural orientations have been shown to be robust correlates of alcohol use. Yet, the literature is limited in illuminating within-group differences in the complex relations among *acculturation*, *enculturation*, bicultural orientations, and alcohol use. Most alcohol research has focused on undergraduate students; little is known about the roles of cultural orientations in graduate student drinking outcomes. **Methods:** Asian American undergraduate ($N = 357$, 60.1% women, $M_{\text{age}} = 20.32$) and graduate students ($N = 230$, 30.4% women, $M_{\text{age}} = 24.76$) completed survey questionnaires assessing their levels of *acculturation* and *enculturation*, and alcohol consumption and drinking-related consequences. **Results:** Accounting for *acculturation*, *enculturation* was not associated with alcohol use outcomes. *Acculturation* was positively associated with alcohol consumption among undergraduates, and was negatively associated with various alcohol use outcomes among graduate students. Bicultural orientations indicated by *acculturation* x *enculturation* predicted alcohol use above and beyond *acculturation* and *enculturation* alone, and gender moderated these relations. Among undergraduates, women who scored lower on *acculturation* and *enculturation* reported more personal drinking-related consequences. Among graduate students, men who scored lower on *enculturation* reported more social drinking-related consequences, whereas women who scored higher on *acculturation* and *enculturation* reported lower levels of social consequences. **Conclusion:** These results can be interpreted in the contexts of social norms and stress theory, and highlight the possible protective roles of ethnic society immersion in alcohol misuse. **Keywords:** acculturation profile; biculturalism; coping motives; drinking problems; social norms **Public Significance Statement:** Compared to individuals who are less immersed in both the U.S. mainstream and ethnic heritage cultures, Asian American undergraduate and graduate

students who are more acculturated and enculturated experience fewer negative personal and social alcohol-related consequences, and there are meaningful gender differences in these associations. Whereas *acculturation* alone may facilitate higher levels of alcohol misuse for undergraduate students, results highlight the possible joint influence of *acculturation* and *enculturation* on alcohol use outcomes and the protective roles of ethnic heritage orientation against drinking-related problems among Asian Americans.

Acculturation and Alcohol Use Outcomes: Incremental Roles of Bicultural Orientations among
Asian Americans Undergraduate and Graduate Students

Hazardous alcohol use is associated with negative health, personal, and social consequences (e.g., liver cirrhosis, depressed mood, or unintended injuries); thus, alcohol (mis)use constitutes a critical public health concern (World Health Organization, 2018). Across the lifespan, alcohol use and misuse are the most prevalent among young adults aged 18 to 29, especially those attending college (Delker, Brown, & Hasin, 2016). Epidemiologic data show steep increases in high-risk drinking behaviors among ethnic minority individuals over the past decade (Grant et al., 2017). Compared to other ethnic groups, the largest surge in prevalence rates for 12-month alcohol use (from 48.4% to 62.5%) and alcohol use disorders (from 4.5% to 8.0%) during 2001-2013 were observed among Asian American adults (Grant et al., 2017). With these rising levels of alcohol use and their related consequences, it is imperative to develop a better understanding of risk and protective factors of alcohol use outcomes among Asian Americans.

Cultural orientations have been studied as key determinants for alcohol use among Asian Americans (Iwamoto, Kaya, Grivel, & Clinton, 2016; Park, Anastas, Shibusawa, & Nguyen, 2014; Savage & Mezuk, 2014). Conceptualized as the degree to which individuals are immersed in mainstream U.S. society (*acculturation*) and their heritage society/countries of origin (*enculturation*), cultural orientations can influence drinking behaviors by subjecting individuals to drinking norms and shaping how individuals think about the functions and consequences of alcohol use (Hahm, Lahiff, & Guterman, 2004; Stephenson, 2000). Alcohol consumption and drinking problems have been shown to be associated positively with *acculturation* and negatively with *enculturation* (Lui & Zamboanga, 2018a); it remains unclear how alcohol use

outcomes are related to the interaction between *acculturation* and *enculturation*. Hence, we aimed to better examine *acculturation*, *enculturation*, and their interaction as they pertain to alcohol use outcomes among Asian American college students.

Patterns of Alcohol Use among Asian Americans

Asian Americans make up the fastest growing ethnic group in the United States by immigration (U.S. Census Bureau, 2012); yet, patterns and determinants of their alcohol use remain underrepresented in the literature. There are two possible reasons for this dearth of research. First, large epidemiologic studies have only reported data on the prevalence of alcohol use among Asian Americans until recently (Fong & Tsuang, 2007; Ward, Clarke, Nugent, & Schiller, 2016; Wu & Blazer, 2015). The lack of statistics on the prevalence of alcohol involvement among Asian Americans likely has concealed the need to study alcohol use in this population. Second, the model minority stereotype has hindered research on alcohol use and other externalizing problems among Asian Americans. The model minority stereotype erroneously portrays all Asian Americans to be well adjusted in the U.S., enjoying financial and academic success (Gupta, Syzmanski, & Leong, 2011; Wing, 2007), and experiencing little to no mental health concerns (Iwamoto et al., 2016). In contrast to the perception that Asian Americans are at low risk for alcohol misuse, data have revealed patterns of high-risk alcohol use in the Asian American community (Lee, Han, & Gfroerer, 2013). Additionally, despite ethnic and cultural heterogeneity that may influence alcohol use behaviors among Asian Americans (e.g., Kitano et al., 1985; Westermeyer, 1985), many ethnic subgroups such as South Asians remain underrepresented in alcohol research.

Evidence suggests that Asian Americans engage in harmful alcohol use at rates that are comparable to those in other ethnic groups (Iwamoto, Corbin, & Fromme, 2010). For example,

Asian American men in college reported binge drinking rates that were at or above the national average (Liu & Iwamoto, 2007). Research has shown various biological and sociocultural factors that account for the rates of alcohol (mis)use among Asian Americans. Biological research has largely focused on gene variations in aldehyde dehydrogenase (ALDH2) and alcohol dehydrogenase (Wong & Osilla, 2012); these genetic mutations are associated with decreased rates of alcohol metabolism and greater, undesirable physiological responses such as flushing (Goedde et al., 1992; Nishimura et al., 2002). Whereas these genetic variations appear to deter heavy drinking among East Asian Americans (Luczak et al., 2001; Luczak, Glatt, & Wall, 2006), levels of alcohol consumption and related disorders nonetheless are on the rise among Asian Americans over the past decade (Grant et al., 2017). Additionally, cultural orientations have been found to predict drinking behavior above and beyond the ALDH2 genotype among Asian American college students (Hendershot et al., 2005). To the extent that these genetic variations do not account for individual variability in alcohol use entirely, sociocultural factors are of importance in examining alcohol use outcomes among Asian American college students.

Cultural orientations, often measured as acculturation statuses, have been linked to health-risk behaviors (e.g., greater alcohol intake or smoking; Abraído-Lanza, Chao, & Flórez, 2005) because adapting to the mainstream U.S. culture can promote more permissive attitudes and beliefs around these behaviors (e.g., alcohol consumption; Schwartz et al., 2011). For example, individuals who adopted U.S. cultural practices were more likely to engage in hazardous alcohol use than their counterparts who were less immersed in the mainstream American traditions (Iwamoto, Le, Brady, & Kaya, 2019; Schwartz et al., 2010).

Acculturation and Enculturation Orientations: Determinants of Alcohol Use Outcomes

Acculturation has been conceptualized as a process of cultural and psychological changes

and adaptations that occurs when individuals encounter intercultural contact (Berry, 2017; Ward & Geeraert, 2016). These cultural experiences may result in changes in various health statuses (Cheon, 2018). From a bidimensional perspective of the acculturation process, many individuals from immigrant families are tasked with straddling the mainstream U.S. and their heritage cultures. Individuals can be highly immersed in either the mainstream U.S. society (*acculturation*) or their heritage society (*enculturation*), both, or neither (Berry, 2017).

Pertaining to alcohol use outcomes among Asian Americans across the lifespan and settings, a systematic review showed that *acculturation* orientation may serve as a risk factor, whereas *enculturation* orientation may serve as a protective factor, especially among women (Lui & Zamboanga, 2018a). Consistent with a narrative review focusing on college students (Zamboanga, Tomaso, & Lui, 2017), the association between cultural orientations and alcohol use was relatively stronger among emerging adults than among adolescents and older adults (Lui & Zamboanga, 2018a). Although these associations tend to be small to moderate in Asian American samples, cultural orientations are relevant to alcohol use because they continue to predict alcohol use outcomes above and beyond biological and other sociocultural factors (Bujarski, Lau, Lee, & Ray, 2015; Hendershot et al., 2005). Additionally, compared to individuals in the community, individuals in college typically consume more alcohol and are at higher risk for heavy use and drinking-related problems (Carter et al., 2010; Mallett et al., 2013; Merrill & Carey, 2016). This is in part because college settings encompass environmental and social conditions (e.g., parties, peer pressure) that facilitate greater alcohol use and misuse (Beck et al., 2013).

Acculturation and Alcohol Use Outcomes

Acculturation may be associated with alcohol use by two processes. First, consistent with

social norms theory, being more acculturated to the mainstream behavioral practices, values, and identities may promote socialization around American drinking norms in college and noncollege settings, and in turn facilitate greater consumption and harmful alcohol use (Makimoto, 1998; Osberg, Insana, Eggert, & Billingsley, 2010; Russell & Arthur, 2016). Second, being more immersed in the mainstream American society may predispose individuals to more stressful events or disadvantages (e.g., discrimination, language barriers; Berry, 2003; Hwang & Ting, 2008), and therefore individuals may consume alcohol as a way to cope with these stressors (Lee et al., 2013a; Vaeth, Wang-Schweig, & Caetano, 2016).

Enculturation and Alcohol Use Outcomes

Compared to *acculturation*, there are fewer studies on the roles of *enculturation* on alcohol use. Theory and meta-analytic findings suggest that adhering to an Asian heritage orientation can serve as a protective factor against alcohol (mis)use by two processes (Bryant & Kim, 2013; Lui & Zamboanga, 2018a; Luk et al., 2013). First, learning about and upholding ethnic-specific drinking norms may be associated with lower risks for harmful alcohol use (Cook et al., 2012). For example, some Asian cultures teach individuals that alcohol should only be used for medicinal purposes (Makimoto, 1998), which in turn discourage hazardous drinking. Second, the process of maintaining heritage culture can be beneficial and help buffer the impact of acculturation-related stresses (Kim & Omizo, 2006). Having personal and social resources that encourage pride in one's ethnic group membership has been associated with positive psychological adjustment (Smith & Silva, 2011). This may help reduce alcohol consumption and drinking problems because individuals who are psychologically well adjusted are less likely to engage in risky alcohol use (Campo & Rohner, 1992).

Interaction between Acculturation and Enculturation Orientations

Despite *acculturation* and *enculturation* showing opposite associations with alcohol use outcomes, studies tended to either focus on *acculturation* alone, or examine *acculturation* and *enculturation* as separate dimensions that underlie alcohol use. Questions remain about how interactions between these two cultural orientations are associated with alcohol use outcomes and whether *enculturation* may moderate the relation between *acculturation* and alcohol use outcomes. Examining *acculturation* and *enculturation* independently but simultaneously, and their interactions, would provide information about factors that underlie individual differences in alcohol use outcomes.

Relations between Bicultural Orientations and Mental Health, and Alcohol Use Outcomes

There are many individual differences in the levels of adherence to heritage and mainstream U.S. cultures (Jang et al., 2017; Kane et al., 2016). Conceptually, based on their levels of *acculturation* and *enculturation*, individuals may be classified into four profiles of bicultural orientations. Bicultural orientations are conceptualized as different ways of combining the influences of *acculturation* and *enculturation*. These profiles are integrated, separated, assimilated, and marginalized (Berry, 1997). The integrated profile is characterized by high levels of U.S. orientation and also high levels of heritage orientation. Individuals with a separated profile are characterized as being immersed in their heritage culture but not the mainstream U.S. culture. Individuals with an assimilated profile are characterized as highly oriented toward the mainstream U.S. culture but not their heritage culture. Individuals who have a marginalized profile are detached from both their heritage and mainstream U.S. cultures. Compared to individuals who are predominantly heritage oriented, individuals who are predominantly U.S. oriented and individuals who are equally U.S. and heritage oriented have been shown to differ in their alcohol use behaviors (Des-Rosiers et al., 2013; Salas-Wright,

Clark, Vaughn, & Córdova, 2015).

Studies have not shown consistent findings about how *acculturation* and *enculturation* jointly are associated with alcohol use outcomes or other mental health outcomes (see Lui & Zamboanga, 2018a; Nguyen & Benet-Martínez, 2013 for critical reviews). Based on current scientific understanding of acculturation profiles, the relations between bicultural orientations and alcohol use are likely complex. Existing mixed findings regarding the roles of bicultural orientations on alcohol use can be attributed to the current methodological approach, especially with regard to categorizing individuals into discrete acculturation profiles. Some studies have shown that integration typically is associated with fewer internalizing and externalizing symptoms, as well as with more favorable health outcomes (Jang et al., 2017). Integration was associated with lower levels of depression and anxiety, as well as lower levels of alcohol consumption (Kane et al., 2016; see Yoon et al., 2013 for review). Marginalization typically has been associated with higher levels of depressive symptoms and psychological distress (Berry, 1997; Cano et al., 2015; Kim, 2009). Yet, other studies have indicated that individuals with cultural orientations similar to a marginalized profile reported higher levels of self-esteem and lower levels of alcohol misuse (Hocoy, 1999; Pham & Lui, 2019), whereas integrated individuals to be at the highest risk for depressive symptoms and substance use (Choi et al., 2018).

Inconsistencies in the relations between acculturation profiles and mental health outcomes may have been a function of the current typological approach; the validity and utility of this approach to bicultural orientations has been called into question (Rudmin, 2006; Schwartz & Zamboanga, 2008). First, empirical data have not always supported the four conceptually informed acculturation profiles. Research has showed that very few individuals actually fall into the marginalization cluster. Mainstream and heritage cultural contexts usually exert (in)directly

their influences on individuals' behaviors, values, and relationship dynamics; thus, it is unlikely for individuals to be detached from and unaffected by either cultures (Del Pilar & Udasco, 2004; Rudmin, 2003; Schwartz & Zamboanga, 2008). Moreover, although most ethnic minority individuals endorse behavioral practices that fit an integrated acculturation profile (Berry et al., 2006; Chia & Costigan, 2006), there is a great deal of within-group heterogeneity in the presentation of their cultural orientations. For example, some integrated individuals are more U.S. dominant, whereas others are more heritage dominant (Benet-Martinez & Haritatos, 2005; Rudmin, 2006). Second, classification of acculturation strategies using cutoff scores are usually specific to sample characteristics (e.g., median split; Giang & Wittig, 2006), making these groupings arbitrary and difficult to replicate in other studies (Schwartz, Unger, Zamboanga, & Szapocznik, 2010). Using this typological approach may make it more challenging to study alcohol use. Using a dimensional approach to consider *acculturation* $\times$ *enculturation* can unpack individual differences in bicultural orientations and how cultural influences link to alcohol use (see Schwartz et al., 2010; Zamboanga, Pham, & Lui, in press).

Gender and Alcohol Use Outcomes

Compared to men, there are lower levels of alcohol consumption and drinking problems, and stronger relations between *acculturation* and alcohol use among Asian American women (Bujarski et al., 2015; Cheng, Lee, & Iwamoto, 2012; Murray et al., 2014). These patterns may reflect differences in gender roles norms and gender-specific socialization around alcohol use in Asian American communities and beyond (Cano et al., 2017; Iwamoto et al., 2016; Wilkinson et al., 2018). Although it is more acceptable for men than women to drink in the broader U.S. context (Fleming & Agnew-Brune, 2015), sanctions against alcohol misuse and gendered drinking norms are much more restrictive and salient for women than men in Asian cultures (Lyu

& Lee, 2014). This may be associated with the notion that alcohol use is a socially deviant behavior—a belief held by many Asians and Asian Americans (Fang, Barnes-Ceeney, & Schinke, 2011). Based on prior research, we aimed to further examine gender differences in these relations in this study, with the expectation that the associations between alcohol use outcomes and cultural orientations would be stronger among women than men.

Graduate and Undergraduate Student Status and Alcohol Use Outcomes

Much of existing alcohol research has examined undergraduate college students or community adults; few studies have specifically focused on drinking among graduate students (Bridges & Sharma, 2015; Kilwein, Kern, & Looby, 2017; cf. Zamboanga et al., 2017). We conducted a literature search on *PsycINFO* using keywords “graduate students,” “alcohol use,” and “substance use,” and found only three articles on alcohol use specific to graduate students and none specific to Asian American graduate students. Presumably, undergraduate students are studied more frequently because of the social and developmental conditions that may promote alcohol use (Cooke et al., 2017; Lui, 2019) whereas graduate students have not been considered a high-risk population for alcohol (mis)use. Drinking cultures among undergraduate and graduate students likely differ greatly: undergraduate students have been found to be more commonly motivated to drink for social reasons (Kenney et al., 2017; Windle et al., 2017), whereas graduate students may be more inclined to drink for other reasons (e.g., coping motives; Globetti, Globetti, & Lo, 1992). There is a dearth of research on graduate student drinking patterns and the associations between cultural orientations and alcohol use. Thus, this study was aimed to explore how alcohol use patterns and associations with acculturation may differ across student status.

The Present Study

The goal of the present study was to better understand the extent to which bicultural

orientations were associated with alcohol use outcomes above and beyond *acculturation* and *enculturation*. We used a dimensional approach to contextualize individual differences in acculturation profiles, and considered within-group differences by gender and by graduate and undergraduate student status. Research has shown distinct associations between cultural orientations and various alcohol use outcomes (Kane et al., 2016; Lui & Zamboanga, 2018a). Thus, we considered five alcohol-related outcomes: intensity of alcohol consumption, alcohol dependence symptoms, harmful alcohol use, personal drinking-related consequences, and social drinking-related consequences. We hypothesized that:

- (1) higher levels of *acculturation* would be associated with higher levels of alcohol use outcomes, even when controlling for *enculturation*;
- (2) higher levels of *enculturation* would be associated with lower levels of alcohol use outcomes, even when controlling for *acculturation*;
- (3) *acculturation* x *enculturation* would predict alcohol use above and beyond each dimension alone; specifically, *enculturation* would buffer the association between *acculturation* and alcohol use outcomes; and
- (4) the associations between cultural orientations and alcohol use outcomes would be stronger for women than men.

We also aimed to explore systematic differences between graduate and undergraduate students in these associations.

Method

Participants and Procedures

Domestic Asian American graduate and undergraduate students participated in this study. Participants aged 18 years or older were recruited at a private, mid-sized university in the

southwestern region of the United States. The sample included undergraduate students ($N = 357$, 60.1% women, $M_{\text{age}} = 20.32$, $SD_{\text{age}} = 2.21$, 76.5% U.S. born) and graduate students ($N = 230$, 30.4% women, $M_{\text{age}} = 24.76$, $SD_{\text{age}} = 3.35$, 16.1% U.S. born) of diverse ethnic backgrounds. Median annual household income fell in the range of \$80,001-\$100,000 for undergraduate students and \$60,000-80,000 for graduate students.¹ Most undergraduate students were Chinese (29.6%), Indian (22.5%), or Korean (13.4%) and most graduate students were Indian (77.3%), Chinese (6.4%), or Pakistani (3.4%). International students temporarily residing in the United States were excluded from this study.

Participants of diverse ethnic backgrounds were recruited via university-wide mass emails for a study on mental health among students of color. Data from Asian Americans were used in the present study. Upon providing electronic informed consent, participants completed online surveys via Qualtrics. The survey took approximately 40 minutes to complete. Participants received a maximum of \$25 as monetary compensation for their time.

Measures

Participants completed a demographic questionnaire and the following self-report measures. All scales demonstrated excellent to adequate internal consistency reliability (see Cronbach's α s for each of these scale data across gender and student status in Tables 1 and 2).

Stephenson Multigroup Acculturation Scale (SMAS; Stephenson, 2000). The SMAS is a 32-item self-report measure that assesses respondents' orientations to the mainstream U.S. and heritage cultures, and has been designed to be used across ethnic groups including Asian Americans (Suinn, 2010). The SMAS scores were associated with immigration generational

¹ Information about the head of the household or number of individuals living under the income was not available.

status, and have demonstrated convergent validity with other measures of acculturation (e.g., Acculturation Rating Scale for Mexican Americans-II; Stephenson, 2000). The SMAS data also have demonstrated criterion-related validity with alcohol-related problems (e.g., $r = -.24$ for mainstream U.S. orientation and $r = -.11$ heritage orientation; Alamilla et al., 2019; Lui, Berkley, & Zamboanga, 2019). Participants indicated their levels of *acculturation* using the 15-item Dominant Society Immersion subscale (e.g., “I feel at home in the United States”). They also indicated their levels of *enculturation* using the 17-item Ethnic Society Immersion subscale (e.g., “I know how to speak my native language). All items were rated on a scale from 1 (*false*) to 4 (*true*). The SMAS was scored by creating separate mean composites for each subscale. Higher scores on the Dominant Society Immersion subscale and the Ethnic Society Immersion subscale indicated higher levels of *acculturation* and *enculturation*, respectively.

Alcohol Use Disorders Identification Test (AUDIT; Saunders et al., 1993). The AUDIT is a 10-item self-report measure of hazardous alcohol use over the past year. The measure was designed by the World Health Organization as a brief measure to detect risky drinking practices. The AUDIT yields three subscales: alcohol consumption, dependence symptoms, and harmful alcohol use (World Health Organization, 2001). There were three items on alcohol consumption (e.g., “How often do you have a drink containing alcohol?”), three items on alcohol dependence symptoms (e.g., “How often during the last year did you find you were not able to stop drinking once you had started?”), and four items on harmful alcohol use (e.g., “How often during the last year have you had a feeling of guilt or remorse after drinking?”). The AUDIT has demonstrated construct validity; it has shown specificity in differentiating individuals who were diagnosed with alcohol use disorder or not (Allen, Litten, Fertig, & Babor, 1997). Moreover, it has demonstrated convergent validity with self-report measures of alcohol

involvement, including the Michigan Alcohol Screening Test ($r = .88$; Bohn, Babor, & Kranzler, 1995). The AUDIT has been found to be a reliable and valid measure of alcohol use in Asian American samples (Oei & Jardim, 2007; Frank et al., 2008). Participants rated items from 0 (*never/no*) to 4 (*daily or almost daily/yes, during the last year*). The AUDIT scores were computed using summed scores of items in each of the three subscales; higher scores indicated greater alcohol consumption, dependence symptoms, and harmful alcohol use, respectively.

College Alcohol Problems Scale—Revised (CAPS-r; Maddock, Laforge, Rossi, & O’Hare, 2001). The CAPS-r contains two subscales, with four items measuring negative personal and social drinking-related consequences associated with college alcohol use. The CAPS-r has been found to be a reliable and valid measure of drinking-related consequences among college students, including those of Asian American backgrounds (Pedersen & Labrie, 2006). The CAPS-r has demonstrated convergent validity with the Young Adult Alcohol Problems Screening Test ($r = .78$; Maddock et al., 2001). Participants rated how often they experienced personal (e.g., “feeling sad, blue, or depressed”) and/or social problems (e.g., “drove under the influence”) over the past year as a result of consuming alcoholic beverages. Participants rated items from 1 (*never*) to 6 (*10 or more times*). We computed summed subscale scores; higher scores indicated greater personal and social drinking-related problems.

Data Analysis

The data analytic plan was preregistered on the Open Science Framework. We first ran independent-samples t -tests and used Fisher Z_r transformations to assess the mean and zero-order correlation differences by gender, as well as by student status and nativity status. Statistically significant differences by gender would justify our plan to include it as a moderating variable, and by student status and nativity would inform our decision of including these demographic

factors as covariates and/or grouping variables. Additionally, we examined the distribution of scores for all five alcohol use outcomes to determine the type of regression analyses that would be most appropriate.

To examine Hypothesis 1 and 2, we entered *acculturation* and *enculturation* as predictors into a regression model for each alcohol use outcome. To test Hypothesis 3, we computed an *acculturation* x *enculturation* interaction by multiplying mean scale scores of *acculturation* and *enculturation*, and entered the interaction term into each regression model. To test Hypothesis 4, we computed two two-way interaction terms (*acculturation* x gender and *enculturation* x gender) and a three-way interaction term (*acculturation* x *enculturation* x gender), and entered them in the regression analysis. All variables were entered into each regression model simultaneously. In order to interpret the results from our interactions, we mean centered *acculturation* and *enculturation* at the respective means for undergraduates and graduate students prior to entering them in analyses.

Results

Preliminary Analyses

All data analyses were conducted in SPSS v. 24. There were only 4% of data missing across all variables in the study; thus, we used listwise deletions in subsequent analyses. We screened the present data for univariate outliers using Z-score values and multivariate outliers using Mahalanobis distance. We found no systematic differences in univariate and multivariate analytic results with and without outliers in the data ($n = 35$); therefore, we retained all cases in our analyses for a larger sample size and greater generalizability.

Gender differences. Consistent with published research on alcohol use and cultural orientations, we found not only statistically significant gender differences in the mean levels of

alcohol consumption and alcohol dependence, but also zero-order correlations between *acculturation* and alcohol dependence, and between *enculturation* and alcohol consumption. Men reported higher levels of alcohol consumption and alcohol dependence than women. Additionally, Fisher's Z_r transformations revealed relatively stronger negative associations between *acculturation* and alcohol dependence among men than women ($z = -2.12, p = .017$) and relatively stronger negative associations between *enculturation* and alcohol consumption among women than men ($z = 2.48, p = .007$). Table 1 summarizes the descriptive statistics of all variables for men and women. These results supported our plan to include gender as a moderator in the regression analyses.

Student status differences. Our exploratory analyses revealed statistically significant differences between undergraduate and graduate students in the mean levels of study variables as well as zero-order correlations among them (see Table 2). The most notable differences were found with respect to alcohol consumption and alcohol dependence: graduate students reported lower levels of consumption ($t = 2.92, p = .006$) and higher levels of dependence ($t = -3.17, p < .001$) than undergraduate students. There were also differences between undergraduate and graduate students in zero-order correlations among our study variables. Fisher's Z_r transformations showed relatively stronger positive associations between *acculturation* and alcohol consumption ($z = -2.32, p = .010$), and between *acculturation* and harmful alcohol use among undergraduate students than graduate students ($z = -4.01, p = .001$). The present statistics supported the notion that graduate and undergraduate students vary in the contexts of alcohol use, thus we conducted separate regression analyses for these two distinct populations to test our hypotheses.

Nativity status. We did not find statistically significant differences in means of and zero-

order correlations among study variables across U.S.- and foreign-born Asian Americans. To examine the explanatory power of cultural orientations above and beyond nativity status, we included nativity as a covariate in all regression models.²

Distribution of alcohol use outcomes. In examining the distribution of all five alcohol use outcomes, we found that the distribution of the residuals of the variables were nonnormal. As evidenced in the levels of skewness and kurtosis (see Tables 1 and 2), the assumption of normality for ordinary least squares regression was not met (Dismuke & Lindrooth, 2006). Hence, we considered nonlinear regression analyses for the data. Negative binomial regression was shown to be a better fit for our data than poisson regression based on model fit indices and dispersion parameter estimates; therefore, negative binomial regression analyses were conducted to account for the variances in alcohol use outcomes (Hilbe, 2011; Tabachnick & Fidell, 2019).

Regression Results Predicting Alcohol Use Outcomes among Undergraduate Students

Regression results for all five alcohol use outcomes are summarized in Table 3. Nativity status was not statistically significantly associated with any of the five alcohol use outcomes. Our results partially supported Hypothesis 1. With *enculturation* and other study variables in the model, *acculturation* was positively associated with alcohol consumption ($B = 1.19, p < .001$), but not other alcohol-related problems. For every one unit increase in *acculturation*, there was a 228.4% increase in the incidence rate of alcohol consumption. Inconsistent with Hypothesis 2, *enculturation* was not associated with any alcohol use outcomes in the simultaneous regression analyses with other variables in the model. Results did not support Hypothesis 3 either; the two-way *acculturation* x *enculturation* interaction was not associated with alcohol use outcomes.

² The null differences by nativity did not justify including this demographic variable as a covariate or moderator as we specified in the preregistered analytic plan; however, we were recommended by two reviewers to include it for conceptual importance. Key multivariate results did not vary when we included and excluded nativity as a covariate. Regression results without nativity status in the model are summarized in Supplemental Table 1.

Hypothesis 4 was partially supported. First, gender moderated the relation between *enculturation* and alcohol consumption ($B = -.35, p = .040$). Undergraduate students who scored higher on *enculturation* were less likely to report alcohol consumption, and women reported less severe dependence symptom than men in general (see Supplemental Figure 1). Second, gender moderated the relation between acculturation and personal drinking-related consequences ($B = -.52, p = .049$). Additionally, gender moderated the relation between *acculturation* x *enculturation* and personal drinking-related consequences ($B = .84, p = .023$). As shown in Figure 1, women undergraduate students who scored lower on *acculturation* and *enculturation* reported higher levels of personal drinking-related consequences compared to other men and women undergraduate students in the sample

Additionally, *acculturation* x *enculturation* x gender was a statistically significant predictor of social drinking-related consequences ($B = .61, p = .039$). As shown in Figure 2, men who scored higher on *acculturation* and lower on *enculturation* reported the highest levels of social drinking-related consequences compared to other undergraduate men and women in the sample. For Asian undergraduate men and women who scored high on *enculturation*, levels of *acculturation* did not appear to matter for both social and personal drinking-related consequences.

Regression Results Predicting Alcohol Use Outcomes among Graduate Students

Nativity was a statistically significant covariate only in the regression model concerning alcohol consumption. Our results supported Hypothesis 1. With *enculturation* and other study variables in the model, *acculturation* was negatively associated with alcohol dependence ($B = -.70, p = .010$) and personal drinking-related consequences ($B = -.25, p = .012$). For each one unit increase in *acculturation*, there was a 50.4% decrease in the incidence rate of alcohol

dependence and a 22.1% decrease in the incidence rate of personal drinking-related consequences among graduate students. Inconsistent with Hypothesis 2, *enculturation* was not associated with alcohol use outcomes in the simultaneous regression analyses. In support of Hypothesis 3, *acculturation* x *enculturation* significantly predicted social drinking-related consequences ($B = .23, p = .031$).

The present data partially supported Hypothesis 4. First, gender moderated the relation between *enculturation* and alcohol dependence ($B = -1.06, p = .011$). Graduate students who scored lower on *enculturation* were more likely to report alcohol dependence symptoms, and women reported less severe dependence symptoms than men in general (see Supplemental Figure 2). Second, *acculturation* x *enculturation* x gender statistically significantly predicted social drinking-related consequences ($B = -.48, p = .002$). As shown in Figure 3, across their levels of *acculturation*, men graduate students who scored lower *enculturation* reported higher levels of social drinking-related consequences compared to other men and women graduate students in the sample. By contrast, women graduate students who scored higher on both *acculturation* and *enculturation* reported lower levels of social drinking-related consequences than other men and women graduate students in the sample.

Discussion

The present study examined the degree to which *acculturation*, *enculturation*, and their interaction, were associated with alcohol consumption and related problems among Asian American college students. Cultural orientations predicted alcohol use; differences across student status likely reflected distinct social norms and drinking motives among undergraduate and graduate students. When both cultural orientations were included in our analyses, *enculturation* was uncorrelated with alcohol use outcomes, but the unique role of *acculturation* on alcohol use

outcomes differed by student status. *Acculturation* was positively associated with alcohol consumption among undergraduate students, but negatively associated with dependence symptoms and personal drinking-related consequences among graduate students. Gender moderated the associations between *acculturation* x *enculturation* and personal drinking consequences and social drinking consequences among undergraduates, as well as social drinking consequences among graduate students. This study advanced the field by revealing how bicultural orientations were linked to alcohol use above and beyond *acculturation* and *enculturation*, and by characterizing within-group heterogeneity in these associations based on gender and student status. These findings help identify segments of the Asian American population who are at greater risk for alcohol misuse. The risk and protective functions of bicultural orientations can inform culturally responsive alcohol interventions aimed to prevent and reduce drinking-related problems among Asian Americans.

Associations between Cultural Orientations and Alcohol Use Outcomes by Student Status

For undergraduate students, *acculturation* was positively associated with alcohol consumption, but not other alcohol-related outcomes. This is partially consistent with prior research indicating that higher levels of immersion in the mainstream culture may be associated with greater endorsement of American drinking norms and attitudes toward alcohol (Russell & Arthur, 2016; Schwartz et al., 2011). Undergraduate students are prone to be socialized to messages that suggest high-risk alcohol-related behaviors (e.g., binge drinking or pregameing) to be acceptable at this stage in life and in college contexts (Tan, 2012). Parties, Greek life, and sporting events are some social events that can promote high levels of alcohol consumption (Scott-Sheldon, Carey, & Carey, 2008). Moreover, American college drinking culture usually indicates that alcohol use is central to the college experience, drinking has significant meaning to

students' social identities, and heavy drinking may be a part of a risk-taking culture (Lui, 2019; Tan, 2012). Thus, among undergraduate students, *acculturation* may reflect college drinking norms and indicate social reasons for engaging in alcohol use (e.g., drinking with friends at parties; Champion, Lewis, & Myers, 2015; Labrie, Hummer, & Pederson, 2007). To the extent that individuals who consume alcohol for social motives experience fewer drinking problems than those who drink for coping reasons (Cooper et al., 2016; Gonzalez, Collins, & Bradizza, 2009), settings and motives for alcohol use may explain why *acculturation* was related to consumption, but not drinking-related consequences in our present undergraduate sample.

Contrary to results with undergraduate students and findings in previous systematic reviews (Lui & Zamboanga, 2018ab; Zemore, 2007), we found that *acculturation* was negatively associated with alcohol dependence and personal drinking-related consequences among graduate students. Given that graduate students have been an understudied population in alcohol use, previous findings with undergraduate students may not generalize to graduate students and this new discovery warrants replication in the future. The negative associations between *acculturation* and alcohol-related problems among graduate students in part may reflect different contexts for drinking. Specifically, research has suggested that individuals are increasingly more likely to drink for coping reasons after they complete their undergraduate degree than when they are in college (Perkins, 1999). Consuming alcohol to cope with stress is internally motivated (Mackinnon et al., 2017); thus, graduate students may be less influenced by external motives for drinking that are associated with *acculturation*. This may explain why *acculturation* was negatively associated with drinking-related problems but not alcohol consumption among graduate students.

Bicultural Orientations and Gender

Our examination of the *acculturation* x *enculturation* interaction helps shed new light on how cultural orientations are linked to alcohol use, and how these relations vary by gender. Specifically, examining the *acculturation* x *enculturation* interaction, and treating *acculturation* and *enculturation* as continuous variables, allowed us to address inconsistencies in the acculturation profiles literature. As expected, cultural orientations are differentially associated with alcohol use outcomes for men and women (Bujarski et al., 2015; Murray et al., 2014). Across undergraduate and graduate students, respectively, the positive roles of *enculturation* on alcohol consumption and dependence symptoms seemed to be more robust for women than men. In general, the interactions among *acculturation*, *enculturation*, and gender were associated with personal and social drinking-related consequences. Compared to other undergraduate men and women in the sample, men who were more immersed in both U.S. mainstream and Asian heritage societies seemed to experience fewer personal drinking-related consequences. This is consistent with prior research indicating that an integrated acculturation profile corresponds to fewer externalizing problems because individuals benefit from having more social resources (e.g., family support and social support) across both heritage and mainstream U.S. contexts (Jang et al., 2017). To the extent that drinking for stress reduction is associated with more negative consequences, our results with undergraduate women are consistent with social stress theory (Cano et al., 2015): women who scored lower on *acculturation* and *enculturation* likely experience more personal consequences because they feel alienated from both heritage and U.S. cultures and consume alcohol as a maladaptive coping strategy.

For both undergraduate and graduate students, *acculturation* x *enculturation* x gender was associated with social drinking-related consequences. Consistent with prior research with college students (Zamboanga et al., 2017), higher levels of *enculturation* appeared to protect

against drinking-related consequences among undergraduate and graduate men and women. Individuals who are more immersed in their Asian heritage society may be more concerned with losing face and bringing shame to their family should they engage in behaviors that are deemed to be unacceptable by Asian values. The CAPS-r conceptualizes social drinking-related consequences as high-risk behaviors, including “not use protection when engaging in sex” and “illegal activities associated with drug use” (Maddock et al., 2001). Individuals who are well enculturated may be less inclined to engage in these behaviors even when they are also well acculturated because of (Asian) culturally sanctioned repercussions. Additionally, women graduate students who score higher on *acculturation* and *enculturation* scales appear to receive relatively greater protection from social drinking-related consequences than men. These benefits are observed among graduate—and not undergraduate—women, likely because Asian women in graduate school face more expectations to not engage in these behaviors. At the graduate level, individuals typically are more concerned with their future career aspirations than undergraduate students (Wyatt & Oswalt, 2013); being more future oriented and goal driven may decrease individuals’ likelihood of engaging in alcohol-related behaviors that could jeopardize career prospects. In contrast, undergraduate men who were higher on *acculturation* and lower on *enculturation* report higher levels of social consequences. Coupled with low immersion in the Asian culture that discourages negative behaviors, greater socialization to more liberal U.S. norms around alcohol behaviors may facilitate higher levels of social drinking-related consequences among men than women. It is possible that this gendered effect is a function of the reduced likelihood for men to be closely monitored for drinking behaviors than their women counterparts, even in the mainstream U.S. culture.

The roles of *enculturation* as a unique determinant of alcohol use outcomes, and likely as

a buffer of the negative impact of *acculturation*, suggest the importance of promoting ethnic heritage orientation as a protective factor against problematic alcohol use outcomes among undergraduate and graduate students. Ethnic heritage orientation can be encouraged and sustained through family connectedness and through programs that promote a sense of ethnic pride (Liu et al., 2012). Specific to the college environment, individuals can increase their sense of ethnic heritage orientation by spending time with same-ethnic peers—who may also drink less as a result of cultural drinking norms. In fact, researchers have emphasized the importance of ethnic affinity spaces to promote social and cultural affiliations and ethnic pride, and well-being among college students (see Lui, Vidales, & Rollock, 2018). Asian Americans can also glean protection from ethnic cultural values (e.g., harmony collectivism) that tend to discourage behaviors such as alcohol misuse that may bring shame to the individual and the family (Campos & Kim, 2017).

Overall, we found that cultural orientations explained a relatively small amount of variance in alcohol use outcomes among both undergraduates and graduate students. Our results highlight what segment of the Asian American population may be at higher risk, and how sociocultural contexts may set the stage, for alcohol misuse. These cultural orientations likely tapped into other cognitive, emotional, or behavioral determinants of alcohol use as delineated in social norms theory and stress theory. Considering the robust roles of drinking motives, for example, it is important to consider cultural orientations in conjunction with motives, given undergraduate and graduate students likely drink for very different motives (e.g., social versus coping motives; Cooper et al., 2016; Labrie, Lac, Kenney, & Mirza, 2011). For example, recent research has shown that *acculturation* and *enculturation* alone explained a smaller percentage of variance in alcohol use outcomes than college alcohol beliefs; yet considering the interactions

between these cultural and motivational factors advanced scientific understanding of how and what underlied individual and ethnic differences in alcohol use (Lui et al., 2019).

Limitations and Future Directions

Despite the use of a large sample of Asian Americans across undergraduate and graduate student status, the present findings should be interpreted with the following limitations in mind. First, the cross-sectional nature of this study means that we cannot draw causal conclusions on the relations between cultural orientations and alcohol use outcomes, and the dynamic associations among them over time. Second, demographic differences between the undergraduate and graduate student samples may contribute to their distinct patterns with regard to cultural orientations and alcohol use. The undergraduate sample consisted of 60% women and included predominantly Indian Americans, whereas the graduate student sample consisted of 30% women and included predominantly Chinese Americans. Future studies should aim to further replicate our findings across student status in other college samples. Specifically, given some heterogeneity in drinking norms and practices across Asian ethnic subgroups (Cook et al., 2012) and that little is known about alcohol involvement among South Asian and Southeast Asian groups, future alcohol research will benefit from focusing on these understudied populations. Third, *acculturation*, *enculturation*, and bicultural orientations accounted for relatively small variances in alcohol use outcomes; there are likely additional factors that further predict alcohol use independently or in conjunction with cultural orientations (Zamboanga et al., in press). *Acculturation* and *enculturation* may indirectly capture individuals' alcohol-related beliefs (e.g., expectancies for the effects of and motivations for alcohol consumption), social drinking norms, and/or may intensify or buffer the direct impact of cognitions on drinking practices (Fish, Osberg, & Syed, 2017; Iwamoto et al., 2016; Lui et al., 2019). Future research should build upon

the present findings to bridge research on sociocultural contexts and individual differences in beliefs, motivations, emotions, and behaviors to better contextualize determinants of alcohol (mis)use.

References

- Abraído-Lanza, A. F., Chao, M. T., & Flórez, K. R. (2005). Do healthy behaviors decline with greater acculturation? Implications for the Latino mortality paradox. *Social Science & Medicine (1982)*, *61*, 1243–1255. doi:10.1016/j.socscimed.2005.01.016
- Alamilla, S. G., Barney, B. J., Small, R., Wang, S. C., Schwartz, S. J., Donovan, R. A., & Lewis, C. (2019). Explaining the Immigrant Paradox: The influence of acculturation, enculturation, and acculturative stress on problematic alcohol consumption. *Behavioral Medicine. Advance online publication*. doi:10.1080/08964289.2018.1539945
- Allen, J. P., Litten, R. Z., Fertig, J. B., & Babor, T. (1997). A review of research on the Alcohol Use Disorders Identification Test (AUDIT). *Alcoholism, Clinical and Experimental Research*, *21*, 613–619.
- Beck, K. H., Caldeira, K. M., Vincent, K. B., & Arria, A. M. (2013). Social contexts of drinking and subsequent alcohol use disorder among college students. *American Journal of Drug and Alcohol Abuse*, *39*, 38–43. doi:10.3109/00952990.2012.694519
- Benet-Martínez, V., & Haritatos, J. (2005). Bicultural identity integration (BII): Components and psychosocial antecedents. *Journal of Personality*, *73*, 1015–1050. doi:10.1111/j.1467-6494.2005.00337.x
- Berry, J. W. (1997). Immigration, acculturation, and adaptation. *Applied Psychology: An International Review*, *46*, 5–34. doi:10.1080/026999497378467
- Berry, J. W. (2003). Conceptual approaches to acculturation. In (Eds. K. M. Chun, P. B. Organista, & G. Marin), *Acculturation: Advances in theory, measurement, and applied research* (pp. 17–37). Washington, DC, US: American Psychological Association. doi:10.1037/10472-004

- Berry, J. W. (2017). Theories and models of acculturation. *The Oxford Handbook of Acculturation and Health*. <https://doi.org/10.1093/oxfordhb/9780190215217.013.2>
- Berry, J. W., Phinney, J. S., Sam, D. L., Vedder, P. (2006). Immigrant youth: Acculturation, identity, and adaptation. *Applied Psychology: An International Review* 55, 303-332. doi:10.1111/j.1464-0597.2006.00256.x
- Bohn, M. J., Babor, T. F., & Kranzler, H. R. (1995). The Alcohol Use Disorders Identification Test (AUDIT): Validation of a screening instrument for use in medical settings. *Journal of Studies on Alcohol*, 56, 423–432. doi:10.15288/jsa.1995.56.423
- Bridges, L. S., & Sharma, M. (2015). A systematic review of interventions aimed at reducing binge drinking among college students. *Journal of Alcohol and Drug Education*, 59, 25-47.
- Bryant, A. N., & Kim, G. (2013). The relation between acculturation and alcohol consumption patterns among older Asian and Hispanic immigrants. *Aging & Mental Health*, 17, 147-156. doi:10.1080/13607863.2012.727382
- Bujarski, S., Lau, A. S., Lee, S. S., & Ray, L. A. (2015). Genetic and environmental predictors of alcohol use in Asian American young adults. *Journal of Studies on Alcohol and Drugs*, 76, 690–699. doi: 10.15288/jsad.2015.76.690
- Campo, A. T., & Rohner, R. P. (1992). Relationships between perceived parental acceptance-rejection, psychological adjustment, and substance abuse among young adults. *Child Abuse & Neglect*, 16, 429–440. doi:10.1016/0145-2134(92)90052-S
- Campos, B. & Kim, H. S. (2017). Incorporating the cultural diversity of family and close relationships into the study of health. *American Psychologist*, 72, 543-554. doi:10.1037/amp0000122

- Cano, M. Á., de Dios, M. A., Castro, Y., Vaughan, E. L., Castillo, L. G., Lorenzo-Blanco, E. I., ... Molleda, L. M. (2015). Alcohol use severity and depressive symptoms among late adolescent Hispanics: Testing associations of acculturation and enculturation in a bicultural transaction model. *Addictive Behaviors*, 49, 78–82.
doi:10.1016/j.addbeh.2015.06.002
- Cano, M. Á., de Dios, M. A., Correa-Fernández, V., Childress, S., Abrams, J. L., & Roncancio, A. M. (2017). Depressive symptom domains and alcohol use severity among Hispanic emerging adults: Examining moderating effects of gender. *Addictive Behaviors*, 72, 72–78. doi:10.1016/j.addbeh.2017.03.015
- Carter, A. C., Brandon, K. O., & Goldman, M. S. (2010). The college and noncollege experience: A review of the factors that influence drinking behavior in young adulthood. *Journal of Studies on Alcohol and Drugs*, 71, 742–750.
- Census Bureau. (2012). *The Asian population: 2010*. Retrieved from <https://www.census.gov/prod/cen2010/briefs/c2010br-11.pdf>
- Champion, D. A., Lewis, T. F., & Myers, J. E. (2015). College student alcohol use and abuse: Social norms, health beliefs, and selected socio-demographic variables as explanatory factors. *Journal of Alcohol and Drug Education*, 59, 57–82.
- Cheng, A. W., Lee, C. S., & Iwamoto, D. K. (2012). Heavy drinking, poor mental health, and substance use among Asian Americans in the NLAAS: A gender-based comparison. *Asian American Journal of Psychology*, 3, 160–167. doi:10.1037/a0028306
- Cheon, B. K. (2018). The diversity of cultural diversity: Psychological consequences of different patterns of intercultural contact and mixing. *Asian Journal of Social Psychology*.
doi:10.1111/ajsp.12321

- Chia, A.-L., & Costigan, C. L. (2006). A person-centered approach to identifying acculturation groups among Chinese Canadians. *International Journal of Psychology, 41*, 397–412. doi:10.1080/00207590500412227
- Choi, Y., Park, M., Lee, J. P., Yasui, M., & Kim, T. Y. (2018). Explicating acculturation strategies among Asian American youth: Subtypes and correlates across Filipino and Korean Americans. *Journal of Youth and Adolescence, 47*, 2181-2205.
- Cook, W. K., Mulia, N., & Karriker-Jaffe, K. (2012). Ethnic drinking cultures and alcohol use among Asian American adults: Findings from a national survey. *Alcohol and Alcoholism, 47*, 340–348. doi:10.1093/alcalc/ags017
- Cooke, M. E., Neale, Z. E., Barr, P. B., Myers, J., Dick, D. M., Kendler, K. S., & Edwards, A. C. (2017). The role of social, familial, and individual-level factors on multiple alcohol use outcomes during the first year of university. *Alcoholism: Clinical and Experimental Research, 41*, 1783–1793. doi:10.1111/acer.13478
- Cooper, M. L., Kuntsche, E., Levitt, A., Barber, L. L., & Wolf, S. (2016). Motivational models of substance use: A review of theory and research on motives for using alcohol, marijuana, and tobacco. In K. J. Sher (Ed.), *The Oxford handbook of substance use and substance use disorders., Vol. 1.* (pp. 375–421). New York, NY: Oxford University Press.
- Delker, E., Brown, Q., & Hasin, D. S. (2016). Alcohol consumption in demographic subpopulations: An epidemiologic overview. *Alcohol Research: Current Reviews, 38*, 7–15.
- Del Pilar, J. A., & Udasco, J. O. (2004). Marginality theory: The lack of construct validity. *Hispanic Journal of Behavioral Sciences, 26*, 3–15. doi:10.1177/0739986303261813
- Des Rosiers, S. E., Schwartz, S. J., Zamboanga, B. L., Ham, L. S., & Huang, S. (2013). A

- cultural and social cognitive model of differences in acculturation orientations, alcohol expectancies, and alcohol-related risk behaviors among Hispanic college students. *Journal of Clinical Psychology*, 69, 319–340. doi:10.1002/jclp.21859
- Dismuke, C. & Lindrooth, R. (2006). Ordinary least squares. *Methods and designs for outcomes research*, 93, 93-104.
- Fang, L., Barnes-Ceeney, K., & Schinke, S. P. (2011). Substance use behavior among early-adolescent Asian American girls: the impact of psychological and family factors. *Women & Health*, 51, 623–642. doi:10.1080/03630242.2011.616575
- Fleming, P. J., & Agnew-Brune, C. (2015). Current trends in the study of gender norms and health behaviors. *Current Opinion in Psychology*, 5, 72–77. doi:10.1016/j.copsyc.2015.05.001
- Fish, J., Osberg, T. M., & Syed, M. (2017). “This is the way we were raised”: Alcohol beliefs and acculturation in relation to alcohol consumption among Native Americans. *Journal of Ethnicity in Substance Abuse*, 16, 219–245. doi:10.1080/15332640.2015.1133362
- Fong, T. W., & Tsuang, J. (2007). Asian-Americans, addictions, and barriers to treatment. *Psychiatry (Edgmont)*, 4, 51–59.
- Frank, D., DeBenedetti, A. F., Volk, R. J., Williams, E. C., Kivlahan, D. R., & Bradley, K. A. (2008). Effectiveness of the AUDIT-C as a screening test for alcohol misuse in three race/ethnic groups. *Journal of General Internal Medicine*, 23, 781–787. doi:10.1007/s11606-008-0594-0
- Giang, M. T., & Wittig, M. A. (2006). Implications of adolescents’ acculturation strategies for personal and collective self-esteem. *Cultural Diversity & Ethnic Minority Psychology*, 12, 725–739. doi:10.1037/1099-9809.12.4.725

- Globetti, E. C., Globetti, G., & Lo, C. (1992). Alcohol and drug use among graduate students at a southern university. *College Student Journal*, 26, 418–426.
- Goedde, H. W., Agarwal, D. P., Fritze, G., Meier-Tackmann, D., Singh, S., Beckmann, G. (1992). Distribution of ADH2 and ALDH2 genotypes in different populations. *Human Genetics*, 88, 344-346.
- Gonzalez, V. M., Collins, R. L., & Bradizza, C. M. (2009). Solitary and social heavy drinking, suicidal ideation, and drinking motives in underage college drinkers. *Addictive Behaviors*, 34, 993–999. doi:10.1016/j.addbeh.2009.06.001
- Grant, B. F., Chou, S. P., Saha, T. D., Pickering, R. P., Kerridge, B. T., Ruan, W. J., ... Hasin, D. S. (2017). Prevalence of 12-month alcohol use, high-risk drinking, and DSM-IV alcohol use disorder in the United States, 2001-2002 to 2012-2013: Results from the National Epidemiologic Survey on Alcohol and Related Conditions. *JAMA Psychiatry*, 74, 911–923. doi:10.1001/jamapsychiatry.2017.2161
- Gupta, A., Szymanski, D. M., & Leong, F. T. L. (2011). The “model minority myth”: Internalized racialism of positive stereotypes as correlates of psychological distress, and attitudes toward help-seeking. *Asian American Journal of Psychology*, 2, 101–114. doi:10.1037/a0024183
- Hahm, H. C., Lahiff, M., & Guterman, N. B. (2004). Asian American adolescents’ acculturation, binge drinking, and alcohol- and tobacco-using peers. *Journal of Community Psychology*, 32, 295–308. doi:10.1002/jcop.20002
- Hendershot, C. S., MacPherson, L., Myers, M. G., Carr, L. G., & Wall, T. L. (2005). Psychosocial, cultural and genetic influences on alcohol use in Asian American youth. *Journal of Studies on Alcohol*, 66, 185–195. doi:10.15288/jsa.2005.66.185

- Hilbe, J. M. (2011). *Negative binomial regression*. Cambridge University Press.
- Hocoy, D. (1999). In (Eds. J. C. Lasry, J. Adair, & K. Dion). *Latest contributions to cross-cultural psychology* (pp. 88-103). Lisse: Swets & Zeitlinger Publishers.
- Hwang, W.-C., & Ting, J. Y. (2008). Disaggregating the effects of acculturation and acculturative stress on the mental health of Asian Americans. *Cultural Diversity & Ethnic Minority Psychology, 14*, 147–154. doi:10.1037/1099-9809.14.2.147
- Iwamoto, D. K., Corbin, W., & Fromme, K. (2010). Trajectory classes of heavy episodic drinking among Asian American college students. *Addiction, 105*, 1912-1920.
- Iwamoto, D. K., Kaya, A., Grivel, M., & Clinton, L. (2016). Under-researched demographics: Heavy episodic drinking and alcohol-related problems among Asian Americans. *Alcohol Research: Current Reviews, 38*, 17–25.
- Iwamoto, D. K., Le, T. P., Brady, J., & Kaya, A. (2019). Distinct classes of alcohol use and related problems among Asian American young adults. *American Journal of Orthopsychiatry*. Advance online publication. doi:10.1037/ort0000361
- Jang, Y., Park, N. S., Chiriboga, D. A., & Kim, M. T. (2017). Latent profiles of acculturation and their implications for health: A study with Asian Americans in central Texas. *Asian American Journal of Psychology, 8*, 200–208. doi:10.1037/aap0000080
- Kane, J. C., Johnson, R. M., Robinson, C., Jernigan, D. H., Harachi, T. W., & Bass, J. K. (2016). longitudinal effects of acculturation on alcohol use among Vietnamese and Cambodian immigrant women in the USA. *Alcohol and Alcoholism, 51*, 702–709. doi:10.1093/alcalc/agw007
- Kenney, S. R., Ott, M., Meisel, M., & Barnett, N. P. (2017). Alcohol perceptions and behavior in a residential peer social network. *Addictive Behaviors, 64*, 143–147.

doi:10.1016/j.addbeh.2016.08.047

- Kilwein, T. M., Kern, S. M., & Looby, A. (2017). Interventions for alcohol-related risky sexual behaviors among college students: A systematic review. *Psychology of Addictive Behaviors, 31*, 944–950. doi:10.1037/adb0000294
- Kitano, H. H., Hatakana, H., Yeung, W. T., & Sue, S. (1985). In (Eds. Bennett, L. A. & Ames, G. M.), *The American experience with alcohol: Contrasting cultural perspective* (pp.335-358). New York, NY, US: Plenum Press.
- Kim, E. (2009). Multidimensional acculturation attitudes and depressive symptoms in Korean Americans. *Issues in Mental Health Nursing, 30*, 98–103.
doi:10.1080/01612840802597663
- Kim, B. S. K., & Omizo, M. M. (2006). Behavioral acculturation and enculturation and psychological functioning among Asian American college students. *Cultural Diversity and Ethnic Minority Psychology, 12*, 245–258. doi:10.1037/1099-9809.12.2.245
- Labrie, J. W., Hummer, J. F., & Pedersen, 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*, 393–398.
- LaBrie, J. W., Lac, A., Kenney, S. R., & Mirza, T. (2011). Protective behavioral strategies mediate the effect of drinking motives on alcohol use among heavy drinking college students: Gender and race differences. *Addictive Behaviors, 36*, 354–361.
doi:10.1016/j.addbeh.2010.12.013
- Lee, C. S., Colby, S. M., Rohsenow, D. J., López, S. R., Hernández, L., & Caetano, R. (2013). Acculturation stress and drinking problems among urban heavy drinking Latinos in the Northeast. *Journal of Ethnicity in Substance Abuse, 12*, 308–320.

doi:10.1080/15332640.2013.830942

Lee, H. K., Han, B., & Gfroerer, J. C. (2013). Differences in the prevalence rates and correlates of alcohol use and binge alcohol use among five Asian American subpopulations.

Addictive Behaviors, 38, 1816–1823 doi:10.1016/j.addbeh.2012.11.001

Liu, W. M., & Iwamoto, D. K. (2007). Conformity to masculine norms, Asian values, coping strategies, peer group influences and substance use among Asian American men.

Psychology of Men & Masculinity, 8, 25–39. doi:10.1037/1524-9220.8.1.25

Liu, L. L., Wang, S., Fung, J., Gudino, O. G., Tao, A. & Lau, A. S. (2012). In (Eds. E. Chang & C. Downey) *Handbook of race and development in mental health* (pp. 147-167). New York, NY: Springer.

Luczak, S. E., Wall, T. L., Shea, S. H., Byun, S. M., & Carr, L. G. (2001). Binge drinking in Chinese, Korean, and White college students: Genetic and ethnic group differences.

Psychology of Addictive Behaviors, 15, 306-309. doi:10.1037/0893-164X.15.4.306

Luczak, S. E., Glatt, S. J., & Wall, T. L. (2006). Meta-analyses of ALDH2 and ADH1B with alcohol dependence in Asians. *Psychological Bulletin*, 132, 607–621. doi:10.1037/0033-2909.132.4.607

Lui, P. P. (2019). College alcohol beliefs: Measurement invariance, mean differences, and correlations with alcohol use outcomes across sociodemographic groups. *Journal of Counseling Psychology*, 66, 487-498. doi:10.1037/cou0000338

Lui, P. P., Berkley, S. R., & Zamboanga, B. L. (2019). College alcohol beliefs and alcohol use: Testing moderations by cultural orientations and ethnicity. *Journal of Counseling Psychology*. Advance online publication. doi:10.1037/cou0000374

Lui, P. P., Vidales, C. A., & Rollock, D. (2018). Personality and the social environment:

- contributions to psychological adjustment among Asian and Euro American students. *Journal of Social and Clinical Psychology*, 37, 659–696. doi:10.1521/jscp.2018.37.9.659
- Lui, P. P., & Zamboanga, B. L. (2018a). Acculturation and alcohol use among Asian Americans: A meta-analytic review. *Psychology of Addictive Behaviors*, 32, 173–186. doi:10.1037/adb0000340
- Lui, P. P., & Zamboanga, B. L. (2018b). A critical review and meta-analysis of the associations between acculturation and alcohol use outcomes among Hispanic Americans. *Alcoholism, Clinical and Experimental Research*, 42, 1841–1862. doi:10.1111/acer.13845
- Luk, J. W., Emery, R. L., Karyadi, K. A., Patock-Peckham, J. A., & King, K. M. (2013). Religiosity and substance use among Asian American college students: moderated effects of race and acculturation. *Drug and Alcohol Dependence*, 130, 142–149. doi:10.1016/j.drugalcdep.2012.10.023
- Lyu, J., & Lee, S. H. (2014). Alcohol consumption and cognitive impairment among Korean older adults: Does gender matter? *International Psychogeriatrics*, 26, 335–340. doi:10.1017/S1041610213001919
- Mackinnon, S. P., Couture, M., Cooper, M. L., Kuntsche, E., O'Connor, R. M., & Stewart, S. H. (2017). Cross-cultural comparisons of drinking motives in 10 countries: Data from the DRINC project. *Drug and Alcohol Review*, 36, 721–730. doi:10.1111/dar.12464
- Maddock, J. E., Laforge, R. G., Rossi, J. S., & O'Hare, T. (2001). The College Alcohol Problems Scale. *Addictive Behaviors*, 26, 385–398. doi:10.13072/midss.444
- Makimoto, K. (1998). Drinking patterns and drinking problems among Asian-Americans and Pacific Islanders. *Alcohol Health and Research World*, 22, 270–275.
- Mallett, K. A., Varvil-Weld, L., Borsari, B., Read, J. P., Neighbors, C., & White, H. R. (2013).

- An update of research examining college student alcohol-related consequences: new perspectives and implications for interventions. *Alcoholism, Clinical and Experimental Research*, 37, 709–716. doi:10.1111/acer.12031
- Merrill, J. E., & Carey, K. B. (2016). Drinking over the lifespan. *Alcohol Research : Current Reviews*, 38, 103–114.
- Murray, K. E., Klonoff, E. A., Garcini, L. M., Ullman, J. B., Wall, T. L., & Myers, M. G. (2014). Assessing acculturation over time: A four-year prospective study of Asian American young adults. *Asian American Journal of Psychology*, 5, 252–261. doi:10.1037/a0034908
- Nguyen, A.-M. D., & Benet-Martínez, V. (2013). Biculturalism and adjustment: A meta-analysis. *Journal of Cross-Cultural Psychology*, 44, 122–159.
doi:10.1177/0022022111435097
- Nishimura, F. T., Fukunaga, T., Kajiura, H., Umeno, K., Takakura, H., Ono, T., & Nishijo, H. (2002). Effects of aldehyde dehydrogenase-2 genotype on cardiovascular and endocrine responses to alcohol in young Japanese subjects. *Autonomic Neuroscience: Basic & Clinical*, 102, 60–70.
- Oei, T. P. S., & Jardim, C. L. (2007). Alcohol expectancies, drinking refusal self-efficacy and drinking behaviour in Asian and Australian students. *Drug and Alcohol Dependence*, 87, 281–287. doi:10.1016/j.drugalcdep.2006.08.019
- Osberg, T. M., Insana, M., Eggert, M., & Billingsley, K. (2011). Incremental validity of college alcohol beliefs in the prediction of freshman drinking and its consequences: A prospective study. *Addictive Behaviors*, 36, 333–340. doi:10.1016/j.addbeh.2010.12.004
- Park, S.-Y., Anastas, J., Shibusawa, T., & Nguyen, D. (2014). The impact of acculturation and acculturative stress on alcohol use across Asian immigrant subgroups. *Substance Use &*

- Misuse*, 49, 922–931. doi:10.3109/10826084.2013.855232
- Pedersen, E. R., & LaBrie, J. (2006). Drinking game participation among college students: Gender and ethnic implications. *Addictive Behaviors*, 31, 2105–2115.
doi:10.1016/j.addbeh.2006.02.003
- Perkins, H. W. (1999). Stress-motivated drinking in collegiate and postcollegiate young adulthood: Life course and gender patterns. *Journal of Studies on Alcohol*, 60, 219–227.
doi:10.15288/jsa.1999.60.219
- Pham, S. & Lui, P. P. (2019). Acculturation profiles and alcohol use among Hispanic Americans. *Journal of Ethnicity in Substance Abuse*. Advance online publication.
doi:10.1080/15332640.2019.1679316
- Rudmin, F. W. (2003). Critical history of the acculturation psychology of assimilation, separation, integration, and marginalization. *Review of General Psychology*, 7, 250–250.
doi:10.1037/1089-2680.7.3.250
- Rudmin, F. W. (2006). Debate in Science: The Case of Acculturation. *AnthroGlobe Journal*.
- Russell, L. D., & Arthur, T. (2016). “That’s what ‘college experience’ is”: Exploring cultural narratives and descriptive norms college students construct for legitimizing alcohol use. *Health Communication*, 31, 917–925. doi:10.1080/10410236.2015.1018700
- Salas-Wright, C. P., Clark, T. T., Vaughn, M. G., & Córdova, D. (2015). Profiles of acculturation among Hispanics in the United States: Links with discrimination and substance use. *Social Psychiatry and Psychiatric Epidemiology*, 50, 39–49. doi:10.1007/s00127-014-0889-x
- Saunders, J. B., Aasland, O. G., Babor, T. F., & de la Fuente, J. R. (1993). Development of the Alcohol Use Disorders Identification Test (AUDIT): WHO collaborative project on early

- detection of persons with harmful alcohol consumption--II. *Addiction*, 88, 791-804.
- Savage, J. E., & Mezuk, B. (2014). Psychosocial and contextual determinants of alcohol and drug use disorders in the National Latino and Asian American Study. *Drug and Alcohol Dependence*, 139, 71–78. doi:10.1016/j.drugalcdep.2014.03.011
- Schwartz, S. J., Unger, J. B., Zamboanga, B. L., & Szapocznik, J. (2010). Rethinking the concept of acculturation. *The American Psychologist*, 65, 237–251. doi:doi.org/10.1037/a0019330
- Schwartz, S. J., Weisskirch, R. S., Zamboanga, B. L., Castillo, L. G., Ham, L. S., Huynh, Q.-L., ... Cano, M. A. (2011). Dimensions of acculturation: associations with health risk behaviors among college students from immigrant families. *Journal of Counseling Psychology*, 58, 27–41. doi:10.1037/a0021356
- Schwartz, S. J., & Zamboanga, B. L. (2008). Testing Berry's model of acculturation: A confirmatory latent class approach. *Cultural Diversity and Ethnic Minority Psychology*, 14, 275–285. doi:10.1037/a0012818
- Scott-Sheldon, L. A. J., Carey, K. B., & Carey, M. P. (2008). Health behavior and college students: Does Greek affiliation matter? *Journal of Behavioral Medicine*, 31, 61–70. doi:10.1007/s10865-007-9136-1
- Smith, T. B., & Silva, L. (2011). Ethnic identity and personal well-being of people of color: A meta-analysis. *Journal of Counseling Psychology*, 58, 42–60. doi:10.1037/a0021528
- Stephenson, M. (2000). Development and validation of the Stephenson Multigroup Acculturation Scale (SMAS). *Psychological Assessment*, 12, 77–88.
- Suinn, R. M. (2010). Reviewing acculturation and Asian Americans: How acculturation affects health, adjustment, school achievement, and counseling. *Asian American Journal of Psychology*, 1, 5–17. doi:10.1037/a0018798

- Tabachnick, B. G. & Fidell, L. S. (2019). *Using multivariate statistics*. New York, NY: Pearson.
- Tan, A. S. L. (2012). Through the drinking glass: An analysis of the cultural meanings of college drinking. *Journal of Youth Studies*, 15, 119–142. doi:10.1080/13676261.2011.630997
- Vaeth, P. A. C., Wang-Schweig, M., & Caetano, R. (2017). Drinking, alcohol use disorder, and treatment access and utilization among U.S. racial/ethnic groups. *Alcoholism: Clinical and Experimental Research*, 41, 6–19. doi:10.1111/acer.13285
- Ward, B. W., Clarke, T. C., Nugent, C. N., & Schiller, J. S. (2016). *Early release of selected estimates based on data from the 2015 National Health Interview Survey*. Retrieved from <https://letsmove.obamawhitehouse.archives.gov/sites/letsmove.gov/files/>
- Ward, C., & Geeraert, N. (2016). Advancing acculturation theory and research: The acculturation process in its ecological context. *Current Opinion in Psychology*, 8, 98–104. doi:10.1016/j.copsyc.2015.09.021
- Westemeyer, J. (1985). In (Eds. Bennett, L. A. & Ames, G. M.), *The American experience with alcohol: Contrasting cultural perspective* (pp.373-394). New York, NY, US: Plenum Press.
- Wilkinson, A. L., Fleming, P. J., Halpern, C. T., Herring, A. H., & Harris, K. M. (2018). Adherence to gender-typical behavior and high-frequency substance use from adolescence into young adulthood. *Psychology of Men & Masculinity*, 19, 145–155. doi:10.1037/men0000088
- Windle, M., Haardörfer, R., Lloyd, S. A., Foster, B., & Berg, C. J. (2017). Social influences on college student use of tobacco products, alcohol, and marijuana. *Substance Use & Misuse*, 52, 1111–1119. doi:10.1080/10826084.2017.1290116
- Wing, J. Y. (2007). Beyond Black and White: The model minority myth and the invisibility of

- Asian American students. *The Urban Review*, 39, 455–487. doi:10.1007/s11256-007-0058-6
- World Health Organization (2001). AUDIT: The alcohol use disorders identification test: Guidelines for use in primary health care. 2nd ed.
- World Health Organization. (2018). Global status report on alcohol and health. Retrieved from http://www.who.int/substance_abuse/publications/global_alcohol_report/gsr_2018/en/
- Wong, E. C. & Osilla, K. C. (2012). Substance use disorders in Asians. In E. C. Chang (Ed.), *Handbook of adult psychopathology in Asians* (pp.59-82). New York: Oxford University Press.
- Wu, L.-T., & Blazer, D. G. (2015). Substance use disorders and co-morbidities among Asian Americans and Native Hawaiians/Pacific Islanders. *Psychological Medicine*, 45, 481–494. doi:10.1017/S0033291714001330
- Wyatt, T. & Oswalt, S. B. (2013). Comparing mental health issues among undergraduate and graduate students. *American Journal of Health Education*, 44, 96-107. doi: 10.1090/19325037.2013.764248.
- Yoon, E., Chang, C.-T., Kim, S., Clawson, A., Cleary, S. E., Hansen, M., ... Gomes, A. M. (2013). A meta-analysis of acculturation/enculturation and mental health. *Journal of Counseling Psychology*, 60, 15–30. doi:10.1037/a0030652
- Zamboanga, B. L., Lui, P. P., & Pham, S. (in press). Acculturation, enculturation, and bicultural orientations: Conceptualization and links to alcohol use. In G. Nagayama Hall & E. R. Huang (Eds.), *Mental and behavioral health of immigrants in the United States: Cultural, environmental, and structural factors*. Elsevier.
- Zamboanga, B. L., Tomaso, C. C., & Lui, P. P. (2017). Acculturation and alcohol use among

Hispanic and Asian American college students. In Schwartz, S. J., & Unger, J. B. (Eds.), *The Oxford handbook of acculturation and health* (pp. 263-280).

doi:10.1093/oxfordhb/9780190215217.013.19

Zemore, S. E. (2007). Acculturation and alcohol among Latino adults in the United States: A comprehensive review. *Alcoholism, Clinical and Experimental Research*, 31(12), 1968–1990. doi:10.1111/j.1530-0277.2007.00532.x

Table 1

Means, Standard Deviations, Internal Consistency Reliability of, Correlations, Skewness, and Kurtosis for All Study Variables by Gender

Variable	Men	Women		1	2	3	4	5	6	7
	<i>M (SD)</i>	<i>M (SD)</i>	<i>t</i>							
1. Alcohol Consumption	2.69 (2.61)	1.92 (2.06)	3.84**	—	.43**	.53**	.11	.29**	.24**	-.36**
2. Alcohol Dependence	1.04 (1.66)	0.59 (1.06)	3.02**	.26**	—	.61**	.23**	.29**	-.12	-.17*
3. Harmful Alcohol Use	1.69 (2.45)	1.44 (2.15)	1.09	.43**	.58**	—	.25**	.35**	.01	-.14
4. Personal Consequences	8.23 (4.84)	8.32 (5.47)	-0.16	.17*	.39**	.31**	—	.58**	-.17*	-.05
5. Social Consequences	6.18 (3.71)	5.58 (2.85)	1.69	.44**	.41**	.46**	.46**	—	-.05	-.18*
6. <i>Acculturation</i>	3.28 (0.55)	3.47 (0.42)	4.39**	.29**	-.33**	-.06	-.14	.03	—	-.29**
7. <i>Enculturation</i>	2.89 (0.72)	2.61 (0.77)	-4.38**	-.18**	-.07	-.17*	-.06	-.16*	-.04	—
Cronbach's α (Men/Women)				.86/.78	.79/.57	.64/.57	.89/.91	.79/.66	.88/.81	.92/.93
Skewness (SE) for Men				0.84 (.14)	1.81 (.17)	1.64 (.17)	1.11 (.18)	2.36 (.18)	-1.16 (.15)	-0.51 (.15)
Kurtosis (SE) for Men				-0.02 (.29)	2.79 (.34)	2.01 (.34)	0.67 (.35)	6.25 (.35)	1.67 (.29)	-0.48 (.29)
Skewness (SE) for Women				1.11 (.15)	3.15 (.16)	2.69 (.15)	1.34 (.15)	2.89 (.15)	-1.22 (.15)	-0.11 (.15)
Kurtosis (SE) for Women				0.96 (.29)	13.04 (.32)	8.79 (.29)	0.83 (.30)	11.14 (.29)	1.77 (.30)	-1.03 (.30)

Note. Correlations for men are presented below the diagonal ($N = 299$), and correlations for women are presented above the diagonal ($N = 285$). Only participants who reported alcohol consumption in the past year are included in analyses involving alcohol dependence, harmful alcohol use, personal consequences and social consequences for men ($N = 202$) and women ($N = 171$). Correlations in bold indicate statistically significant gender differences. Possible scale scores ranged from 0 to 15 for alcohol consumption and alcohol dependence, 0 to 20 for harmful alcohol use, 4 to 24 for personal and social consequences, and 1 to 4 for *acculturation* and *enculturation*.

* $p < .05$. ** $p < .01$.

Table 2

Means, Standard Deviations, Internal Consistency Reliability of, and Correlations for All Study Variables Across Undergraduate and Graduate Students

Variable	Undergraduate (UG)	Graduate (G)		1	2	3	4	5	6	7
	<i>M (SD)</i>	<i>M (SD)</i>	<i>t</i>							
1. Alcohol Consumption	2.53 (2.56)	1.96 (2.04)	2.92*	—	.45**	.37**	.15	.39**	.09	-.19**
2. Alcohol Dependence	0.63 (0.98)	1.17 (1.89)	-3.17**	.38**	—	.73**	.39**	.48**	-.37**	-.22**
3. Harmful Alcohol Use	1.69 (2.37)	1.39 (2.23)	1.22	.51**	.54**	—	.29**	.34**	-.29**	-.13
4. Personal Consequences	8.28 (5.25)	8.25 (4.93)	0.05	.14*	.29**	.28**	—	.53**	-.28*	.02
5. Social Consequences	5.96 (3.32)	5.77 (3.38)	0.52	.41**	.34**	.48**	.48**	—	-.09	-.19*
6. <i>Acculturation</i>	3.52 (0.38)	3.14 (0.56)	-11.81**	.28**	.06	.13	-.05	.02	—	.13
7. <i>Enculturation</i>	2.49 (0.69)	3.18 (0.65)	8.93**	-.16**	-.11	-.11*	-.10	-.09	-.13**	—
	Cronbach's α (UG/G)			.83/.80	.45/.85	.55/.71	.89/.91	.70/.82	.78/.87	.91/.92
	Skewness (SE) for UG			0.90 (.13)	1.75 (.16)	1.89 (.16)	1.25 (.16)	2.27 (.16)	-1.58 (.13)	0.04 (.13)
	Kurtosis (SE) for UG			0.19 (.27)	2.84 (.32)	3.69 (.32)	0.63 (.32)	6.01 (.32)	0.19 (.26)	4.69 (.27)
	Skewness (SE) for G			1.12 (.17)	1.71 (.20)	1.73 (.20)	1.15 (.21)	3.05 (.21)	-0.79 (.17)	-1.21 (.17)
	Kurtosis (SE) for G			0.79 (.33)	1.95 (.40)	2.18 (.40)	0.84 (.41)	11.71 (.41)	0.71 (.33)	1.36 (.33)

Note. Correlations for undergraduate students are presented below the diagonal ($N = 357$), and correlations for graduate students are presented above the diagonal ($N = 230$). Only participants who reported alcohol consumption in the past year are included in analyses involving alcohol dependence, harmful alcohol use, personal consequences and social consequences for undergraduate ($N = 231$) and graduate students ($N = 144$). Correlations in bold indicate statistically significant differences between undergraduate and graduate students. Possible scale scores ranged from 0 to 15 for alcohol consumption and alcohol dependence, 0 to 20 for harmful alcohol use, 4 to 24 for personal and social consequences, and 1 to 4 for *acculturation* and *enculturation*.

* $p < .05$. ** $p < .01$.

Table 3

Summary of Negative Binomial Regression Analyses Predicting Alcohol Use Outcomes among Undergraduate and Graduate Students

Predictor	<u>Undergraduate</u>					<u>Graduate</u>				
	<i>B</i> (SE)	95% CI	Wald χ^2	Exp(<i>B</i>)	Omnibus χ^2	<i>B</i> (SE)	95% CI	Wald χ^2	Exp(<i>B</i>)	Omnibus χ^2
Outcome: Alcohol Consumption					47.22**					21.75**
Nativity (U.S. born = 0)	-.06 (.08)	[-.31, .19]	.20	.95		-.44 (.20)	[-.83, -.05]	4.94*	.64	
Gender (Man = 0)	-.51 (.13)	[-.72, -.29]	20.88**	.60		-.71 (.18)	[-1.07, -.35]	14.77**	.49	
<i>Acculturation</i>	1.19 (.23)	[.74, 1.64]	26.98**	3.28		.22 (.16)	[-.09, .52]	1.95	1.24	
<i>Enculturation</i>	.01 (.12)	[-.23, .24]	<.01	1.01		-.23 (.15)	[-.51, .06]	2.47	.80	
<i>Acculturation</i> x <i>Enculturation</i>	-.03 (.29)	[-.59, .53]	.01	.97		-.07 (.17)	[-.41, .27]	.16	.93	
<i>Acculturation</i> x Gender	-.46 (.34)	[-1.12, .21]	1.83	.63		-.13 (.32)	[-.75, .49]	.17	.88	
<i>Enculturation</i> x Gender	-.35 (.17)	[-.68, -.02]	4.24*	.71		-.43 (.26)	[-.93, .07]	2.84	.65	
<i>Acculturation</i> x <i>Enculturation</i> x Gender	-.27 (.45)	[-1.14, .61]	.36	.76		.58 (.37)	[-.14, 1.30]	2.48	1.78	
Outcome: Alcohol Dependence					8.36					41.78**
Nativity (U.S. born = 0)	-.09 (.24)	[-.55, .38]	.13	.92		-.32 (.43)	[-1.17, .53]	.55	.73	
Gender (Man = 0)	-.20 (.24)	[-.67, .27]	.70	.82		-1.56 (.42)	[-2.38, -.74]	13.88**	.21	
<i>Acculturation</i>	.62 (.59)	[-.54, 1.78]	1.09	1.86		-.70 (.27)	[-1.23, -.17]	6.72*	.50	
<i>Enculturation</i>	-.28 (.22)	[-.71, .14]	1.69	.75		-.35 (.29)	[-.92, .22]	1.43	.71	
<i>Acculturation</i> x <i>Enculturation</i>	-.16 (.67)	[-1.48, 1.16]	.06	.85		.24 (.42)	[-.58, 1.06]	.34	1.28	
<i>Acculturation</i> x Gender	-.53 (.79)	[-2.07, 1.01]	.46	.59		-.64 (.60)	[-1.83, .54]	1.14	.53	
<i>Enculturation</i> x Gender	-.20 (.29)	[-.77, .38]	.45	.82		-1.06 (.42)	[-1.88, -.24]	6.45*	.35	
<i>Acculturation</i> x <i>Enculturation</i> x Gender	1.44 (.89)	[-.31, 3.18]	2.60	4.20		-.22 (.55)	[-1.30, .88]	.15	.81	
Outcome: Harmful Alcohol Use					11.83					29.06**
Nativity (U.S. born = 0)	.26 (.22)	[-.17, .68]	1.40	1.29		.23 (.49)	[-.72, 1.19]	.23	1.26	
Gender (Man = 0)	-.05 (.20)	[-.44, .35]	.06	.95		-.90 (.43)	[-1.73, -.07]	4.51*	.41	
<i>Acculturation</i>	.69 (.55)	[-.39, 1.77]	1.57	1.99		-.49 (.29)	[-1.06, .08]	2.82	.61	
<i>Enculturation</i>	-.35 (.21)	[-.76, .05]	2.97	.70		-.38 (.28)	[-.93, .18]	1.77	.69	

<i>Acculturation</i> x <i>Enculturation</i>	-.29 (.68)	[-1.62, 1.04]	.18	.75		-.10 (.33)	[-.74, .54]	.09	.91	
<i>Acculturation</i> x Gender	-.16 (.71)	[-1.54, 1.23]	.05	.86		-.44 (.61)	[-1.64, .75]	.53	.64	
	<u>Undergraduate</u>					<u>Graduate</u>				
Predictor	<i>B</i> (SE)	95% CI	Wald χ^2	Exp(<i>B</i>)	Omnibus χ^2	<i>B</i> (SE)	95% CI	Wald χ^2	Exp(<i>B</i>)	Omnibus χ^2
<i>Enculturation</i> x Gender	.17 (.29)	[-.39, .73]	.34	1.18		-.48 (.42)	[-1.31, .35]	1.27	.62	
<i>Acculturation</i> x <i>Enculturation</i> x Gender	.91 (.87)	[-.80, 2.61]	1.09	2.47		.68 (.55)	[-.39, 1.75]	1.54	1.97	
Outcome: Personal Consequences					3.88					3.96
Nativity (U.S. born = 0)	.05 (.10)	[-.15, .25]	.25	1.05		-.14 (.15)	[-.43, .16]	.82	.87	
Gender (Man = 0)	.10 (.09)	[-.08, .27]	1.21	1.10		-.06 (.13)	[-.31, .19]	.22	.94	
<i>Acculturation</i>	.14 (.19)	[-.23, .51]	.57	1.15		-.25 (.10)	[-.44, -.05]	6.28*	.78	
<i>Enculturation</i>	-.09 (.11)	[-.30, .13]	.64	.92		.04 (.10)	[-.17, .24]	.14	1.04	
<i>Acculturation</i> x <i>Enculturation</i>	-.29 (.29)	[-.86, .28]	1.01	.75		.02 (.09)	[-.17, .21]	.04	1.02	
<i>Acculturation</i> x Gender	-.52 (.27)	[-1.05, -.01]	3.86*	.59		-.22 (.20)	[-.61, .17]	1.26	.80	
<i>Enculturation</i> x Gender	-.10 (.14)	[-.37, .18]	.45	.91		.10 (.15)	[-.19, .38]	.45	1.10	
<i>Acculturation</i> x <i>Enculturation</i> x Gender	.84 (.37)	[.12, 1.57]	5.18*	2.33		-.33 (.17)	[-.67, .02]	3.50	.72	
Outcome: Social Consequences					2.68					4.86
Nativity (U.S. born = 0)	.15 (.09)	[-.03, .33]	2.57	1.16		-.19 (.15)	[-.49, .11]	1.49	.83	
Gender (Man = 0)	-.08 (.07)	[-.22, .06]	1.13	.93		-.24 (.07)	[-.38, -.10]	11.12**	.79	
<i>Acculturation</i>	.15 (.17)	[-.19, .49]	.78	1.17		.09 (.08)	[-.06, .25]	1.34	1.10	
<i>Enculturation</i>	-.09 (.08)	[-.24, .07]	1.15	.92		-.18 (.10)	[-.38, .02]	3.29	.83	
<i>Acculturation</i> x <i>Enculturation</i>	-.31 (.20)	[-.70, .08]	2.42	.73		.23 (.11)	[.02, .45]	4.67*	1.26	
<i>Acculturation</i> x Gender	-.28 (.23)	[-.73, .17]	1.52	.76		-.43 (.13)	[-.68, -.17]	10.82**	.65	
<i>Enculturation</i> x Gender	-.03 (.10)	[-.23, .17]	.11	.97		.11 (.12)	[-.12, .35]	.88	1.12	
<i>Acculturation</i> x <i>Enculturation</i> x Gender	.61 (.30)	[.03, 1.19]	4.27*	1.84		-.48 (.16)	[-.79, -.18]	9.54**	.62	

* $p < .05$, ** $p < .005$

BICULTURAL ORIENTATIONS AND ALCOHOL USE OUTCOMES

Figure 1. Personal drinking-related consequences (possible scores ranged from 4-24) as a function of by *acculturation*, *enculturation*, and gender among Asian American undergraduate students. Low and high levels of *acculturation* and *enculturation* are calculated as 1 SD below and above their respective means.

BICULTURAL ORIENTATIONS AND ALCOHOL USE OUTCOMES

Figure 2. Social drinking-related consequences (possible scores ranged from 4 to 24) as a function of *acculturation*, *enculturation*, and gender among Asian American undergraduate students Low and high levels of *acculturation* and *enculturation* are calculated as 1 SD below and above their respective mea

BICULTURAL ORIENTATIONS AND ALCOHOL USE OUTCOMES

Figure 3. Social drinking-related consequences (possible scores ranged from 4 to 24) as a function of *acculturation*, *enculturation*, and gender among Asian American graduate students. Low and high levels of *acculturation* and *enculturation* are calculated as 1 SD below and above their respective means.

BICULTURAL ORIENTATIONS AND ALCOHOL USE OUTCOMES

Supplemental Table 1

Negative Binomial Regression Analyses Predicting Alcohol Use Outcomes among Undergraduate and Graduate Students Without Nativity as a Covariate

Predictor	Undergraduate					Graduate				
	<i>B</i> (SE)	95% CI	Wald χ^2	Exp (<i>B</i>)	Omnibus χ^2	<i>B</i> (SE)	95% CI	Wald χ^2	Exp (<i>B</i>)	Omnibus χ^2
Outcome: Alcohol Consumption					47.11**					19.07*
Gender (Man = 0)	-.50 (.11)	[-.72, -.29]	20.84**	.60		-.66 (.18)	[-1.00, -.31]	13.63**	.52	
<i>Acculturation</i>	1.19 (.23)	[.74, 1.64]	26.57**	3.28		.27 (.17)	[-.06, .60]	2.57	1.31	
<i>Enculturation</i>	-.01 (.12)	[-.24, .23]	.01	.99		-.33 (.14)	[-.60, -.06]	5.54*	.72	
<i>Acculturation</i> x <i>Enculturation</i>	-.02 (.28)	[-.57, .54]	<.01	.99		-.09 (.18)	[-.44, .26]	.25	.91	
<i>Acculturation</i> x Gender	-.45 (.34)	[-1.11, .22]	1.73	.64		.01 (.34)	[-.65, .67]	<.01	1.01	
<i>Enculturation</i> x Gender	-.34 (.17)	[-.67, -.01]	4.08	.71		-.45 (.26)	[-.96, .06]	2.95	.64	
<i>Acculturation</i> x <i>Enculturation</i> x Gender	-.28 (.44)	[-1.15, .60]	.38	.76		.60 (.40)	[-.18, 1.38]	2.30	1.83	
Outcome: Alcohol Dependence					8.27					40.99**
Gender (Man = 0)	-.20 (.24)	[-.67, .27]	.68	.82		-1.48 (.39)	[-2.25, -.71]	14.29**	.23	
<i>Acculturation</i>	.61 (.60)	[-.56, 1.78]	1.05	1.84		-.65 (.32)	[-1.27, -.04]	4.33*	.52	
<i>Enculturation</i>	-.29 (.21)	[-.71, .13]	1.87	.75		-.41 (.28)	[-.95, .14]	2.16	.67	
<i>Acculturation</i> x <i>Enculturation</i>	-.15 (.68)	[-1.45, 1.18]	.05	.87		.27 (.48)	[-.66, 1.21]	.33	1.31	
<i>Acculturation</i> x Gender	-.52 (.79)	[-2.06, 1.03]	.43	.60		-.56 (.59)	[-1.72, .61]	.88	.57	
<i>Enculturation</i> x Gender	-.18 (.28)	[-.73, .38]	.39	.84		-1.03 (.42)	[-1.85, -.21]	6.12*	.36	
<i>Acculturation</i> x <i>Enculturation</i> x Gender	1.41 (.89)	[-.33, 3.16]	2.52	4.11		-.26 (.61)	[-1.46, .94]	.18	.77	
Outcome: Harmful Alcohol Use					10.44					28.64**
Gender (Man = 0)	-.08 (.20)	[-.47, .32]	.93	.96		-.94 (.41)	[-1.74, -.13]	5.22*	.39	
<i>Acculturation</i>	.79 (.55)	[-.28, 1.87]	2.21	1.34		-.52 (.31)	[-1.12, .08]	2.91	.59	
<i>Enculturation</i>	-.30 (.21)	[-.71, .10]	.74	.79		-.33 (.24)	[-.80, .15]	1.83	.72	
<i>Acculturation</i> x <i>Enculturation</i>	-.39 (.63)	[-1.62, .83]	.39	.68		-.09 (.30)	[-.69, .50]	.10	.91	
<i>Acculturation</i> x Gender	-.28 (.71)	[-1.67, 1.11]	.76	1.01		-.51 (.55)	[-1.60, .35]	.85	.60	
<i>Enculturation</i> x Gender	.11 (.28)	[-.45, .66]	1.12	1.06		-.49 (.42)	[-1.32, .35]	1.31	.62	
<i>Acculturation</i> x <i>Enculturation</i> x Gender	.95 (.83)	[-.68, 2.58]	1.31	2.59		.67 (.54)	[-.38, 1.71]	1.55	1.95	

BICULTURAL ORIENTATIONS AND ALCOHOL USE OUTCOMES

(Cont.)										
Predictor	Undergraduate					Graduate				
	<i>B</i> (SE)	95% CI	Wald χ^2	Exp (<i>B</i>)	Omnibus χ^2	<i>B</i> (SE)	95% CI	Wald χ^2	Exp (<i>B</i>)	Omnibus χ^2
Outcome: Personal Consequences					3.80					
Gender (Man = 0)	.10 (.09)	[-.08, .27]	1.22	1.11		-.03 (.12)	[-.27, .21]	.08	.97	
<i>Acculturation</i>	.14 (.18)	[-.23, .50]	.58	1.15		-.23 (.11)	[-.44, -.01]	4.34*	.80	
<i>Enculturation</i>	-.08 (.11)	[-.29, .13]	.55	.93		.01 (.10)	[-.18, .20]	.02	1.01	
<i>Acculturation</i> x <i>Enculturation</i>	-.30 (.28)	[-.85, .24]	1.18	.74		.02 (.10)	[-.18, .23]	.04	1.02	
<i>Acculturation</i> x Gender	-.53 (.26)	[-1.05, -.02]	4.08*	.59		-.21 (.20)	[-.59, .18]	1.10	.82	
<i>Enculturation</i> x Gender	-.10 (.14)	[-.38, .17]	.54	.90		.08 (.15)	[-.21, .38]	.30	1.09	
<i>Acculturation</i> x <i>Enculturation</i> x Gender	.85 (.36)	[.14, 1.56]	5.48*	2.34		-.31 (.18)	[-.66, .04]	3.10	.73	
Outcome: Social Consequences					2.03					
Gender (Man = 0)	-.08 (.07)	[-.22, .06]	1.24	.92		-.21 (.06)	[-.33, -.09]	11.50**	.81	
<i>Acculturation</i>	.17 (.17)	[-.17, .50]	.91	1.18		.13 (.11)	[-.08, .35]	1.44	1.14	
<i>Enculturation</i>	-.06 (.08)	[-.23, .10]	.52	.94		-.22 (.09)	[-.41, -.04]	5.76*	.80	
<i>Acculturation</i> x <i>Enculturation</i>	-.32 (.18)	[-.67, .03]	3.24	.73		.25 (.13)	[-.01, .50]	3.53	1.29	
<i>Acculturation</i> x Gender	-.32 (.23)	[-.77, .13]	1.96	.73		-.40 (.13)	[-.66, -.15]	9.90**	.67	
<i>Enculturation</i> x Gender	-.06 (.11)	[-.27, .15]	.35	.94		.11 (.12)	[-.13, .35]	.85	1.12	
<i>Acculturation</i> x <i>Enculturation</i> x Gender	.60 (.27)	[.07, 1.13]	4.88*	1.82		-.49 (.17)	[-.82, -.16]	8.39**	.44	

Note. *N* = 324 for alcohol consumption, and *N* = 216-220 for alcohol-related problems in undergraduate sample. *N* = 205 for alcohol consumption, and *N* = 136-137 for alcohol-related problems in graduate student sample.

p* < .05, *p* < .005

BICULTURAL ORIENTATIONS AND ALCOHOL USE OUTCOMES

Supplementary Figure 1. Alcohol consumption (possible scores ranged from 0 to 15) as a function of *enculturation* and gender among Asian American undergraduate students. Low and high levels of *enculturation* are plotted 1 SD below and above the mean.

BICULTURAL ORIENTATIONS AND ALCOHOL USE OUTCOMES

Supplementary Figure 2. Alcohol dependence symptoms (possible scores ranged from 0 to 15) as a function of *enculturation* and gender among Asian American graduate students. Low and high levels of *enculturation* are plotted 1 SD below and above the mean.