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The Gender Difference in the Association between Early Onset of Drinking and Problem Drinking between the U.S. and Japan*

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Abstract

Using comparable survey data from the GENACIS Project, collected from representative samples of people aged 20 to 70 years old in the U.S. ($n=2,598$) and Japan ($n=1,734$), this study examined, across these two diverse societies, the gender difference in the association between the early onset of drinking and the development of drinking problems. The results of this study suggest that there does not appear to be a cross-national causal relationship between the early onset of drinking and problem drinking because of significant country and gender variations in this association and because there is no association found among Japanese females. As hypothesized, the early onset of drinking predicted problem drinking among males more strongly than among females in both countries.

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Though alcohol is consumed widely worldwide, the prevalence of disorders resulting from alcohol consumption is quite high, afflicting about 4.1% of the world population aged 15 years and older (World Health Organization 2014). Besides alcohol use disorder (AUD), defined by the *Diagnostic and Statistical Manual of Mental Disorders-5* (DSM-5), alcohol consumption, especially heavy and chronic consumption, is associated with numerous negative health and social consequences, such as increased morbidity and mortality, decreased economic productivity, increased accidents, violence, and problems with relationships and other aspects of social life (World Health Organization 2014). According to the World Health Organization (2014), about 5.9% of all deaths that occurred globally in 2012 were attributable to alcohol use.

A number of studies of factors that predict the development of AUD have found that the early onset of alcohol use is one of the best predictors (e.g., Agrawal *et al.* 2009; Bonomo *et al.* 2004; Dawson *et al.* 2008; Grant and Dawson 1997; Hingson *et al.* 2006 Thomas *et al.* 2000). A similar finding was reported within criminology, where the early onset of delinquency, defined usually as an arrest or a contact with the police before age 14 years old (Tibbetts and Piquero 1999), was found to be one of the best predictors of later criminality and serious, chronic offending during adulthood (Moffitt 1993; Piquero *et al.* 2002).

Although the processes through which the early onset of alcohol use and the development of AUD are associated are not well understood (Rossow and Kuntsche 2013), there are three major groups of explanations for this association (National Institute on Alcohol Abuse and Alcoholism 2000). One group offers causal explanations focused on *biochemical effects* of alcohol consumed during formative years of a youth's development (e.g., on cognitive development) that increase the susceptibility to developing problems with drinking alcohol later in life. Another group focuses on *psychiatric precursors*, such as personality disorders, that explain both the early onset of alcohol use and the development of problems with alcohol use later in life, as well as a high co-occurrence of a mental disorder and AUD in an individual (Kessler *et al.* 1996; Ross *et al.* 1997). Finally, the last group focuses on *socio-psychological factors*, such as the association with delinquent peers or low self-control, that increase the risk for both the early onset of alcohol use and the subsequent development of problems with alcohol use (e.g., Costello *et al.* 2014; Desmond *et al.* 2012; Reisig and Pratt 2011). Often called "problem behavior syndrome" (Jessor and Jessor 1977) or "generality of deviance" (Osgood *et al.* 1988), socio-psychological explanations emphasize the frequency and the persistency of deviance in general, including but not limited to deviance related to alcohol use, that is a manifestation of the "problem behavior syndrome," which also explains both the early onset of delinquency and the continued criminal offending during adulthood.

Using comparable self-report survey data collected among people aged 20 to 70 years old in the U.S. and Japan, this study examines, across these two diverse societies, the gender difference in how the early onset of drinking is associated with the development of problem drinking. Twelve measures of problem drinking used in this study closely resemble the criteria used in the DSM-5 to identify AUD and comprise two groups: experiences of problem drinking (e.g., drinking enough to feel nausea or blackout) and harmful effects of problem drinking on various aspects of one's life (e.g., family, finance, and work). Furthermore, two measures of onset of alcohol use, including the age of onset of drinking

and the early onset of drinking (began drinking before age 14), are compared for their utility in predicting the development of problem drinking. Finally, the age of onset of drinking that best predicts the development of problem drinking calculated for males and females in the two countries separately and compared.

Early Onset of Drinking

With an emergence of longitudinal research and an increasing realization of the importance of developmental process in understanding delinquency and crime, a number of studies have found that the early onset of delinquency is one of the best predictors of criminality and serious, chronic offending during adulthood (Tibbetts and Piquero 1999). In a similar vein, researchers have increasingly focused on the developmental process of alcohol use/misuse and AUD and found that the early onset of alcohol use is one of the best predictors of the experience of problems with alcohol use (e.g., DeWit *et al.* 2000; Warner and White 2003). This association is also found in studies outside of the U.S., including in Japan (Takakura and Wake 2003), and it is found irrespective of preexisting psychological and other health problems (Liang and Chikritzhs 2012; 2014), a finding that is contrary to the psychiatric-precursors explanation. Indeed, delaying the consumption of alcohol is advocated by many as an effective way to prevent the development of AUD (Bonomo *et al.* 2004), perhaps assuming causal, long-lasting biochemical effects of alcohol use on a youth's development. A number of studies, moreover, have found an association between the early onset of alcohol use and engagement in violence, substance use, and other delinquent and criminal behaviors (Ellickson *et al.* 2003; Hingson 2004), suggesting that the early onset of alcohol use may be a manifestation of the underlying "problem behavior syndrome" that explains deviance in general and not just deviance related to alcohol use.

This study examines, between gender and across country, the association between the early onset of drinking and the development of problem drinking using two measures of onset of drinking. The first and the most commonly used measure is the age when respondents drank alcohol (more than just sips) for the first time (see, for instance, Warner and White 2003). The second measure is created based on the popular measure of early onset of delinquency that sets the cutoff age as 14 years. A number of empirical studies of alcohol use also used the cutoff age of 14 to define early onset of drinking (e.g., Dawson *et al.* 2008; Hingson *et al.* 2006). Indeed, the 2014 National Survey on Drug Use and Health (NSDUH) found that the prevalence of alcohol dependence or abuse (called AUD in DSM-5) among people aged 18 or older was 15.4% for those who began drinking at age 14 or younger and 3.8% for those who began drinking at age 18 or older (Center for Behavioral Health Statistics and Quality 2015a). Setting the cutoff age at 14 years, instead of the legal drinking age¹, is crucial for this study because many people in both the U.S. and Japan begin drinking alcohol before the legal drinking age. About 36% of 12th graders in the U.S. in 2015 (Johnston *et al.*, 2015) and about 27% of 12th graders in Japan in 2008 (Ooida *et al.* 2010), for instance, reported drinking alcohol in the 30-days prior to the survey.

¹It is not easy to measure the early onset of drinking based on the drinking law because the legal age of drinking differs in the U.S., where it is 21 years old, and in Japan, where it is 20 years old, and has changed over time and varied by state in the U.S. until the passage of the Federal Uniform Drinking Age Act in 1988.

Because this study utilizes samples with the age range from 20 years to 70 years old, respondent's current age is included in all analyses to control for a greater opportunity older respondents have had to develop a bad drinking habit² compared to younger respondents. Longitudinal studies have, moreover, found that the predictive power of the early onset of drinking on the development of drinking problems diminishes as people get older and more proximate risk factors become more relevant than do distal risk factors like the age of onset of drinking (Labouvie and White 2002). It is, therefore, important to control for respondent's current age, and though this study utilizes cross-sectional data rather than longitudinal data, the interaction terms between age and two measures of onset of drinking are used to examine the age or the cohort difference in how the age of onset of drinking is associated with problem drinking.

Controlling for the respondents' current age also attempts to take into account the fact that the average age at first use of alcohol in the population might have changed, and likely got younger, over time, though alcohol use in general, especially among youth, has been declining in recent years in the U.S. The *Monitoring the Future Survey*, for instance, reports that the overall prevalence of alcohol use among youth has been declining between 1975 and 2015 (Johnson *et al.* 2016). The 2014 NSDUH also reports that between the years 2002–2014, the lifetime prevalence of alcohol use among persons aged 12 to 20, the prevalence of AUD among all age groups, and underage drinking overall have all been declining, while the average age at first use of alcohol has increased slightly during that time (Center for Behavioral Health Statistics and Quality 2015b). These possible age and cohort variations in the age of onset of drinking, and thus its relationship with problem drinking, are reasons for controlling for the respondent's current age in all analyses. Using two measures of the onset of drinking, this study examines differences between the U.S. and Japan in gender-specific associations between the early onset of drinking and later problem drinking.

Gender and Alcohol Consumption

One of the most consistent correlates in criminology is gender; the gender difference in crime and deviance is found irrespective of the types of data and over time and space (Gottfredson and Hirschi 1990). Males and females differ in terms of both rates and patterns of crime and deviance. Males overall engage in crime and deviance at higher rates than females (Gottfredson and Hirschi 1990; Steffensmeier *et al.* 1989), and the more serious, violent, and strongly condemned the behavior, the wider the gender difference (Daly 1998; Hirtenlehner *et al.* 2014; Steffensmeier and Allan 1996; Steffensmeier and Streifel 1991; Sutherland *et al.* 1992).

Because alcohol use is pervasive and is not ordinarily considered a serious, violent, and strongly condemned behavior in the U.S., the gender difference in its prevalence is relatively small (the gender difference in alcohol use in Japan is discussed later). According to the 2014 NSDUH, for instance, the percentage of lifetime alcohol use among people aged 12 or older in the U.S. was 84.6% for males and 79.8% for females (Center for Behavioral Health

²All twelve measures of problem drinking used for this study are *past 12-months* experiences, thus, irrespective of the current age, all respondents have the same 12-month-period opportunity to experience problem drinking.

Statistics and Quality 2015b). Similar to the gender-difference pattern in deviance more generally, the gender difference tends to be greater for more problematic drinking behaviors, however, such as binge drinking (30.0% for males and 16.4% for females)³, heavy alcohol use (9.3% for males and 3.2% for female)⁴, and driving under the influence (13.7% for males and 7.4% for females)⁵, and also for its harmful consequences, such as the development of alcohol dependence or abuse (8.5% for males and 4.4% for females)⁶ and receiving alcohol use treatment (1.4% for males and 0.7% for males)⁷ (Center for Behavioral health Statistics and Quality 2015b).

Interestingly, the gender difference in substance use, including alcohol use, tends to be smaller among youth compared to older populations, reflecting the higher prevalence of deviance in general among youth, peaking around late teens to early twenties. The 2014 NHSDUH, for instance, reports that the lifetime prevalence of drinking among people aged 12 to 20 years old in the U.S. was 42.9% for males and 45.4% for females and the mean age of first alcohol use was 17.4 years old for males and 17.7 years old for females (Center for Behavioral Health Statistics and Quality 2015b). Like the age of onset of drinking, the gender difference in alcohol use has possibly decreased over time. According to the Monitoring the Future Survey reports, for instance, there was a 23 percentage-point difference between male and female 12th graders in the prevalence of “having five or more drinks in a row” in 1975 and the gender difference shrunk to 5 percentage-point difference in 2014 (Johnson *et al.* 2015). Perhaps because the gender difference in alcohol use is small among youth, especially in more recent years, some empirical studies have found a significant gender difference in the age of onset of drinking, with males overall began drinking at a younger age (Pedersen and Skrondal 1988; York 1995), but other empirical studies have found no such gender difference (Flory *et al.* 2004; Samson *et al.* 1989).

Additionally, although the early onset of alcohol use is one of the best predictors of the development of AUD and other drinking problems for both genders, the effectiveness of this prediction might vary by gender. For instance, some studies have found that the early onset of drinking predicts the development of AUD and other drinking problems of males more effectively than those of females (Pitkänen *et al.* 2008; Warner and White 2003). Though empirical studies that examine the developmental process of delinquency and crime among females are limited (see a meta-analysis by Fontaine *et al.* 2009), such studies also report that the early onset of delinquency predicts the continued offending of crime during adulthood among males more effectively than among females. In fact, some studies have found no association between the early onset of delinquency and serious offending during adulthood among females (e.g., Piquero and Chung 2001). The gender difference in the predictive power of the early onset of delinquency on crime is, however, consistent with the general finding within criminology, which indicates that associations between many theoretical variables and delinquency/crime are overall stronger for males than for females (e.g., Alarid *et al.* 2000; Heimer and DeCoster 1999; Mears *et al.* 1998; Morash 1986;

³The percentages are past-month prevalence among people aged 12 or older.

⁴The percentages are past-month prevalence among people aged 12 or older.

⁵The percentages are past-year prevalence among people aged 12 or older.

⁶The percentages are past-year prevalence among people aged 12 or older.

⁷The percentages are past-year prevalence among people aged 12 or older.

Piquero *et al.* 2005). Such gendered association is often explained by the lower susceptibility among females than among males to negative influences that increase the risks of deviance (e.g., Mears *et al.* 1998; Piquero *et al.* 2005).

This study examines the gender difference in the association between the early onset of drinking and the development of problem drinking. Based on the review of the literature, it is hypothesized that the early onset of drinking is more strongly associated with the development of problem drinking among males than among females. Going a step further, using comparable self-report survey data collected among representative samples of people aged 20 to 70 years old in the U.S. and Japan, the examination of the gender difference in the association is extended to the cross-national level and compared across these two diverse societies.

Country and Alcohol Consumption

Japan offers an interesting cross-national contrast to Western industrialized societies for social science research because of the similarities in terms of modernization and subsequent economic, political, and structural change but differences in terms of culture (Nakane 1970; Reischauer 1988). For instance, the two countries differ in level of gender inequality, with Japan exhibiting greater gender inequality in terms of division of labor (Ochiai 2014), attitude toward gender roles (Treas and Widmer 2000), and participation in higher education (OECD 2004) and the labor market (United Nations Statistics Division 2007), as compared to the U.S.

Empirical studies report a greater overall gender difference in alcohol use and other deviance in societies that exhibit a gender inequality than in egalitarian societies (Gefou-Madianou 1992; Kashima *et al.* 1995; Nayak *et al.* 2003; Wilsnack *et al.* 2000). Kitano *et al.* (1992), for instance, found more tolerance toward heavy drinking by men but less tolerance toward drinking by women among Japanese who live in Japan compared to Japanese who live in Hawaii or California. The same study also found that gender and country differences in the amount of alcohol consumed corresponded to group differences in drinking norms, such that “[t]hose who drank the most also had the most permissive norms toward drinking” (Kitano *et al.* 1992: 33). Therefore, the hypothesized gender difference in the early onset of drinking and problem drinking as well as its association are all expected to be greater in Japan than in the U.S. (though, Kobayashi *et al.* 2008 argue that the gender difference in general deviance is smaller in Japan than in the U.S.). Indeed, a national survey conducted by the Japanese Ministry of Health, Labour and Wellness showed that the gender difference in the prevalence of alcohol use among people 15 years old and older in Japan (84% for males and 64% for females) (Higuchi 2006) was greater than the previously mentioned gender difference found in the U.S. (84% for males, 79% for females). If the hypothesized gender difference in the association between the early onset of drinking and problem drinking is greater in Japan than in the U.S., such a finding could offer some support for the socio-psychological explanation because the country difference can be attributed not to biological differences⁸, but rather to structural and cultural differences between the two countries.

Perhaps females' lower susceptibility (compared to males) to negative influences (e.g., the early onset of drinking) toward deviance (e.g., problem drinking) overall, which could explain their weaker associations overall among theoretical variables and deviance, derives from constraining influences of gender norms against engaging in behaviors that are contrary to such norms. In fact, one of the authors of this study found in another study that gender, as a variable in multivariate models, works like morality in preventing deviant peers from increasing the likelihood of engaging in deviance (Tedor 2015). If the hypothesized gender difference in the association between the early onset of drinking and problem drinking is greater in Japan than in the U.S., such a finding could suggest the stronger adherence to the gender norms surrounding drinking in Japan compared to the U.S.

Based on the literature to date, the following four hypotheses were generated and tested in this study.

1. Those who begin drinking at an early age are more likely to experience problem drinking than those who begin drinking at a later age.
2. Males are more likely than females to begin drinking at an early age and experience problem drinking.
3. The relationship between the early onset of drinking and problem drinking is stronger for males than for females.
4. The hypothesized gender differences (Hypotheses 2 and 3) are all greater in Japan compared to the U.S.

Method

Data and Sample

The data to test the four hypotheses come from *Gender, Alcohol, and Culture: An International Study* (GENACIS; see Wilsnack 2012 for more information on this project). A comparable survey created for GENACIS was given to nationally-representative samples of people aged 20 to 70 years old in the U.S. and Japan. Because this study examines problem drinking that drinking respondents have experienced within 12 months prior to the survey, individuals who had never consumed alcohol and those who drank alcohol less than once a year ($n=290$ or 14.66% of U.S. males; $n=696$ or 29.77% of U.S. females; $n=54$ or 4.85% of Japanese males; and $n=170$ or 14.91% of Japanese females) were excluded. The implications of difference in the prevalence of lifetime abstainers and non-current drinkers for this study are discussed later. Additionally, respondents with missing values for the age when they drank alcohol for the first time or for the majority of items measuring problem drinking ($n=13$ U.S. respondents and $n=159$ Japanese respondents) were excluded. After the exclusions, the analyses were conducted based on 2,598 U.S. and 1,734 Japanese respondents. All variables were created separately by country with missing values of each variable imputed with either the mode or the mean of the variable of the respective country.

⁸Though see a review of explanations for the lower alcohol consumption among Asian Americans compared to the national average in the U.S., which includes a biochemical explanation (Caetano *et al.* 1998).

Measures

Demographic variables—Besides dummy variables for *country* (U.S.=1) and *gender* (males=1), six variables that capture socio-demographic variations across the two samples were created as control variables. *Age* is an interval variable⁹, and the other five control variables are dummy variables: *marital status* (married or live with a partner=1), *underage child* (living with at least one child younger than age 18=1), *educational attainment* (some college or higher=1), *household income* (greater than the median household income category¹⁰=1), and *employment status* (employed full time=1). Descriptive statistics of these six control variables and *gender* were calculated separately by *country* (results not shown). Compared to the Japanese sample, the U.S. sample was significantly younger ($t=-13.66$, $p<.001$) and had significantly higher proportions of those who lived with at least one underage child ($\chi^2=185.79$, $p<.001$) and those who earned more than the sample median category of income ($\chi^2=25.88$, $p<.001$). In addition, the U.S. sample had significantly lower proportions of those who were married or lived with a partner ($\chi^2=-13.66$, $p<.001$) and were employed full time ($\chi^2=75.74$, $p<.001$) than the Japanese sample. Because the two samples varied across these important socio-demographic characteristics that are associated with alcohol use, all multivariate models controlled for these six variables.

Onset of drinking—Two measures of the onset of alcohol use were created. First, *age of onset of drinking*¹¹ is an interval variable that reflects the age when respondents drank alcohol for the first time (mean=18.80, $S.D.=5.01$ years for the U.S. sample; mean=18.95, $S.D.=4.75$ years for the Japanese sample). Second, a dummy variable measuring *early onset of drinking* was created with a cutoff set at first drink before age 14 years. Those who began drinking before age 14 years were coded as one (6.35% of U.S. respondents, 5.77% of Japanese respondents).

Problem drinking—Twelve items used to measure problem drinking closely resemble the criteria used in the DSM-5 to determine the severity of AUD. These twelve items measure two major aspects of problem drinking: experiences of problem drinking and harmful effects of problem drinking. Seven items measure respondent's experiences in the past 12 months with alcohol-related behaviors indicative of heavy and dependent drinking. Each item is coded as "yes" (1) or "no" (0) for the following seven behaviors: "drunk enough to feel the effects of the alcohol," "felt sick as a result of drinking," "taken a drink to get over any of the bad aftereffects of drinking," "found that you were not able to stop drinking once you had started," "needed a first drink in the morning to get yourself going after a heavy drinking session," "had a feel of guilt or remorse after drinking," and "been unable to remember what happened the night before because you had been drinking." The *experiences of problem drinking* scale was created by summing the z-score transformations of these seven items ($\alpha=0.64$, mean=0.56, $S.D.=4.25$ for the U.S. males; $\alpha=0.60$, mean=-0.39,

⁹The Japanese sample was limited to respondents who are between the ages of 20 to 70 years old, thus we also limited the U.S. sample to include the respondents in the same age range (excluded are 173 respondents who are younger than 20 years of age and 431 respondents are older than 70 years of age, constituted about 12.28% of the sample).

¹⁰The median household income category for this study for the U.S. sample was \$20,001 and for the Japanese sample was ¥76 million, calculated separately for each sample.

¹¹The U.S. survey asked "About how old were you when you first started drinking alcoholic beverages, not including small tastes?" The Japanese survey asked "How old were you when you first began drinking, more than just a sip or a taste?"

$S.D.=3.27$ for the U.S. females; $\alpha=0.69$, mean=0.79, $S.D.=4.87$ for Japanese males; and $\alpha=0.71$, mean=-1.34, $S.D.=3.35$ for Japanese females). The remaining five items measure harmful effects of drinking respondents experienced in the past 12 months. Each item is coded as “yes” (1) or “no” (0) for harmful effects of drinking on the following five aspects of respondents’ lives: work and education, marriage or intimate relationships, friendship or social life, physical health, and finances. The *harmful effects of problem drinking* scale was created by summing the z-score transformations of these five items ($\alpha=0.78$, mean=-0.22, $S.D.=3.40$ for the U.S. males; $\alpha=0.72$, mean=-0.88, $S.D.=2.14$ for the U.S. females; $\alpha=0.69$, mean=1.62, $S.D.=4.70$ for Japanese males; and $\alpha=0.64$, mean=-0.22, $S.D.=2.97$ for Japanese females).

Results

Logistic regression, Ordinary Least Squares Regression (OLS), and Structural Equation Modeling (SEM) analyses are used to test the four hypotheses. All multivariate models are assessed for assumptions and for statistical significance at the 0.05 level. The following associations compared across country and gender are examined to test [Hypotheses 1, 2, and 4](#): (1) onset of drinking and *experiences of problem drinking*, (2) onset of drinking and *harmful effects of problem drinking*, and (3) onset of drinking, *experiences of problem drinking*, and *harmful effects of problem drinking*. The two-way interaction terms between *gender* and each of the two measures of onset of drinking are examined separately by *country* to test [Hypothesis 3](#) for the gendered effect of the onset of drinking on two measures of problem drinking. The three-way interaction terms between *country*, *gender*, and each of the two measures of the onset of drinking are examined to test [Hypothesis 4](#) for the country difference in the gendered effect of the onset of drinking on problem drinking.

Onset of drinking

First, country and gender differences in two measures of onset of drinking (*age of onset of drinking* and *early onset of drinking*) were examined (results not shown). The results of the combined analysis indicate that U.S. respondents were significantly older ($\beta=.058$, $p<.001$) when they began drinking alcohol for the first time. There was no significant country difference in the likelihood of drinking before age 14 years ($OR=.921$, $p=.556$). The results of separate analyses by country indicate that there was a significant gender difference in both measures of onset of drinking in both countries. As hypothesized, males in both countries were significantly younger when they drank alcohol for the first time ($\beta=-.239$, $p<.001$ for the U.S. sample; $\beta=-.225$, $p<.001$ for the Japanese sample) and had significantly higher odds of having begun drinking alcohol before age 14 (2.00 times higher, $p<.001$ for the U.S. sample; 1.57 times higher, $p=.045$ for the Japanese sample). The interaction term between *country* and *gender* was, however, not significant in the combined model, and thus, contrary to the hypothesis, the gender difference in the two measures of onset of drinking was not significantly different between the two countries.

Onset of drinking and *experiences of problem drinking*

First, country and gender differences in *experiences of problem drinking* were examined. The country difference in *age of onset of drinking* suggests a higher likelihood of

engagement in problem drinking among Japanese respondents compared to U.S. respondents. The results of the combined analysis (results not shown), however, indicate that there was no significant country difference in *experiences of problem drinking* ($\beta = -.016$, $p = .314$).

The results of the separate analysis by country (see Models 1, Table 1) indicate that, consistent with the hypothesis, males in both countries had a significantly higher level of *experiences of problem drinking* than did females ($\beta = 0.163$, $p < .001$ for the U.S. sample; $\beta = 0.239$, $p < .001$ for the Japanese sample). Consistent with the hypothesis, moreover, the significant interaction term between *country* and *gender* in the combined analysis (results not shown) indicates that the gender difference in *experiences of problem drinking* was significantly greater among Japanese sample compared to the U.S. sample.

Second, country and gender differences in the association between the onset of drinking and *experiences of problem drinking* were examined. The results of the analysis separated by country and gender (see Table 2) indicate that, consistent with the hypothesis, there were significant associations between two measures of onset of drinking and *experiences of problem drinking* in the expected directions among all groups, except Japanese females. Contrary to the hypothesis, neither of the two measures of onset of drinking was significantly related to *experiences of problem drinking* among Japanese females. The results by group, therefore, suggest a greater gender difference in the association between the onset of drinking and *experiences of problem drinking* among Japanese sample compared to the U.S. sample. Furthermore, the interaction term between *age* and *age of onset of drinking* was significant among U.S. males and Japanese females (results not shown), which supports the past studies that found a diminishing influence of *age of onset of drinking* on *experiences of problem drinking* as people get older.

Consistent with the hypothesis, the results of the analysis separated by country (see Table 1) show that the association between *age of onset of drinking* and *experiences of problem drinking* was significantly stronger for males than for females in both countries, indicated by the significant interaction term between *gender* and *age of onset of drinking* in both countries (see Models 3, Table 1). The significant interaction term supports the hypothesized gendered effect of *age of onset of drinking* on *experiences of problem drinking* in both countries. Furthermore, the three-way interaction term among *country*, *gender*, and *age of onset of drinking* was significant in the combined model (results not shown), indicating that, as hypothesized, the gendered effect of *age of onset of drinking* on *experiences of problem drinking* was greater among the Japanese sample compared to the U.S. sample. The significance of the three-way interaction term is consistent with the fact that while *age of onset of drinking* had a significant relationship with *experiences of problem drinking* among Japanese males (and both genders in the U.S.), it had no significant relationship with *experiences of problem drinking* among Japanese females (see Models 1, Table 2). Finally, consistent with the hypothesis and the finding from Table 2, the interaction term between *gender* and *early onset of drinking* was significant among the Japanese sample (see Model 5, Table 1), indicating that the relationship between *early onset of drinking* and *experiences of problem drinking* was significantly greater for males than for females among Japanese sample.

For the ease of interpreting the significant interaction terms, the linear regression equation with *experiences of problem drinking* on the y-axis and *age of onset of drinking* on the x-axis, while holding all other variables constant are shown in Figure 1. Four linear regression equations were created by substituting the values for each combination of gender and country¹², producing a different y-intercept and slope for each group. The linear regression equations indicate that the association between *age of onset of drinking* and *experiences of problem drinking* was strongest for Japanese males, followed by U.S. males, U.S. females, and weakest among Japanese females, thus confirming the result with the significant three-way interaction term. In fact, *age of onset of drinking* does not seem to matter much, in terms of predicting *experiences of problem drinking*, among females in either countries, while the best cutoff age to predict *experiences of problem drinking* seems to be age 20 for U.S. males and age 21 for Japanese males. Though there were significant country as well as gender differences in *age of onset of drinking*, neither of the measures of the onset of drinking explains well, overall, the country difference or the gender difference (in either countries) of *experiences of problem drinking* because the standardized regression coefficients of country and gender, respectively, and the model R^2 remain relatively unchanged throughout the models.

Onset of drinking and harmful effects of problem drinking

First, country and gender differences in *harmful effects of problem drinking* were examined. The results of the combined analysis (results not shown) indicate that U.S. respondents were significantly less likely than Japanese respondents to experience harmful effects of problem drinking ($\beta = -.210, p < .001$). The country difference in *harmful effects of problem drinking* is consistent with the country difference in *age of onset of drinking*, which indicate the earlier onset of drinking among Japanese respondents, thus a greater risk of experiencing harmful effects of problem drinking, compared to the U.S. respondents.

The results of the separate analyses by country (see Models 1, Table 3) indicate that, consistent with the hypothesis, males in both countries were significantly more likely than females to experience *harmful effects of problem drinking* ($\beta = .151, p < .001$ for the U.S. sample; $\beta = .217, p < .001$ for the Japanese sample). Consistent with the hypothesis, moreover, the significant interaction term between *country* and *gender* (results not shown) indicates that the gender difference in *harmful effects of problem drinking* was greater among the Japanese sample compared to the U.S. sample.

Second, the association between onset of drinking and *harmful effects of problem drinking* was examined. The results separated by country and gender (see Table 4) once again indicate that neither of the two measures of onset of drinking had a significant association with *harmful effects of problem drinking* among Japanese females. On the other hand, both measures of onset of drinking had significant associations with *harmful effects of problem drinking* among U.S. males; only *age of onset of drinking* had a significant association with *harmful effects of problem drinking* among Japanese males and only *early onset of drinking* had a significant association with *harmful effects of problem drinking* among U.S. females.

¹²For U.S. males, for instance, the equation becomes *experiences of problem drinking* = $(2.329 + 0.955 + 2.219 - 3.139) + (-0.027 - 0.185 - 0.023 + 0.112) \times \text{age of first drink} = 2.364 - 0.123 \times \text{age of first drink}$.

All the significant associations are in the expected directions. These findings support the hypothesis, once again, that there is a gender difference in both countries in how the onset of drinking is associated with *harmful effects of problem drinking*. The interaction term between *age* and *age of onset of drinking* was significant only among U.S. males (results not shown), once again, supporting the finding of the past studies that there are age differences in how *age of onset of drinking* predicts *harmful effects of problem drinking*, but only among U.S. males.

Country and gender differences in the association between *age of onset of drinking* and *harmful effects of problem drinking* were further confirmed by the significant interaction term between *country* and *age of onset of drinking* in the combined analysis (results not shown), which indicates that the association between *age of onset of drinking* and *harmful effects of problem drinking* was stronger for Japanese respondents compared to U.S. respondents. In addition, the significant interaction term between *gender* and *age of onset of drinking* for both countries (see Models 3, Table 3) indicates that, consistent with the hypothesis, the association between *age of onset of drinking* and *harmful effects of problem drinking* was significantly stronger for males than for females in both countries, confirming the results separately by group.

The linear regression equation with *harmful effects of problem drinking* on the y-axis and *age of onset of drinking* on the x-axis, while holding all other variables constant and shown in Figure 1. Four linear regression equations were created by substituting the values for each combination of gender and country¹³. Since there are no significant interactions involving *gender* in the combined model, the lines for gender for both countries are parallel (no gender difference in slope), while country has a different slope. The linear regression equations indicate that the association between *age of onset of drinking* and *harmful effects of problem drinking* was stronger among Japanese respondents compared to U.S. respondents. Age of onset of drinking, in fact, does not seem to matter much among U.S. males in terms of explaining *harmful effects of problem drinking*, while the best cutoff age to predict *harmful effects of problem drinking* seems to be age 25 for U.S. females, age 37 for Japanese females, and age 50 for Japanese males. Though there were significant country as well as gender differences in the early onset of drinking, neither of the onset of drinking variables explain the country difference or the gender difference (in either countries) of *harmful effects of problem drinking* because, once again, the standardized regression coefficients of country and gender, respectively, and the model R^2 remain relatively unchanged throughout the models.

Onset of drinking, experiences of problem drinking, and harmful effects of problem drinking

The SEM analysis using R separately by *country* and *gender* was run on the full model that includes six control variables, seven observed variables for experiences of problem drinking and its latent construct, five observed variables for harmful effects of problem drinking and its latent construct, and each of the two observed variables of the onset of drinking one at a

¹³For U.S. males, for instance, the equation becomes Harmful effects of problem drinking = $(3.230 - 2.631 + 1.154) + (-0.086 + 0.062) \times \text{Age of first drink} = 1.753 - 0.024 \times \text{Age of first drink}$.

time¹⁴. The major difference between OLS and SEM and an advantage in using the SEM for analyzing the full model is that the SEM produces results that takes into account the association between the onset of drinking and *experiences of problem drinking* in estimating both the associations between the onset of drinking and *harmful effects of problem drinking* and between *experiences of problem drinking* and *harmful effects of problem drinking* (and vice versa on the estimation of the association between onset of drinking and *harmful effects of problem drinking*). The results of the SEM analysis are identical to and confirm the earlier regression results. A simplified diagram with each of the early onset of drinking and two latent constructs and their observed variables along with standardized regression coefficients is shown in Figures 2 and 3.

Results of SEM overall confirmed earlier OLS results and provided additional support for the gender difference in how the onset of drinking is associated with problem drinking overall. In fact, the association between *experiences of problem drinking* and *harmful effects of problem drinking* as well as the loadings of seven measures on *experiences of problem drinking* and five measures on *harmful effects of problem drinking* look identical between males and females in both countries. What is different across gender in two countries is how the two measures of onset of drinking are associated with *experiences of problem drinking* and *harmful effects of problem drinking*. For Japanese females, neither of the two measures of onset of drinking is associated with either of the two measures of problem drinking. For U.S. males, both measures of onset of drinking are significantly associated with both measures of problem drinking in the expected directions. For Japanese males, only *age at first drinking* is significantly associated with the two measures of problem drinking in the expected directions, while *early onset of drinking* was associated with just *experiences of problem drinking*. On the other hand, for the U.S. females, though both measures of onset of drinking are significantly associated with *experiences of problem drinking*, only *early onset of drinking* is significantly associated with *harmful effects of problem drinking*.

Finally, the SEM model fit information for both models (one with *age of onset of drinking* and another with *early onset of drinking*) separately for four groups is shown in Table 5, which shows a significant chi-square at the 0.05 level, CFI greater than 0.80 (except for Japanese females on the model with *early onset of drinking*), RMSEA less than 0.07 for both models for all four groups. While a non-significant chi-squared statistic indicates good model fit, it is important to note that this statistic assumes multivariate normality and is sensitive to large sample sizes. Our data, the majority of which are binary, are not multivariate normal, and our sample size for all four groups are far larger than is recommended for structural equation modeling. The large chi-square values are perhaps indicative of these limitations, rather than of poor model fit. The Comparative Fit Index (CFI) compares the chi-square of the fitted model to the chi-square of the null model. CFI values closer to 1 indicate good model fit, with CFI>0.95 currently accepted as indicative of good fit. The CFI, unlike the chi-square, accounts for large sample sizes, however it traditionally underestimates fit of more complex models. The RMSEA is less biased for large sample sizes, but still suffers from underestimating the fit of more complex models.

¹⁴An attempt was made to include both observed variables of onset of drinking at once, but the model failed to converge.

Generally, a cutoff of $RMSEA < 0.08$ is considered acceptable fit. Thus, our results indicate good fit based on RMSEA for both models for all four groups. Summarily, while two of our reported fit indices indicate poor fit of the models, we can reasonably attribute this to the combination of large sample size, non-normal data, and model complexity (Hooper *et al.* 2008).

Discussion

This study attempted to fill a critical gap in the research literature through a cross-national examination (in the U.S. and Japan) of gender differences in how the early onset of drinking is associated with the development of problem drinking. The results indicate significant country and gender differences in this association; and provided some support for four hypotheses. The first hypothesis, that those who begin drinking at an early age are more likely to experience problem drinking, was supported among all groups except Japanese females. The second hypothesis, that males are more likely than females to begin drinking at an early age and experience problem drinking, was supported in both countries. The third hypothesis, that the association between the early onset of drinking and problem drinking is stronger for males than for females, was also supported in both countries when the onset of drinking was measured in terms of *age of onset of drinking*. The fourth hypothesis, that the hypothesized gender differences are all greater in Japan compared to the U.S., was supported overall especially when *age of onset of drinking* was considered. Along with other research literature to date, the study's findings related to the four hypotheses generate four major implications and offer several suggestions for future study.

First, both measures of onset of drinking (*age of onset of drinking* and *early onset of drinking*) were significantly associated with both measures of problem drinking (*experiences of problem drinking* and *harmful effects of problem drinking*) in the expected directions only among U.S. males, while the two measures of onset of drinking were associated with neither of the problem drinking measures among Japanese females. For U.S. females and Japanese males, while both measures of onset of drinking were significantly associated with *experiences of problem drinking*, only *early onset of drinking* was significantly associated with *harmful effects of problem drinking* for U.S. females and only *age of onset of drinking* was significantly associated with *harmful effects of problem drinking* for Japanese males. All significant associations were in the expected directions. These gender and country differences in how onset of drinking is, or is not, associated with problem drinking suggest that the early onset of drinking is not as important in predicting drinking problems, especially among Japanese females, and the association between the two is not as “determinate,” as past studies suggest, especially those invoking a biochemical explanation. Rather, the association appears to be more tenuous and variable, especially compared to the strong association between two measures of problem drinking among all groups, including among Japanese females. Our results indicate that Japanese females appear to be relatively immune to the influence of the early onset of drinking on the development of drinking problems, while early onset of drinking appears to most strongly influence the development of drinking problems among U.S. males.

Second, as expected, there was a significant gender difference in all measures of drinking in both countries: males compared to females in both countries were younger when they drank alcohol for the first time, were more likely to begin drinking before age 14 years, and more likely to experience problem drinking in terms of both *experiences of problem drinking* and *harmful effects of problem drinking*. Consistent with the past studies conducted in the U.S., the predictive power of *age of onset of drinking* on both *experiences of problem drinking* and *harmful effects of problem drinking* was stronger for males than for females in both countries. Though this is not surprising with the Japanese sample, the finding suggests that females in both countries are less vulnerable than males to the influence of the early onset of drinking on the development of drinking problems.

Third, because of greater gender inequality in Japan than in the U.S., and because studies have found greater gender differences in alcohol use in societies with greater gender inequality (e.g., Gefou-Madianou 1992; Kashima *et al.* 1995; Nayak *et al.* 2003; Wilsnack *et al.* 2000), it was hypothesized that gender differences in early drinking onset, later problem drinking, and links between these two patterns would be greater in Japan than in the U.S. Contrary to this hypothesis, men's and women's drinking onset ages did not differ more in Japan than in the U. S. On the other hand, consistent with the hypothesis, the gender difference in both measures of problem drinking was significantly greater in Japan than in the U.S.

These findings suggest the early onset of drinking might not be considered as deviant in Japan as in the U.S. Our data indicate that the prevalence of abstainers in the U.S. (39.50%) was more than twice the prevalence in Japan (16.02%), though abstainers probably included those who were abstaining because of AUD. Our results, moreover, showed that Japanese respondents began drinking younger than U.S. respondents (cf. Nagoshi *et al.*, 1994). On the other hand, it is possible that problem drinking, in terms of both experiences and harmful effects, is considered more deviant in Japan than in the U.S., which would help explain the significantly greater gender difference in both types of problem drinking found in Japan compared to the U.S. Furthermore, consistent with the hypothesis, the gender difference in the predictive power of *age of onset of drinking* on problem drinking (or the gendered association between *age of onset of drinking* and problem drinking) was greater in Japan than in the U.S. This is consistent with the overall finding that there was no association between onset of drinking and problem drinking among Japanese females unlike the other three groups, resulting in a greater gender difference in this association in Japan compared to the U.S.

Finally, our results with samples ranging in age from 20 to 70 years old indicate that respondent's current age was a much more effective predictor of problem drinking than was the most commonly used measure of the early onset of drinking, *age of onset of drinking*, or *early onset of drinking* for all four groups. In fact, both measures of onset of drinking explained very little variance of either measure of problem drinking for four groups. Furthermore, for U.S. males and Japanese females, the predictive power of *age of onset of drinking* on *experiences with problem drinking* diminished as the respondent's age increased, consistent with the finding of past studies from the U.S. If respondent's age is a proxy for the length of time he or she has been drinking alcohol, rather than relying solely

on *age of onset of drinking* or *early onset of drinking*, and thus focusing on the drinking pattern during teenage years, empirical studies that use retrospective surveys with samples that range in age might, therefore, benefit from focusing instead on the length of exposure to drinking, or the drinking pattern of one's entire life. This finding has an implication for biochemical explanations because it suggests that instead of focusing on biochemical effects of alcohol use on a youth's development, it is more beneficial to focus on biochemical effects of prolonged alcohol use to explain the development of drinking problems. Additionally, though *early onset of drinking* allowed us to identify respondents who began drinking before age 14 who are purportedly the most at-risk in terms of developing drinking problems, this measure was less effective than *age of onset of drinking* in predicting drinking problems among all groups. This finding further confirms the importance of the length of exposure to drinking and not just the first age of drinking to predict the development of drinking problems. However, the relative weakness of the measure of *early onset of drinking* on predicting problem drinking, compared to *age of onset of drinking*, might be explained by the fact that this measure was a dichotomous variable, thus having less numerical information, instead of interval variable like *age of onset of drinking*. It is also possible that early onset of drinking was a relatively weaker measure to predict problem drinking because we erred on the cutoff age. As the linear regression equations by group (Figures 1 and 2) indicate, the specific age when one began drinking does not seem to matter on problem drinking among some groups, while the best cutoff age that can be estimated based on the equations seem to be much older for some groups.

This study has four major limitations, which are related to one another and suggest directions for future studies. First, our cross-sectional survey data pose a limitation in explicating the causal order of the three drinking variables examined in this study. It is possible that early onset of drinking, experiences of problem drinking, and harmful effects of problem are all manifestations of an underlying problem that shares a common cause, and thus they might bear no causal relationship with each other, as suggested by the "problem behavior syndrome." In order to explicate the causal sequence among these variables, it is, therefore, important to utilize longitudinal data. Second, some studies indicate that the age of onset of drinking cannot be reliably measured when retrospective self-report data are used because older respondents tend to recall an older age of onset of drinking compared to younger respondents (Engels *et al.* 1997; Parra *et al.* 2003). Conversely, a U.S. study found little difference in accuracy of recall of age of onset in a two-year test-retest comparison between those under age 50 and 50 and over (Greenfield, et al., 2014). Still, because of the age difference in the predictive power of the age of onset of drinking on problems with drinking (especially among U.S. males and Japanese females), longitudinal studies that minimize recall bias and errors are preferred over cross-sectional studies when examining the effect of early onset of alcohol use on current alcohol use. Third, because samples of this study included people who vary widely in age between 20 to 70 years old, current abstainers who were excluded most likely include those who began drinking early, experienced AUD, and subsequently quit drinking altogether. It is, therefore, possible that abstainers include those who were most at risk and would be considered most serious problem drinkers, had they been drinking alcohol. It is possible that the results of the country comparisons are, thus, biased because there was a significant country difference in the proportion of

abstainers who had never consumed alcohol and those who did not drink alcohol in the past 12 months (39.50% of U.S. respondents and 16.02% of Japanese respondents). Additionally, we have not formally considered birth cohort effects on early age onset, which in one study of males in India were found to be considerable, with more recent cohorts (born 1976–1985) engaging in much more adolescent drinking than earlier birth cohorts (1956–1965) (Pillai et al., 2014). Finally, because females are more likely than males to be abstainers or non-current drinkers (14.66% of U.S. males; 29.77% of U.S. females; 4.85% of Japanese males; and 14.91% of Japanese females) and those females who hold more traditional views on gender may more likely to abstain from drinking, any country variations in how one's gender influences onset of drinking and problem drinking may be masked by the exclusion of the abstainers and non-current drinkers. Indeed, there are consistent multinational data on the greater prevalence of lifetime abstainers and ex-drinkers among women, although an exception occurs among younger Japanese adults (Wilsnack et al. 2009). Thus, future research may benefit from inclusion of abstainers and non-current drinkers and their history of drinking habit.

Conclusions

Significant country and gender differences in how the early onset of drinking is associated with current drinking problems suggest that a blanket effort to delay alcohol consumption among youth might not be effective in reducing the risk of developing drinking problems later in life. There does not appear to be a determinate, causal relationship between the early onset of drinking and either experiences of problem drinking or harmful effects of problem drinking, as suggested by the biochemical explanation, especially among Japanese females. Perhaps instead of trying to understand why the early onset of drinking increases the risk of developing drinking problems, it would be more useful to understand why the susceptibility to the influence of the early onset of drinking on drinking problems varies between males and females and across countries. Understanding why Japanese females are immune to the influence of the early onset of drinking, for instance, might suggest ways to reduce the development of drinking problems among everyone. Examining the early onset of drinking, among youth who begin drinking before age 14 years old, could be useful to the extent that it allows identification of youth who are at a risk for deviance in general, including failure at school, substance use, violence, delinquency, and criminality during adulthood, and might explain its association among U.S. respondents with harmful effects of problem drinking on various aspects of their lives.

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Figure 1.

Linear Regression Equations for *Age of Onset of Drinking* and *Experiences of Problem Drinking* (Left) and *Age of Onset of Drinking* and *Harmful Effects of Drinking* (Right) by *Country* and *Gender*.

Note: All models control for *age*, *marital status*, *underage child*, *income*, *education*, and *employment status*.

Figure 2.

Results of the SEM Analysis for the U.S. Sample (Top) and the Japanese Sample (Bottom) with Standardized Coefficients.

Note: Standardized coefficients are shown as males/females. All models control for *age*, *marital status*, *underage child*, *income*, *education*, and *employment status*. All significance tests are two-tailed tests with * <.05, ** <.01, and *** <.001.

Table 1
Multiple Regression Analyses^J with *Experiences of Problem Drinking*² as a Dependent Variable by Country

Variables	U.S. (n=2,598)											
	Model 1			Model 2			Model 3			Model 4		
	b	β	p	b	β	p	b	β	p	b	β	p
Intercept	2.757		0.000	4.057		0.000	3.546		0.000	2.580		0.000
Gender (males=1)	1.258	0.163	0.000	1.057	0.137	0.000	2.358	0.306	0.000	1.195	0.155	0.000
Age	-0.055	-0.177	0.000	-0.045	-0.145	0.000	-0.045	-0.146	0.000	-0.054	-0.173	0.000
Age of onset of drinking				-0.084	-0.109	0.000	-0.058	-0.076	0.002			
Gender×Age of onset of drinking							-0.070	-0.170	0.025			
Early onset of drinking (before age 14=1)										1.575	0.100	0.001
Adjusted R ²	0.065			0.075			0.076			0.074		

Variables	Japan (n=1,734)											
	Model 1			Model 2			Model 3			Model 4		
	b	β	p	b	β	p	b	β	p	b	β	p
Intercept	1.648		0.001	2.565		0.000	1.494		0.022	1.530		0.001
Gender (males=1)	2.103	0.239	0.000	1.979	0.225	0.000	5.599	0.636	0.000	2.082	0.237	0.000
Age	-0.071	-0.218	0.000	-0.065	-0.197	0.000	-0.066	-0.201	0.000	-0.070	-0.213	0.000
Age of onset of drinking				-0.058	-0.063	0.012	-0.004	-0.005	0.873			
Gender×Age of onset of drinking							-0.195	-0.414	0.000			
Early onset of drinking (before age 14=1)										0.846	0.045	0.049
Gender×Early onset of drinking										1.735	0.074	0.049
Adjusted R ²	0.113			0.113			0.121			0.111		

^J All of the models control for age, marital status, underage child, employment status, household income, and educational attainment. Only the significant interaction terms are shown.

Table 2

Multiple Regression Analyses^J with *Experiences of Problem Drinking*² as a Dependent Variable by Country and Gender

Variables	U.S. Males (n=1,382)						U.S. Females (n=1,216)					
	Model 1			Model 2			Model 1			Model 2		
	b	β	p	b	β	p	b	β	p	b	β	p
Intercept	6.404		0.000	4.384		0.000	3.288		0.000	2.204		0.000
Age	-0.052	-0.153	0.000	-0.060	-0.177	0.000	-0.039	-0.148	0.000	-0.049	-0.184	0.000
Age of onset of drinking	-0.123	-0.116	0.000				-0.065	-0.114	0.000			
Early onset of drinking (before age 14=1)				1.435	0.091	0.001				1.833	0.119	0.000
Adjusted R ²	0.069			0.064			0.055			0.058		

Variables	Japanese Males (n=949)						Japanese Females (n=785)					
	Model 1			Model 2			Model 1			Model 2		
	b	β	p	b	β	p	b	β	p	b	β	p
Intercept	6.633		0.000	3.434		0.000	2.512		0.000	2.295		0.000
Age	-0.071	-0.199	0.000	-0.079	-0.219	0.000	-0.065	-0.256	0.000	-0.070	-0.273	0.000
Age of onset of drinking	-0.190	-0.127	0.000				-0.019	-0.034	0.387			
Early onset of drinking (before age 14=1)				1.423	0.073	0.022				-0.193	-0.012	0.727
Adjusted R ²	0.067			0.057			0.073			0.072		

^J All of the models control for age, marital status, underage child, employment status, household income, and educational attainment.

Table 3

Multiple Regression Analyses¹ with *Harmful Effects of Problem Drinking*² as a Dependent Variable by Country

Variables	U.S. (n=2,598)											
	Model 1			Model 2			Model 3			Model 4		
	b	β	p	b	β	p	b	β	p	b	β	p
Intercept	0.760		0.002	1.315		0.000	0.877		0.012	0.658		0.007
Gender (males=1)	0.879	0.151	0.000	0.793	0.137	0.000	1.911	0.329	0.000	0.843	0.145	0.000
Age	-0.022	-0.095	0.000	-0.018	-0.077	0.000	-0.018	-0.077	0.000	-0.021	-0.092	0.000
Age of onset of drinking				-0.036	-0.062	0.003	-0.014	-0.024	0.333			
Gender×Age of onset of drinking							-0.060	-0.193	0.011			
Early onset of drinking (before age 14=1)										0.900	0.076	0.000
Adjusted R ²	0.050			0.053			0.055			0.058		

Variables	Japan (n=1,734)											
	Model 1			Model 2			Model 3			Model 4		
	b	β	p	b	β	p	b	β	p	b	β	p
Intercept	0.938		0.040	1.888		0.001	1.263		0.045	0.877		0.056
Gender (males=1)	1.795	0.217	0.000	1.667	0.202	0.000	3.783	0.458	0.000	1.785	0.216	0.000
Age	-0.032	-0.106	0.000	-0.025	-0.082	0.006	-0.026	-0.085	0.005	-0.032	-0.103	0.000
Age of onset of drinking				-0.060	-0.069	0.007	-0.029	-0.033	0.263			
Gender×Age of onset of drinking							-0.114	-0.258	0.014			
Early onset of drinking (before age 14=1)										0.431	0.024	0.298
Adjusted R ²	0.060			0.064			0.066			0.060		

¹ All of the models control for *age, marital status, underage child, employment status, household income, and educational attainment*. Only the significant interaction terms are shown.

² Ordinary Least Squares regression analysis was used. All significance tests are two-tailed tests.

Table 4

Multiple Regression Analyses¹ with *Harmful Effects of Drinking Behaviors*² as a Dependent Variable by Country and Gender

Variables	U.S. Males (n=1,382)						U.S. Females (n=1,216)					
	Model 1			Model 2			Model 1			Model 2		
	b	β	p	b	β	p	b	β	p	b	β	p
Intercept	3.117		0.000	2.003		0.000	0.736		0.010	0.300		0.272
Age	-0.025	-0.090	0.002	-0.029	-0.107	0.000	-0.011	-0.065	0.049	-0.014	-0.078	0.011
Age of onset of drinking	-0.069	-0.081	0.003				-0.021	-0.056	0.064			
Early onset of drinking (before age 14=1)				0.656	0.052	0.050				1.375	0.136	0.000
Adjusted R ²	0.047			0.043			0.045			0.060		
Variables	Japanese Males (n=949)						Japanese Females (n=785)					
	Model 1			Model 2			Model 1			Model 2		
	b	β	p	b	β	p	b	β	p	b	β	p
Intercept	4.876		0.000	2.654		0.000	1.540		0.009	1.024		0.056
Age	-0.024	-0.069	0.112	-0.030	-0.085	0.047	-0.027	-0.117	0.011	-0.034	-0.150	0.001
Age of onset of drinking	-0.135	-0.094	0.005				-0.039	-0.077	0.058			
Early onset of drinking (before age 14=1)				0.652	0.035	0.287				0.046	0.003	0.927
Adjusted R ²	0.019			0.012			0.015			0.011		

¹ All of the models control for age, marital status, underage child, employment status, household income, and educational attainment.

² Ordinary Least Squares regression analysis was used. All significance tests are two-tailed tests.

Table 5

SEM Model Fit by Group

Models	Group	<i>n</i>	χ^2	<i>df</i>	<i>CFI</i>	<i>RMSEA</i>
Model with age of onset of drinking	U.S. males	1,382	551.001	113	0.888	0.053
	U.S. females	1,216	616.814	113	0.845	0.061
	Japanese males	949	554.268	113	0.814	0.064
	Japanese females	785	527.243	113	0.801	0.068
Model with early onset of drinking	U.S. males	1,382	556.176	113	0.887	0.053
	U.S. females	1,216	638.737	113	0.840	0.062
	Japanese males	949	546.856	113	0.816	0.064
	Japanese females	785	533.382	113	0.799	0.069

Note: CFI = to comparative fit index; RMSEA = root mean square error of approximation. All chi-square tests are significant at $p < .001$.