Latent Class Analysis of Drinking Game Consequences Among College Drinkers

by

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Abstract

Participation in drinking games has been identified as one specific alcohol-related context linked to increased risk among college students. Despite advances in drinking game research, questions remain about the different types of individuals at risk from participating. The current study utilized latent class analysis to classify individuals based on their endorsement of eight consequences from the Hazardous Drinking Games Measure. Analyses included identification of classes among 656 college students, followed by covariate analyses regressing class membership on motives for playing drinking games, general drinking motives, impulsivity facets, general problematic alcohol use, and specific drinking game behaviors. Next, to account for potential gender differences in latent classes, a multigroup latent class analysis included gender as a grouping variable to create a model that allowed classes to vary by gender where significant differences were identified. In the full sample, three classes were identified, including a class with the fewest number of problems, a class with higher rates of hangovers and becoming sick, and a class with relatively higher rates on a majority of the other consequences. Classes differed in endorsement of motives, impulsivity facets, general problematic consumption, and drinking game behaviors. Multigroup latent class analysis demonstrated gender differences in some item thresholds by class, and gender-specific covariate analyses suggested some differences in risk factors by gender. Results highlight distinct classes of individuals at risk from drinking game participation among the full sample, men, and women, as well as specific factors associated with risk. Recommendations for future studies and potential prevention and intervention efforts are discussed.

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Alcohol consumption among college students continues to contribute to community and personal health concerns and has been associated with increased risk for a wide range of negative consequences (e.g., deaths, injuries, assaults, etc.) and relatively high rates of alcohol use disorders (Hingson et al., 2009; Substance Abuse and Mental Health Services Administration, 2018; White & Hingson, 2013). Given these concerns, a large body of research has been dedicated to improving an understanding of alcohol-related behaviors and outcomes in college-aged individuals. In relation to this population, it has been deemed important to examine specific contexts and situations wherein individuals are more at-risk for alcohol-related problems (Neighbors et al., 2006; Riordan et al., 2016). Several contexts that are associated with increased alcohol-related risk have been well-researched, including spring breaks, 21st birthdays, and university sporting events (Geisner et al., 2015; Geisner et al., 2017; Neal & Fromme, 2007). Participation in drinking games accounts for another contextually specific behavior that has been linked to negative alcohol-related consequences, particularly among adolescent and young adult populations (Merrill & Carey, 2016).

Drinking games have been defined by researchers as events in which individuals drink with others while adhering to gameplay rules that determine the quantity and frequency of consumption; these games typically involve increased consumption within a limited window of time and may require individuals to perform tasks, wherein gameplay rules call for consumption behavior based on task outcomes (Zamboanga et al., 2013). A substantial amount of research has been conducted to better understand drinking game behaviors, outcomes, and correlates. Among college student drinkers, participation in drinking games is widespread. Estimates of participation prevalence vary, but studies have typically suggested, at minimum, over half of

drinkers playing drinking games, with some studies showing up to 91% of drinkers reporting participation (Read et al., 2010; Zamboanga et al., 2014). Strong associations have also emerged between participation frequency and general alcohol consumption and hazardous use, including binge drinking, typical weekly drinking, and maximum episodic consumption (Cameron et al., 2010; Zamboanga et al., 2018), further highlighting the increased risk of alcohol-related concerns among drinking game participants.

A wide array of negative consequences can be linked to drinking game participation. Playing drinking games has been associated with risky levels of consumption and consequences, relative to individuals who drink but do not play drinking games (Cameron et al., 2010). Specifically, individuals who played drinking games have been found more likely to pass out after drinking, obtain blood alcohol concentrations (BACs) higher than .15, and engage in extreme heavy drinking (i.e., 8 or more drinks for women, 10 or more drinks for men in a given period; Fairlie et al., 2015). Risk for dependence symptoms and negative interpersonal consequences of alcohol use have also been found higher among individuals who play drinking games more often and who consume more alcohol when playing drinking games, relative to drinkers who consumed similar amounts of alcohol but participated less frequently in drinking games (Zamboanga et al., 2010). Additionally, in the context of prepartying (i.e., alcohol consumption prior to attending parties or bars), which has been historically linked to increased risk for consequences, drinking game participation led to additional risk for negative alcohol-related outcomes above and beyond prepartying itself (Hummer et al., 2013). Given these problematic outcomes, in addition to high rates of drinking game participation among college drinkers (Zamboanga et al., 2014), seeking to better understand factors that increase the risk of drinking game participation seems warranted.

While drinking game participation has been identified as a potentially risky behavior, furthering knowledge of factors that increase the likelihood for negative outcomes may be useful in developing appropriate assessment, intervention, and prevention efforts among young adults and especially college students. Several factors have been well examined that may contribute to individuals' risk for increased consumption and negative outcomes while drinking. For example, assessing motives for alcohol consumption and drug use has been an important area of research related to substance use behaviors. Research has consistently demonstrated that different motivations for use are associated with varying degrees of precipitating factors and outcomes (Cooper, 1994; Cooper et al., 2016). Findings suggest that attempting to adjust emotional states through positive reinforcement motives (i.e., enhancement motives) and negative reinforcement motives (i.e., coping motives) are most commonly linked to increases in overall consumption and negative alcohol-related consequences, relative to motives related to social factors (i.e., social and conformity motives; Cooper et al., 2016; Kuntsche et al., 2005). More specifically, coping motives are often linked to negative alcohol-related consequences, even after accounting for total alcohol consumption, among college students (Simons et al., 2005). Enhancement motives, on the other hand, have shown positive relations with negative consequences, but often not after controlling for total alcohol consumption (Merrill & Read, 2010). Findings related to social and conformity motives are generally mixed and do not demonstrate consistent relations to negative consequences (Cooper et al., 2016).

Given the inherent social component of drinking games (Zamboanga et al., 2014), interest has been found in measuring motives specifically for participating in drinking games (Johnson et al., 1999). Johnson and Sheets (2004) provided the first standardized questionnaire designed to assess individuals' motives for playing drinking games. The Motives for Playing

Drinking Games (MPDG) questionnaire included eight factors related to individuals' motives for participation, including (1) competition and thrills, (2) conformity, (3) fun and celebration, (4) social lubrication, (5) novelty, (6) sexual manipulation, (7) boredom, and (8) coping. As expected, they found that these motives were differentially associated with overall drinking game consumption and negative consequences (Johnson & Sheets, 2004).

Despite demonstrating the importance of measuring motives for playing drinking games, the eight factors could not be replicated with confirmatory factor analyses (CFAs) in future samples (George et al., 2018; Zamboanga et al., 2019). Rather, a seven-factor model was deemed more appropriate based on exploratory structural equation modeling (ESEM) and a CFA, as the original coping factor yielded poor loading coefficients and high cross-loadings with other factors. Given these concerns, a 28-item, seven-factor solution has been identified, with factors of (1) competition, (2) conformity, (3) enhancement and thrills, (4) social lubrication, (5) novelty, (6) sexual pursuit, and (7) boredom (Zamboanga et al., 2019). This revised edition of the MPDG questionnaire has been utilized in drinking game research and deemed more appropriate for assessing motives (George et al., 2018; Zamboanga et al., 2018). Findings have suggested the appropriateness of assessing drinking game-specific motives, as they have accounted for negative consequences above and beyond standard motives alone (Zamboanga et al., 2018). While research with the revised factors of the MPDG questionnaire is relatively new, multiple studies have suggested that competition motives are related to the amount of alcohol consumed while playing drinking games (George et al., 2018; Zamboanga et al., 2018). Concerning negative consequences from participating in drinking games, one study suggested significant relations with conformity, enhancement and thrills, social lubrication, sexual pursuit, and boredom motives (George et al., 2018), while another study demonstrated significant relations

with conformity, enhancement and thrills, and sexual pursuit motives (Zamboanga et al., 2019). Given the potential importance of MPDG in furthering an understanding of risk, further evaluation of specific motives' relations to negative consequences is warranted.

In addition to motives for participation, some personality-based variables have been identified as important factors linked to drinking game participation and outcomes. Impulsivity accounts for one specific variable that has been studied in relation to general drinking outcomes and drinking games. The construct of impulsivity has been closely linked to a wide variety of alcohol-related concerns, including overall consumption levels and the likelihood of experiencing negative alcohol-related consequences (e.g., Dick et al., 2010; Littlefield et al., 2014; Nagoshi et al., 1994). Concerning drinking games, measures of general impulsivity have demonstrated positive relations to the amount in which college students participate in drinking games as well as the number of negative consequences experienced from playing, while even stronger relations have been found for the specific impulsivity-related factor of sensation seeking and negative drinking game outcomes (Diulio et al., 2014). Other findings have also highlighted the role of sensation seeking in drinking game-related consequences above and beyond total alcohol consumption alone (Johnson & Cropsey, 2000).

Although impulsivity as a broad construct has helped further an understanding of alcohol-related outcomes, research has demonstrated the importance of defining and measuring specific aspects of impulsivity that may be associated with differential outcomes. For example, the UPPS-P model of impulsivity (Lynam et al., 2006; Whiteside & Lynam, 2001) addresses the multi-facet nature of this construct and has been widely used in research related to substance use. The UPPS-P model accounts for five specific facets of impulsivity, including negative urgency (i.e., the tendency for rash reaction in response to negative affect), lack of perseverance, lack of

premeditation, sensation seeking, and positive urgency (i.e., the tendency for rash reaction in response to positive affect; Cyders & Smith, 2007). Research has demonstrated that these impulsivity facets differentially relate to alcohol-related engagement and outcomes. For example, the amount of alcohol typically consumed has been most often linked to higher rates of lack of perseverance (Coskunpinar et al., 2013). Negative urgency and positive urgency, on the other hand, have been consistently linked to negative alcohol-related problems among college students (McCarty et al., 2017; Tran et al., 2018). All UPPS-P impulsivity facets have been related to overall drinking frequency (Coskunpinar et al., 2013).

Given the nature of drinking games (e.g., often fast-paced and/or exciting), impulsivity seems to be a potentially important variable to explore in relation to their occurrence and outcomes. To date, there is limited research linking drinking games and impulsivity with a multi-faceted approach, such as the UPPS-P model of impulsivity. Given the limited amount of research pertaining to more specific impulsivity facets and drinking game outcomes, furthered research in this area seems warranted.

Much of the previously discussed literature demonstrates the importance of researching a variety of factors related to drinking games, including drinking game behaviors, personality variables, and outcomes. A majority of these studies have examined relations among the observed variables themselves (e.g., through correlation and regression analyses; Zamboanga et al., 2014). Some researchers have questioned more specifically the *types* of people who choose to play drinking games, and further, differences in outcomes and factors among these types of individuals (Borsari et al., 2013). A multitude of analytical techniques can be utilized to address questions about subsets of individuals (e.g., types of individuals who play drinking games) in a given sample. One specific analytic tool that has been useful for this aim is a technique called

latent class analyses. Latent class analysis is a data analytic technique that involves the identification of underlying latent classes, or groups, based on response patterns among individuals in the sample (McCutcheon, 1987; Vermunt & Magindson, 2004). The technique allows for this distinction based on participants' endorsement of a predetermined set of *categorical* observed indicators (Masyn, 2013; Nylund-Gibson & Choi, 2018). There are two primary outcomes of interest in traditional latent class analysis, including (1) the proportion of individuals in the sample who belong to each "class" and (2) the probability for each item of being endorsed in each given class (i.e., *conditional item probabilities*; Clark & Muthen, 2008; Nylung-Gibson & Choi, 2018).

In addition to these primary variables of interest, latent class analysis allows for important secondary analyses, wherein the latent variable (i.e., class membership) is related to other observed variables, often referred to as auxiliary variables or covariates (Asparouhov & Muthen, 2013; Clark & Muthen, 2008). For example, latent class membership may be used as a dependent variable regressed on observed data or an independent variable that may predict a distal dependent variable (i.e., a distal outcome; Asparouhov & Muthen, 2013). Auxiliary variable analysis assists in the development of theories about observable variables that may make an individual more likely to belong to a specific "class", as well as whether belonging to a specific "class" is likely to be associated with different outcomes (Collier & Leite, 2017).

Concerning drinking behaviors and outcomes, latent class analysis has provided several important insights into subsets of individual who drink. For example, numerous studies have utilized latent class analysis with indicators of alcohol use disorder symptoms. A large majority of these studies have contributed to an understanding of alcohol use disorder as a dimensional construct, as latent classes have typically been differentiated by the *number* of symptoms

endorsed, with each successive class demonstrating incremental increases in symptom count (e.g., Rinker & Neighbors, 2015; Swift et al., 2016). Examination of auxiliary variables have also found classes of alcohol use disorder severity to relate differentially to observed variables, such as impulsivity (Kuvaas et al., 2014), co-occurring psychological disorders (Muller et al., 2020), and use of other substances (Chiauzzi et al., 2013; Moss et al., 2015).

In addition to general alcohol use disorder symptoms, latent class analyses have been conducted with more specific indicators among drinkers. For example, Rinker and colleagues (2016) conducted a latent class analysis with a large sample of first-year college students who completed baseline alcohol questionnaires across several universities. Indicators for their analysis included seven common predefined consequences that students experience due to alcohol consumption. For each consequence, a student who indicated any endorsement of the outcome (i.e., more than "never") over the most recent 2 weeks was coded as endorsing the consequence. To determine the number of classes, they utilized common fit statistics, including the Akaike information criterion (AIC), Bayesian information criterion BIC (BIC), and sample size adjusted Bayesian information criterion BIC (a-BIC), which are similarly utilized to demonstrate how likely the data is to be observed in a given model. While these fit statistics are similar in aim, as complexity is generally penalized, the a-BIC accounts for sample size, to prevent overestimation of complexity, and the BIC generally penalizes complexity more heavily than the AIC (Nylund et al., 2007). Additionally, the authors used the Lo-Mendell-Rubin-adjusted likelihood ratio test (LMR-adjusted LRT), a significance test designed to evaluate model improvement for each incremental class size (e.g., 4 classes to 5 classes). Their fit statistics and evaluation of the LMR-adjusted LRT indicated that a 4-class solution fit the data most appropriately. These classes were qualitatively and quantitatively described as follows: (1)

a “no problems” class, which included 90% of the sample and demonstrated relatively low item endorsement probabilities (≤ .07) for all items; an “academic problems” class, accounting for 2% of the sample and showing higher rates of performing poorly on assignments/tests, getting behind in schoolwork, or missing a class (item endorsement probabilities = .85, .94, .55, respectively); an “injured self” class, which included 5% of the sample and had a high item endorsement probability (.69) for injuring oneself; and a “severe problems” class, which accounted for 3% of the sample and showed high item endorsement probabilities (≥ .90) for all items. Classes were then compared among a number of covariates, as odds ratios were examined for auxiliary variables in relation to class membership. Specifically, class membership differed significantly in a number of covariates, including gender (i.e., more female students in the “no problems” group), average number of drinks per day, amount of drinking occasions, age of first drinking initiation, intention to participate in Greek life, and number of family members with alcohol-related problems. The findings were proposed to be useful in planning prevention programming so that brief interventions could be applied to specific types of problems (e.g., academic) and could help identify new college students who would be more likely to endorse higher rates of negative outcomes

To date, one study has utilized latent class analysis in order to better understand individuals who participate in drinking games. Borsari and colleagues (2013) sought to classify high school students who engaged in drinking games, using indicators of negative consequences experienced from drinking game participation. These indicators were assessed with the Hazardous Drinking Games Measure (HDGM), one of the only standardized measures of variables related to drinking games (Borsari et al., 2013; Borsari et al., 2014). Their analyses identified three specific classes of individuals, including a “lower-risk” group, a “higher-risk”

group, and a "sexual regret" group. The "lower-risk" group (67.98% of the sample), demonstrated relatively low probabilities (≤ 5% for all consequences), with exception to "had a hangover" (26%) for all eight consequences. The "higher-risk" group (20.22% of the sample) showed higher rates of endorsing every consequence, except for "regretted sexual activity" which was endorsed by no individuals in the "higher-risk" or "lower-risk" groups. The "sexual regret" group (11.80% of the sample) demonstrated a 100% likelihood of endorsing "regretted sexual activity" and probabilities that varied between low endorsement (0%) and moderate endorsement (48%) of other consequences. Auxiliary variable analyses included demographic information, alcohol-related risk, general drinking motives, general impulsivity, types of drinking games played, and alcohol outcome expectancies. Significant class differences included Alcohol Use Disorder Identification (AUDIT) scores (lowest in "lower-risk" class), number of drinks consumed while playing (highest in "sexual regret" class), playing consumption games (e.g., keg stands, power hour; lowest in the "lower-risk" class), playing card games (highest in the "sexual regret" class), social drinking motives (lowest in the "lower-risk" class), enhancement drinking motives (lowest in the "lower-risk" class, highest in the "higher-risk" class), and general impulsivity (lowest in the "lower-risk" class, highest in the "sexual regret" class).

While the latent class analysis conducted by Borsari and colleagues (2013) provided innovative results related to adolescent drinking game participation, replication and extension of their results with a college sample is warranted for a multitude of reasons. For example, their sample size of 178 high school students would generally be considered too small for a latent class analysis, as researchers have discouraged latent class analysis with sample sizes of 200 or less (e.g., Nylund et al., 2007; Swanson et al., 2012). It should also be noted that their sample of

game players had a mean age of 16.3, which is generally lower than the age in which individuals play drinking games most often (i.e., last year of high school and first year of college; Zamboanga et al., 2013). Consequences among gameplayers may also differ for college students, as changes have been observed in negative alcohol-related consequences, including sexual consequences, among high school drinkers transitioning to college (Corbin et al., 2011; Orchowski & Barnett, 2012). Furthermore, increased interest might be found in additional or alternative auxiliary variables. For example, assessing motives for playing drinking games can extend findings related to general drinking motives to motives for drinking games specifically (Johnson & Sheets, 2004). Concerning impulsivity, much existing research highlights the utility of assessing multiple facets of impulsivity in relation to drinking outcomes (e.g., Littlefield et al., 2014; Smith et al., 2007), whereas the study conducted by Borsari and colleagues (2013) utilized one broad measure of impulsivity; findings related to sensation seeking and drinking games (e.g., Moser et al., 2014) further supports the importance of using an expanded approach to impulsivity. Altogether, replication and expansion of this methodology with a college sample would provide important insights into different groups, or classes, of individuals who choose to engage in drinking games.

Current Study

While a considerable amount of research has been conducted to better understand factors related to drinking games (Borsari, 2004; Zamboanga et al., 2014), several important questions still remain. Given relations between drinking game participation and alcohol-related consequences, it may be important to more specifically estimate the proportion of college drinking game participants who are likely to experience varying levels and types of common problems from participation. Furthermore, characterizing such individuals can help identify

measurable variables about the individuals themselves, properties of the drinking games, and other factors that are likely to be associated with different patterns of consequences. Furthering this understanding may be useful in testing more targeted prevention and intervention efforts. Specifically, harm reduction approaches to prevention and intervention rely on data to better understand variables related to drinking that are likely to result in varying degrees of consequences (Marlatt & Witkiewitz, 2002). By improving an understanding of what proportion of individuals are at risk for many consequences, as well as factors linked to increased likelihood for risk, these harm reduction approaches among college students can be further individualized and improved (Neighbors et al., 2006).

Much like the Borsari et al. (2013) study, the current study sought to classify drinking game participants based on their endorsement of a range of drinking game-related consequences. More specifically, latent class analysis was used to better understand different subsets of individuals who experience predefined negative consequences from playing drinking games. Thus, in addition to classification of individuals, class membership was related to (1) general drinking motives, (2) MPDG, (3) UPPS-P impulsivity facets, (4) variables related to drinking games (i.e., number of times played, amount consumed while playing, and game type), and (5) general harmful alcohol use. This approach aimed for improved estimates of drinking game consequence endorsement, as well as a furthered understanding of variables related to differential levels of consequence endorsement.

We hypothesized that distinct classes would emerge based on the endorsement of negative drinking game consequences, and classes would suggest varying levels of consequence severity among drinking game participants. Furthermore, we expected class membership to be related to differential general drinking motives, motives for playing drinking games, impulsivity

facets, variables related to drinking games, and general risk for harmful alcohol use. Concerning general drinking motives, we hypothesized that enhancement motives would be statistically related to class membership. While important relations often emerge between coping motives and general negative consequences (e.g., Carey & Correia, 1997), outcomes related to drinking games (e.g., frequency of play, amount consumed) have been more closely linked to enhancement motives (Zamboanga et al., 2018). Additionally, Borsari and colleagues (2013) did not find meaningful relations between general coping motives and class membership in their latent class analysis of drinking game consequences. Strong relations (r = .69) have also been demonstrated between general enhancement motives and MPDG associated with negative drinking game consequences (i.e., enhancement and thrills, Zamboanga et al., 2018). Concerning MPDG, we hypothesized that conformity, enhancement and thrills, and sexual pursuit motives would be statistically predictive of class membership, as these motives have been linked to increased drinking game consequences in multiple studies since the revision of the MPDG Questionnaire (George et al., 2018; Zamboanga et al., 2019).

We hypothesized that the UPPS-P facets of lack of perseverance and positive urgency would be related to class membership, given relations between lack of perseverance and overall alcohol consumption, in addition to well-established relations between positive urgency and negative alcohol-related consequences (Coskunpinar et al., 2013; Tran et al., 2018). Although negative urgency is often linked to general alcohol-related problems, it was not hypothesized to be predictive of class membership given the lack of data supporting the role of negative reinforcement behaviors (e.g., coping motives) in game-related consequences. In regard to game-specific variables (i.e., amount consumed, game type), we hypothesized that, similar to findings from Borsari and colleagues (2013), the amount consumed and the game type would be linked to

class membership, with consumption games being linked to increased consequence severity. Finally, we expected class membership to be significantly related to AUDIT scores, given significant differences in AUDIT scores between classes in Borsari and colleagues' (2013) latent class analysis, as well as previously established relations between AUDIT scores and drinking game consequences (George et al., 2018). Ultimately, these findings should assist with increased assessment for drinking game-related risk and the evaluation of individualized and general prevention and intervention strategies.

Given that men and women experience different overall rates of alcohol-related problems, and *specific* problems may be experienced differentially between men and women, the current study also sought to explore gender differences in latent class membership and item endorsement. For example, while men generally demonstrate higher rates of overall consumption and negative consequences, they may also be less likely to report having experienced sexual assault than women (Orchowski et al., 2018). Given that specific latent class indicators in the current study (e.g., unplanned sexual activity that was later regretted) may present important differences by gender, a multigroup latent class approach was then utilized to assess for gender differences in class membership and structure. While findings related to gender and negative outcomes from drinking games have been generally mixed (Zamboanga et al., 2021), the current study sought to test for potential differences in classes that may provide further clarification on specific outcomes and covariates, with a particular interest in sexual consequences and sexual motives for playing drinking games.

Method

Participants

Participants included individuals who were administered questionnaires at a large public Southeastern university. Although an adequate sample size for latent class analysis has not been well-established, some research has recommended that sample sizes of at least between 300 (Nylund-Gibson & Choi, 2018; Swanson et al., 2012) and 500 individuals (Nylund et al., 2007) are appropriate for latent class models, particularly in comparison to smaller samples sizes (e.g., n = 200; Nylund et al., 2007). Participants were compensated with course credit via the university's Psychological Sciences department research participation program, SONA. Given the indicators utilized of past month drinking game consequences, only college students who endorsed any alcohol consumption while participating in drinking games within 30 days of survey completion were included in the final sample. A total of 1,527 college students responded to the initial survey. After identifying eligible participants and accounting for outliers and careless respondents, 656 students were included in the final sample.

Measures

General Information Questionnaire

This measure includes items that assess for basic demographic information, including gender, age, credit-year in college, Greek affiliation, race, and ethnicity.

Hazardous Drinking Games Measure (HDGM)

The HDGM (Borsari et al., 2013) is a standardized measure of drinking game behaviors and outcomes. This measure, includes variables of (1) frequency of playing drinking games in the last 30 days, (2) amount consumed when playing drinking games, (3) average length of time spent playing during a typical night, (4) types of games that were played in the last 30 days, and

(5) negative consequences that were endorsed due to drinking game participation in the last 30 days. Frequency of drinking games is rated on a scale from "Never" to "4+ times a week". Open-ended questions assess for the number of drinks typically consumed while playing and the typical number of minutes playing. Binary items are used to indicate which types of drinking game the individual played within the last 30 days, with examples listed of each game. Consequences, which were used as latent class analysis indicators, include binary items to indicate if the following consequences occurred within the past 30 days "as a result of playing drinking games": "engaged in unplanned sexual activity that I later regretted"; "had a hangover"; "got physically sick"; "found it difficult to limit how much I drank"; "became rude, obnoxious, or insulting"; "was unable to recall large stretches of time"; "passed out from drinking alcohol"; and "drove a car when I knew I had too much to drink to drive safely". To date, the HDGM is not a widely used method for measuring variables related to drinking games, as research in this area has traditionally utilized unstandardized methods (e.g., adapting general drinking measures, using researchers' self-developed questionnaires) to ask questions about drinking games (Read, 2014). However, the measure did show acceptable levels of test-retest reliability and both content and criteria-related validity in the initial validation study (Borsari et al., 2013) with three samples of college students. The negative consequence items have also been used in the previously discussed LCA study of high school students (Borsari et al., 2013).

Alcohol Use Disorder Identification Test (AUDIT)

The AUDIT (Saunders et al., 1993) is a widely used 10-item self-report screening instrument designed to assess for risk of problematic alcohol use. Questions (e.g., "How often during the last year have you found that you were not able to stop drinking once you had started?"; "How often during the last year have you had a feeling of guilt or remorse after drinking?") are scored

on Likert scales from 0 to 4, with ratings of 0 (e.g., “Never”) being less indicative of problematic alcohol use (e.g., “Daily or almost daily”) and ratings of 4 being more indicative of problematic use. The AUDIT demonstrated adequate internal consistency ($\alpha = .71$) in the current sample.

UPPS-P Impulsive Behavior Scale

The UPPS-P Impulsive Behavior Scale (Lynam et al., 2006) is a 59-item self-report questionnaire that measures the degree of impulsive tendencies in the facets of negative urgency, lack of premeditation, lack of perseverance, sensation seeking, and positive urgency. Statements (e.g., “When I am upset, I often act without thinking”, “I often get involved in things I often wish I could get out of”) are rated on a Likert scale from 1 (“Agree strongly) to 4 (“Disagree strongly), and higher scores are indicative of higher rates of impulsivity. The measure has demonstrated strong evidence of convergent and discriminant validity among college student samples (Argyriou et al., 2020) and all scales yielded adequate internal consistency in the current sample ($\alpha s \geq .82$).

Drinking Motives Questionnaire – Revised (DMQ-R)

The DMQ-R (Cooper, 1994) is a 20-item self-report measure that measures the frequency in which individuals drink for coping, enhancement, social, and conformity motives. Self-report items are scored on a scale from 1 (“Almost never / never”) to 5 (“Almost always / always”). Items include statements that list potential reasons for which the participant chooses to drink (e.g., “to forget your worries; “so you won’t feel left out”). The DMQ-R is a widely used measure of assessing drinking motives and demonstrated adequate internal consistency among the sample ($\alpha s \geq .82$).

Motives for Playing Drinking Games (MPDG) Questionnaire

The MPDQ questionnaire (Johnson & Sheets, 2004; Zamboanga et al., 2019) was originally a 34-item measure with eight factors developed to assess for reasons individuals choose to play drinking games. However, given the limited amount of data to support the eight-factor structure and more recent CFA and ESEM conducted with the MPDG questionnaire, a seven-factor measure with 28 items has yielded better fit statistics and less cross-loadings among factors (George et al., 2018; Zamboanga et al., 2019). Given these findings, the 28-item, 7-factor version of the MPDG was used. Statements with reasons for playing drinking games (e.g., "For the competition", "To liven up the party", "As a way of expressing interest in someone") are rated on a scale from 0 ("Not at all important") to 3 ("Very important"), and scores are added to indicate the importance of social lubrication, conformity, boredom, novelty, enhancement and thrills, sexual pursuit, and competition in choosing to participate. While only one known study has reported on the internal consistency of the revised seven scales, all scales, with exception to the Boredom scale ($\alpha = .62$) showed adequate levels of internal consistency ($\alpha s \geq .72$; George et al., 2018). Similar statistics were observed in the current sample, with all scales yielding $\alpha s \geq .72$, except the boredom scale, which yielded a α of .69.

Daily Drinking Questionnaire (DDQ)

The DDQ (Collins et al., 1985) was used to measure participants' alcohol consumption within the past 28 days. Open-ended items prompt participants to indicate how many standard drinks they consumed and how many hours they drank on each day of a typical week and the week during with they drank most heavily. Participants also indicate how many drinks they consumed on the day in which they consumed the most alcohol in the past 28 days. The DDQ was used only to describe the current sample and was not utilized in any formal hypothesis testing.

Data Analysis

For conducting latent class analysis, Mplus version 8.5 (Muthen & Muthen, 2017) was utilized. The robust maximum likelihood estimator was used (Muthen & Muthen, 2017), and missing data was accounted for with full information maximum likelihood. Indicators for the primary analysis included the eight consequences from the HDGM (Borsari et al., 2013). The number of latent classes was determined based on the fit statistics of the AIC, BIC, and a-BIC, as well as the bootstrapped likelihood ratio test (BLRT), a significance test for model improvement with the addition of each potential class (Nylund-Gibson et al., 2007).

To examine relations among class membership and auxiliary variables, or correlates, a three-step approach was used, which requires classes to be identified prior to secondary analyses, thus ensuring that covariates do not affect the identification of latent classes (i.e., the first step; Asparouhov & Muthen, 2014); initial identification of classes has been recommended by experts in latent class analysis for this reason (Nylund-Gibson & Masyn, 2016). In the three-step approach, the second step includes developing a most likely class variable based on participants' classification into groups, and then the third step involves this variable being regressed on covariates while measurement error is fixed (Asparuhov & Muthem 2014; Vermunt, 2010). A total of five sets of analyses were used wherein the most likely class variable was regressed on different sets of predictor variables. Sets of predictor variables included (1) general drinking motives; (2) motives for playing drinking games; (3) UPPS-P impulsivity facets; (4) frequency of play, amount consumed while playing, and game type being played within the last 30 days; and (5) AUDIT scores.

Given that latent classes may differ by groups, particularly gender (e.g., Chen et al., 2019; Finch, 2015), a multi-group latent class analysis was then conducted, wherein gender was

added as a grouping variable, allowing for classes to be estimated separately by gender within one model (Eid et al., 2003). By adding a grouping variable, the probability of being in a given class, as well as specific parameter estimates, can be estimated separately for each group (Finch, 2015). First, to evaluate whether adding a grouping variable influenced the probabilities of being in a given class, a model that allowed free estimation of class probabilities and item thresholds was compared to a model that constrained class probabilities and allowed for free estimation of item thresholds with a likelihood ratio test (LRT = $-2(\text{loglikelihood}_1 - \text{loglikelihood}_2)$) as described by Finch (2005) and Masyn (2017). Following this, a model that allowed for free estimation of item thresholds was compared to a model that constrained item thresholds in each class across groups (Finch, 2015). After a significant difference was observed in the comparison of item threshold models, each indicator in matching classes (e.g., class 1, consequence 1 for men vs. women), was compared across groups with Wald tests (Brauner et al., 2016; Pohl et al., 2014). The final multigroup model constrained thresholds for items that did not significantly differ while allowing free estimation where parameters significantly differed. Similar to the analytic approach taken in the full-sample model, class membership was then regressed on the same previously specified covariates (i.e., general drinking motives, motives for playing drinking games, impulsivity facets, drinking game variables, and AUDIT scores) for each gender.

Results

Preliminary analyses included calculations of frequency, means, and standard deviations of variables of interest (i.e., motives for playing drinking games, general drinking motives, impulsivity facets, typical weekly alcohol consumption, number of times playing drinking games, number of drinking game consequences endorsed, amount typically consumed while playing). General descriptive statistics for the full sample, as well as among women and men

specifically can be found in Table 1. Among the current sample, students drank alcohol for an average of 7.94 days (SD = 4.60) within the past 28 days and played drinking games for an average of 3.40 times (SD = 3.15) within the last 30 days. Men had higher scores in motives for playing drinking games of competition, conformity, enhancement and thrills, and social lubrication; positive urgency and sensation seeking; AUDIT scores; average number of drinks consumed per week; frequency of playing drinking games; and amount typically consumed while playing drinking games.

Bivariate correlations for the full sample can be found in Table 2. Concerning motives, all general drinking motives were positively correlated with all motives for playing drinking games. Significant positive correlations were observed among all MPDG scales as well. As expected, strong correlations were observed between general enhancement motives and the MPDG scale of enhancement and thrills ($r = .65$, $p < .001$) and between general conformity motives and the MPDG scale of conformity ($r = .66$, $p < .001$). The correlation between AUDIT scores and the MPDG scale of enhancement and thrills was significantly larger ($r = .45$, $p < .001$) than relations among AUDIT scores and all other MDPG scales. Similarly, a larger correlation was found between the number of negative drinking game consequences endorsed and enhancement and thrills MPDG ($r = .40$, $p < .001$) than for all other MPDG scales.

Class Identification

The first step of the latent class analysis included the identification of classes. Given an interest in gender differences between classes, the model was first run with all participants and was then later run as a multigroup latent class analysis. Model fit information used to determine the appropriate number of classes can be found in Table 2. Although fit indices (i.e., BIC, AIC, a-BIC) generally supported a 2-class solution, the BLRT indicated significant model

improvement from a 2-class to a 3-class solution. While these solutions differ, Nylund-Gibson and Choi (2018) noted a similar discrepancy in analyses presented in their latent class analysis review, and based on strong evidence to support the use of the BLRT given its robust performance (Nylund et al., 2007), in addition to theoretical considerations, opted to select the model with an additional class. Given a reasonable theoretical interpretation for our 3-class solution (see below for class descriptions), in addition to these research findings, a 3-class solution was tentatively selected as most appropriate for the current model. Statistics used for model selection can be found in Table 3.

A diagram of latent classes identified, along with the item probability endorsements for each estimated class can be observed in Figure 1. The class with the fewest amount of problems endorsed (Class 3 ["Fewest Problems" class]) accounted for an estimated 73.1% of individuals, and item endorsement probabilities for each consequence were below .10, with the exception of having a hangover the next day, which yielded a probability of .30. The next class (Class 2 ["High Hangover" class]; estimated 19.0% of individuals) had all participants (i.e., item probability = 1.00) endorse experiencing a hangover the next day, a moderate proportion of individuals (.52) throwing up after participating, and relatively low probabilities (≤ .23) for all other consequences The class with the most number of problems (Class 1 ["Most Problems" class]; estimated 7.8 % of individuals), included a moderate likelihood for becoming sick (item response probability = .56) and difficulty limiting consumption (item response probability = .55); a high likelihood for hangovers (.83) and blackouts (1.00); and higher probabilities than both classes on most other items. Thus, in comparison to Class 3, both Class 2 and Class 1 were more likely to endorse hangovers and becoming sick, whereas Class 1 endorsed additional problems compared to all classes, with particularly high rates of blackouts. While these statistics represent

an estimated model for individuals who play drinking games, descriptive statistics for classes in a most likely class model (i.e., where each individual from the current sample is placed into a specific class) can be found in Table 4.

Covariate Analysis

After the 3 classes were identified, the three-step approach was utilized to regress class membership on covariates of interest. Specifically, class membership was regressed on scales from the MPDG questionnaire, DMQ-R, and UPPS-P Impulsive Behavior Scale; drinking game variables (i.e., number of times playing, number of drinks typically consumed, game type played); and AUDIT scores via multinomial logistic regression. Results with odds ratios can be found in Table 5. First, Class 3 (i.e., the "Fewest Problems" class) was used as the reference group, given that it was the largest class in the sample and associated with the fewest number of negative consequences (Evans-Polce et al., 2016). Then another model was run with Class 2 (i.e., the "High Hangover" class) as a reference group in order to test for differences between Class 2 and Class 1 (i.e., the "Most Problems" class).

Consistent with MPDG hypotheses, individuals with higher scores on enhancement and thrills were more likely to be in Class 1 and Class 2 than Class 3 (i.e., Fewest Problems); scores on this scale were also higher in the Most Problems class than in the High Hangover class. Also consistent with hypotheses, conformity MPDG were higher in the High Hangover class than in the Fewest Problems class. Surprisingly, competition motives were higher in the High Hangover class than the Most Problems class. Contrary to the initial hypothesis, DMQ scales differed among classes in that coping motives were higher in the Most Problems class than in either of the other two classes. Compared to the Fewest Problems class, conformity motives were higher in Class 1 and Class 2, and social motives were higher in the High Hangover class. Concerning

impulsivity facets, negative urgency was unexpectedly higher in both problem classes than in Class 3. For variables related to drinking game participation, the amount of drinks typically consumed while playing and participation in consumption games (i.e., games with a goal of consuming more alcohol than all other participants) were also higher in both problem classes. As expected, AUDIT scores were higher in both of the problem classes compared to the Fewest Problems class and higher in Class 1 than Class 2.

Multigroup Latent Class Analysis

Given an interest in examining differences in latent classes by gender, a multigroup latent class analysis was conducted. The KNOWNCLASS option was utilized in Mplus, which allows a grouping variable in addition to the identification of latent classes (Muthen & Muthen, 2017). First, to determine if there were gender differences in the probability being in a given class, models were compared that (1) fixed class probabilities and allowed for differences in item thresholds and (2) allowed for differences in class probabilities and item thresholds via likelihood ratio tests (Finch, 2005; Masyn, 2017). No significant differences were found between the two models (distributed χ^2 [2] = 1.20, p = .55). Next, a model in which item threshold were fixed across groups was compared to a model in which item thresholds were allowed to vary. A significant difference was found between these two models (distributed χ^2 [24] = 52.29, p = .001), indicating differences in item thresholds per class by gender. To test specific item thresholds across classes by gender, Wald tests were conducted in each class to identify significant differences in item means across gender. Wald test statistics demonstrating gender differences by item within each class can be found in Table 5. Specifically, in the Fewest Problems class, negative consequences of regretted unplanned sex and becoming sick after participating were higher for men than for women. In the High Hangover Class, consequences of

becoming sick and passing out were higher for women, whereas inability to recall events and difficulty limiting consumption were higher for men. Finally, in the Most Problems class, becoming sick was higher for men, whereas difficulty with recall and driving after having too much to drink was higher for women.

An additional multigroup latent class model was then run in which parameters with significant differences were allowed to vary and indicators with nonsignificant differences were constrained. There were no significant differences between this model and the model in which all item thresholds were allowed to vary (distributed χ^2 [16] = 16.93, p = .39). The plotted estimates for this final solution can be observed in Figure 2. While the female group demonstrated a similar pattern to the latent class analysis conducted with the entire sample, the male group followed a different pattern, specifically in Class 2. Class 1 demonstrated a similar pattern between men and women, with moderate to high probabilities in having a hangover, becoming sick, and inability to recall events. The most notable differences in Class 2 were observed in consequences of becoming sick and difficulty limiting consumption. In Class 2, women had a high probability (.86) of becoming sick, whereas men had no endorsement of becoming sick (i.e., probability = .00). Additionally, men had a high probability (.89) of difficulty limiting consumption, whereas women had a relatively low probability (.21) of difficulty limiting consumption. Thus, noticeably differential problems for men and women were observed in Class 2. Class 3 differences were found in men being more likely to have sex that they later regretted and becoming sick.

Covariate Analysis

Similar to the covariate analysis conducted in the full-sample 3-class model, latent class membership was regressed on the same covariates of interest. Multinomial logistic regression

was conducted to compare covariates among each women's class, followed by each men's class. Odds ratios can be found in Tables 7 and 8 for women and men, respectively. For the women's classes, much like the full-sample covariate analysis, higher scores on enhancement and thrills MPDG were observed in Classes 1 and 2 than Class 3 and in Class 1 than Class 2. Conformity MPDG were higher in Class 2 than Class 3, and surprisingly, competition motives were lowest in the Most Problems class. Social lubrication MPDG were also higher in Class 1 than Class 3. Concerning general drinking motives, Class 1 was higher than both classes in coping motives, Class 1 was higher than Class 3 in conformity motives, and Class 2 was higher than Class 3 in social motives. With regard to drinking game variables, playing consumption games was more highly endorsed for Class 1 and 2 than Class 3. Class 1 was higher than both classes in negative urgency and higher than Class 2 in sensation seeking. AUDIT scores were higher in both problem classes than Class 3 and higher in Class 1 than Class 2.

For covariate analysis with men's classes, Enhancement and thrills and boredom MPDG were higher in Class 1 than Class 3. Interestingly, the sexual pursuit scale of the MPDG questionnaire was lowest in Class 1 (i.e., the Most Problems class) compared to both other classes. Enhancement general drinking motives and negative urgency were also higher in Class 1 than Class 3. Playing consumption drinking games was more highly endorsed in Class 2 than Class 3. AUDIT scores were higher in Class 1 and 2 than the Fewest Problems class.

Discussion

The current study aimed to provide a furthered understanding of individuals who are likely to play drinking games in college. Generally, the results indicate that college students are likely to differ in the amount, and type, of negative consequences endorsed from participating in drinking games. Identifying the types of individuals who are likely to experience different

patterns of consequences may be useful in better understanding the risk associated with drinking games, as well developing targeted prevention and intervention efforts for those who are likely to be more at risk.

Latent class analysis was specifically selected for the current study due to its ability to identify patterns of individuals based on specific outcomes. Classification of individuals in this manner can be useful in estimating prevalence rates for endorsing different patterns of risk. Secondary analyses are then useful in examining variables that make an individual more likely to be classified into groups associated with more problematic types of risk. Finally, through multigroup latent class analysis, in which class structure and covariates can be examined and compared among two specific groups of interest, gender was introduced as a grouping variable.

The current study demonstrates that distinct classes of college students do seem to exist based on their experience of negative consequences from playing drinking games. As with the Borsari (2013) latent class analysis, three classes were identified, with a lowest risk group and two other groups that varied in the types of problems reported. The Borsari (2013) study identified three classes, including a low risk group, a high risk group, and a sexual regret group, whereas the current study identified a group with minimal problems, a group with higher rates of hangovers and becoming sick, and a group that had higher rates of a majority of consequences. Notably, in the Borsari (2013) study, 11.80% of high school students reported regretted sexual activity, whereas 6.70% of college students reported this consequence in the current study. Perhaps one reason that the classes differed in consequence type can be attributed to the developmental differences of high school and college students, especially in relation to the high rates of sexual regret experienced among high school students who engage in initial sexual activity (Rouche et al., 2019). That is, high school students may be more likely to report regret

from unplanned sexual activity, especially in contexts of earlier sexual engagement, than college students.

Concerning classes identified in the current study, the Fewest Problems class demonstrated lower probabilities on all consequences, whereas the High Hangover class and Most Problems class had relatively high rates of hangovers and moderate probabilities of becoming sick, and the Most Problems class had higher endorsement probabilities on all other items. These results are generally unsurprising given that that hangovers and becoming sick seem to be more commonly endorsed and less associated with overall alcohol problem severity than other specific negative consequences (Devos & Lange, 2008; Kahler et al., 2005). Specifically, experiencing hangovers and become sick after drinking may be conceptualized as fairly common acute reactions to heavy episodic drinking, whereas other assessed consequences, such as difficulty limiting consumption and blackouts, may be more indicative of problems that develop over time. Thus, individuals in the Most Problems class may be more likely to experience an ever-wider range of drinking-related risks and consequences from drinking game participation. With an exceptionally large proportion of individuals in the most problematic class endorsing difficulty with recall, in addition to low probabilities for this symptom in the other two classes, assessing for this consequence may be a helpful way to efficiently identify individuals more at risk for negative outcomes from play.

While a three-class solution was deemed most appropriate based on model statistics and theoretical considerations (Nylund et al., 2007), a 2-class solution did also fit the data well. Should a 2-class model have been selected, the two distinct classes would have included a class with relatively low probabilities on all items and a class with higher probabilities on all items, with hangovers being the most common negative consequence in both classes. Given the BLRT

statistics, as well as a reasonable theoretical interpretation, current latent class analysis recommendations support the selection of the 3-class model for the current sample (Nylund-Gibson & Choi, 2018). Given that a 2-class solution would have only consisted of "more problems" and "less problems" classes, utilizing latent class analysis in this manner allowed for finer discrimination of types of risk beyond simply higher rates of negative outcomes and lower rates of negative outcomes.

In addition to the distinct classes identified in the current full-sample latent class analysis, significant relations were also found among class membership and several predictor variables. Specifically, as expected, enhancement and thrills MPDG were more highly endorsed in each successively problematic class relative to each preceding class. Conformity motives were also more highly endorsed in the High Hangover class (i.e., Class 2) than the Fewest Problems class (i.e., Class 3); odds ratios for the Most Problems class (i.e., Class 1) compared to the Fewest Problems class were similar (i.e., OR = 1.18 for both Class 2 and Class 1), but did not reach statistical significance. Surprisingly, playing for competition motives was less likely in the Most Problems class, perhaps suggesting that playing for excitement related to rapid consumption was more indicative of problematic outcomes than playing for excitement related to competing with others (i.e., trying to win the games).

With regard to general drinking motives, conformity motives have not been typically linked to negative alcohol-related consequences (Cooper, 2016) but were found to be higher in both problematic classes than Class 3. These findings may provide unique utility for the assessment of conformity motives among college drinkers, as they seem to be a risk factor for problematic drinking game participation. Additionally, while coping motives haven't typically been found predictive of negative outcomes from drinking game participation (Borsari et al.,

2013), they were significantly higher in Class 1 (i.e., Most Problems) than both other classes. These findings indicate that coping motives, while not traditionally conceptualized as predictive of drinking game problems (Zamboanga et al., 2018), may still hold utility in the identification of gameplay participants at risk for negative outcomes. Social motives were also higher in the High Hangover class than the Fewest Problems class. Taken together, playing drinking games for enhancement and thrills and conformity motives were associated with increased risk compared to the Fewest Problems class, and general conformity, social, and coping drinking motives were also identified as potential risk factors for problematic class membership in the current full sample.

To date, the current study is the first to utilize a multifaceted measure of impulsivity in relation to drinking games. Contrary to our hypotheses, negative urgency was the only impulsivity facet related to more problematic class membership. While negative urgency has been traditionally linked to problematic substance use outcomes (e.g., Tran et al., 2018), we did not expect any relations to drinking game problems, for the same reasons that coping motives were not hypothesized to be related to class membership. Thus, findings in the current study related to both negative urgency and coping motives demonstrates that LCA may be useful in identifying drinking game participants at risk for negative outcomes who may not have been previously identified through different methodologies (e.g., Zamboanga et al., 2018).

Concerning drinking game variables, the amount of drinks typically consumed while playing was higher in both problem classes than Class 3. That is, as expected, the more that individuals typically drink while playing, the more likely they are to be categorized as experiencing problematic outcomes from playing. The only game type that was associated with being in Class 1 or Class 2 compared to the Fewest Problems class was consumption games,

where the goal of participating is to drink more alcohol than other participants. Given that team games, such as beer pong, typically account for the most participation in drinking games (Alfonso & Deschenes, 2013), these findings highlight the importance of identifying game type as a potential risk factor for problematic consequence endorsement. Individuals in the Fewest Problems class may often choose to play the most common drinking games (e.g., beer pong) that include a social component, as opposed to playing the types of drinking games more explicitly designed to facilitate rapid alcohol consumption and intoxication.

As expected, AUDIT scores also differed among classes, with each successive problematic class showing higher scores than other classes. In summation, Class 3 (i.e., Fewest Problems) was lower than either one or both of the more problematic classes in MPDG of enhancement and thrills and conformity; general coping, social, and conformity drinking motives; negative urgency; typical consumption amount while playing drinking games; playing consumption games; and AUDIT scores. All of these variables may be useful in better identifying who might be more likely to experience problematic patterns of consequences from playing drinking games.

When accounting for gender in the multigroup latent class analysis, there were notable gender differences in the probability of items being endorsed in each class, as evidenced by significantly worse model fit when item thresholds were constrained for men and women in each class than when they were allowed to vary. Due to this, indicators were tested for gender differences in each class and then allowed to vary if significant differences were observed. Specifically, in the Most Problems class men were more likely to endorse becoming sick after drinking, whereas women were more likely to experience blackouts and to drive after drinking too much to safely drive. In the High Hangover class, men were more likely to endorse difficulty

limiting consumption and blackouts, whereas women were more likely to become sick and to pass out. Finally, in the Fewest Problems class, men were more likely to engage in unplanned sexual activity that they later regretted and becoming sick. After item thresholds with significant differences were allowed to vary by gender, the model fit was improved and was not significantly worse than the model in which all thresholds were allowed to vary.

Logistic regression conducted with only male or female participants highlighted many similarities and some differences to the covariate analyses conducted with the full sample. Specifically, playing drinking games for enhancement and thrills was more endorsed for men and for women in the Most Problems class relative to the Fewest Problems class. Competition motives were also lowest in the Most Problems class for women, and while this result did not reach statistical significance for men, potentially due to power concerns, estimates were similar in direction. Conformity MPDG were also higher in Class 2 than Class 3 for women. Notably, playing for social lubrication was higher for women in the Most Problems class, which was not identified in the full-sample model. Thus, for women, utilizing drinking games to facilitate social interactions may be more indicative of increased risk for negative consequences. Coping and conformity general drinking motives were also higher for women in the Most Problems class, whereas enhancement motives were the only drinking motive associated with being in the Most Problems class for men; men who are experiencing the most problematic drinking game outcomes may be more likely to report drinking in order to experience the positive effects of alcohol (i.e., becoming intoxicated), where women may experience more problems if they often drink to reduce feeling isolated or in attempts to reduce negative affect. Much like the full-sample covariate analyses, negative urgency was highlighted as a risk factor for both men and women, and playing consumption games was associated with increased risk for both genders.

Given that there is a large base of literature examining risk factors related to gender differences and sexual assault after drinking events (e.g., Neilson et al., 2018), it is interesting that item thresholds did not significantly differ for engaging in unplanned sexual activity that was later regretted in both problem classes. The only difference for this specific consequence was identified in the Fewest Problems class, for which men reported higher item endorsement. One potential reason for this finding could be found within the phrasing of the item; "engaged in unplanned sexual activity that I later regretted" may be interpreted by the respondent as involving a certain level of personal responsibility and conscious decision making. That is, people who experienced sexual assault may appropriately choose *not* to endorse the item, and therefore, the HDGM may not be capturing various sexual assault experiences within its consequence items. In fact, people who become intoxicated and are perpetrators of sexual assault may report that they engaged in sexual activity that they later regretted due to feelings of shame or guilt (Brennan et al., 2018), which could be a capturing different type of outcome than some experiences of sexual assault survivors.

In addition to these findings on sexual regret, it was particularly interesting that men in the Most Problems class demonstrated significantly lower scores on the MPDG sexual pursuit scale than both other classes. It may be especially important to consider that this class endorsed particularly high levels of general enhancement motives and enhancement and thrills MPDG. A longitudinal mediation analysis conducted by Lindren and colleagues (2012) found that coping motives, but not enhancement motives mediated relations between problem drinking and sexual assault. Thus, men who are particularly at risk for problems while playing drinking games may endorse a high likelihood for motives consistent with wanting to become rapidly intoxicated and experience excitement while playing, rather than motives closely linked to sexual assault (i.e.,

coping motives). Given that drinking to cope was not significantly related to class membership for men, future research may be warranted to better understand variables that make men who play drinking games more likely to engage in problematic sexual behaviors and potentially sexual violence. Additionally, men who play drinking games for sexual pursuit may recognize that rapid consumption and intoxication may not be compatible with premeditated sexual pursuit. Men in the Most Problems class seem to be motivated to play in a manner that facilitates rapid intoxication, which may be more likely to lead to a wider range of negative drinking game outcomes but less premeditated sexual pursuit.

Limitations

Although the current study provides several findings that may help in furthering an understanding of drinking game participants, there are several limitations that should be considered. First, the sample consisted of primarily white, female students, and thus, results may not be generalizable to more diverse samples. Given that examining gender differences within the multigroup latent class analysis was an important part of the current study, it should be noted that the current sample only included 165 men out of 656 total participants. The limited amount of men in the sample may have depressed the likelihood that the multigroup latent class analysis adequately captured results for men (Nylund et al., 2007). Relatedly, numerically more covariates were found to be statistically related to class membership in the full sample latent class analysis and the women's classes in the multigroup latent class analysis. Although the proportion of men and women designated to each class was similar, the amount of men in Class 1 and Class 2 may not have yielded enough statistical power to identify significant relations among class membership and covariates (Sperandei, 2014). Thus, while substantive conclusions cannot be drawn from estimates themselves, observing the direction of relations between

covariates and classes may provide useful information for future directions in covariate analyses. Future studies with similar aims should seek to utilize more diverse and representative samples of college students.

Another potential limitation of the current study can be found in the cross-sectional nature of the analysis. While latent class analysis is a strong analytic tool for classifying individuals based on problem endorsement, covariates and drinking game outcomes can change over time. Thus, a longitudinal classification of individuals, which can be achieved via advance statistical methodologies such as latent transition analysis, may provide clearer results concerning the likelihood for risk to persist over time among individuals, as well as the effects of changes in covariates on future class membership.

Although the HDGM has demonstrated utility in assessing drinking game behaviors and outcomes, there are a limited number of studies assessing its psychometric properties. Assessing drinking game behaviors and outcomes still often relies on simply adapted measures of general drinking variables or informal assessment of drinking game items; consistent measurement of drinking game variables continues to represent a limitation in this area of research (Zamboanga et al., 2021). As previously discussed in relation to the sexual regret indicator, there may be additional negative outcomes that were not adequately captured in the HDGM. Thus, other negative consequences that were experienced after play may still need to be identified and assessed among drinking game participants.

Future Directions

To better understand risk concerning drinking game participation, addressing several additional factors may provide interesting results while utilizing similar methodologies. For example, as previously discussed, there were notable differences in the class structure between

high school classes in the Borsari (2013) study and college classes in the current study. Multigroup latent class analysis comparing high school and college students may be one useful way to better explore such differences. Alternatively, longitudinal studies, such as latent transition analysis, could seek to explore relations among early onset (i.e., high school) drinking game risk and future college drinking game risk. Including additional indicators to those presented in the HDGM may also assist in capturing other types of risk that were not addressed in the current study. For example, Zamboanga and colleagues (2019) have demonstrated attempts to address the psychometric properties of adapting a widely used alcohol consequence measure (i.e., the Brief Young Adult Consequences Questionnaire; Kahler et al., 2008) for assessing drinking game problems. Utilizing a more expansive list of problems from participation may provide useful insights on the adapted measure itself and more specific classes of risk that individuals are likely to experience.

The findings presented in the current study may also be useful in developing continued research related to risk factors and targeted prevention and intervention efforts for individuals who are likely to participate in drinking games. As previously discussed, similar studies should seek to assess negative consequences and related covariates with more representative samples and samples with a higher proportion of male students. This may provide further clarity on the differences in risk for male and female college students and factors that are more closely linked to a higher likelihood for experiencing negative outcomes among both men and women.

Brief assessments and interventions continue to be an effective and efficient method for targeting negative outcomes among college student drinkers (Prosser et al., 2018). Such efforts are based in a motivational interviewing framework and typically include assessment of alcohol-related variables and potential risk factors linked to a high likelihood of negative consequences,

followed by personalized feedback and goal-setting to limit alcohol-related problems (Fachini et al., 2012). Given that drinking games are played at a high rate among college student drinkers, attempts to test the incorporation of results from the current study into brief assessments and interventions may be useful.

Given that advancements have been made in the assessment of drinking game variables via field studies and laboratory simulations (e.g., Clapp et al., 2014; Silvestri et al., 2013), expansion of such methodologies may add unique value to the methodology of the current study. For example, simulation studies can assess the amount of alcohol one would typically consume per drinking game event (e.g., what kind of beverage is consumed and how much is consumed after someone throws a ball into their cup while playing beer pong). Quantifying and utilizing such measures as covariates in latent class analysis could add a useful variable to further an understanding of drinking game properties tied to increased types of risk. Further, field studies examining social relationships of game play (e.g., whether playing with close friends or others, playing with members of the opposite gender) could also be utilized to better understand drinking game properties and their relations to problematic class membership.

Utilizing specific consequences for efficient assessment and feedback may be useful among students mandated to brief alcohol interventions. For example, in the full sample latent class analysis and the multigroup latent class analysis, experiencing blackouts after participating was particularly highly endorsed for the Most Problems classes. Feedback provided to students who experienced blackouts after playing drinking games may present the increased risk that they are likely to experience across a wide range of negative consequences due to their play. Concerning covariate analysis results, assessing the covariates linked with more problematic class membership may also be used to identify and provide personalized feedback to students

who are likely to experience more problematic outcomes from drinking game participation. Specifically, students who play drinking games for enhancement and thrills motives, often play consumption games, are more impulsive when experiencing negative affect (i.e., negative urgency), and play in order to "fit in" (i.e., conformity MPDG) could be provided in personalized feedback concerning their likelihood of experiencing negative outcomes. Incorporation of this feedback in brief intervention models could be tested to assess their efficacy in reducing problematic drinking game participation.

In order to better capture risk related to drinking game participation, longitudinal studies may be of interest. As introduced previously, latent transition analysis is much like latent class analysis in identifying classes based on categorical indicators but utilizes longitudinal data to assess whether class membership changes for individuals over time (Lanza et al., 2010). Utilization of such approaches could allow for a better understanding of risk factors that are *consistently* linked to problematic class membership as well as the usefulness of various prevention and intervention efforts. Longitudinal studies can also identify which covariates are more likely to change over time, and relatedly, whether such changes are likely to be associated with changes in risk for negative outcomes.

Finally, as drinking game participation has shown additional risk compared to high rates of general drinking (i.e., assessed noncontextually; Zamboanga et al., 2010), further identification of the ways in which drinking games present additional risk is warranted. Examining what specific factors related to drinking games are likely to increase risk above and beyond excessive consumption itself should continue to be researched. For example, as drinking games are inherently linked to rapid rises in blood alcohol concentration (BAC), assessing the incremental risk of drinking game participation above and beyond rapid BAC elevations is

warranted. Specific factors unique to drinking games, such as the social nature of games, competing against others, or trying to impress other participants may be of interest to evaluate the ways in which drinking game participation increases risk for negative outcomes. Such efforts may help to target specific properties of drinking games or individual differences that are likely to further a risk for negative alcohol-related consequences in specific contexts.

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Appendix

Table 1

Descriptive Statistics for Variables of Interest Among Full Sample, Men, and Women

	Full Sample		Women		Men	
	M	SD	M	SD	M	SD
DMQ Social	16.31	4.78	16.27	9.95	16.47	4.66
DMQ Coping	9.82	4.14	9.95	4.26	9.45	3.76
DMQ Enhancement	13.45	4.66	13.42	4.64	13.56	4.73
DMQ Conformity	7.36	3.22	7.25	3.20	7.70	3.26
MPDG Competition	6.42	2.53	6.14	2.51	7.26***	2.39
MPDG Conformity	7.25	2.53	7.13	2.52	7.63*	2.51
MPDG E and T	16.92	4.74	16.57	4.77	17.98**	4.51
MPDG Lubrication	8.51	2.86	8.34	2.79	9.02**	3.03
MPDG Novelty	3.77	1.53	3.84	1.56	3.58	1.44
MPDG Sexual Pursuit	3.40	1.13	3.35	1.05	3.55	1.33
MPDG Boredom	5.35	1.89	5.36	1.89	5.32	1.89
Negative Urgency	29.30	7.07	29.41	7.12	28.93	6.92
Positive Urgency	28.05	8.45	27.59	8.64	29.32*	7.63
Sensation Seeking	34.88	6.38	34.17	6.46	37.04***	5.68
Lack of Premeditation	21.30	4.95	21.42	5.05	21.00	4.65
Lack of Perseverance	19.19	4.77	19.31	4.81	18.86	4.64
AUDIT	9.45	4.62	9.21	4.47	10.23**	4.93
Drinks/Week	10.78	9.00	9.69	8.19	13.68***	10.37
DG Times	3.40	3.15	3.14	2.85	4.18***	3.83
DG Consequences	1.13	1.32	1.10	1.34	1.21	1.27
DG Drinks	3.16	2.52	2.87	2.41	4.03***	2.63

Note. DMQ = general drinking motives; MPDG = Motives for Playing Drinking Games; E and T = Enhancement and Thrills; DG Times = number of times playing drinking games in past 30 days; DG Consequences = number of drinking game consequences endorsed; DG Drinks = typical number of drinks consumed while playing; * $p < .05$, ** $p < .01$, *** $p < .001$ indicating higher value for gender compared to other gender.

Table 2

Bivariate Correlations for Variables of Interest Among the Full Sample

	1	2	3	4	5	6	7	7	9	10	11	12	13	14	15	16	17	18	19	20	21
1. DM Soc	1																				
2. DM Cop	.47***	1																			
3. DM Enh	.65***	.50***	1																		
4. DM Con	.30***	.33***	.20***	1																	
5. MP Com	.27***	.25***	.34***	.16***	1																
6. MP Conf	.29***	.25***	.18***	.66***	.16***	1															
7. MP ET	.58***	.45***	.65***	.24***	.54***	.28***	1														
8. MP Lub	.35***	.34***	.33***	.36***	.38***	.45***	.47***	1													
9. MP Nov	.23***	.31***	.34***	.23***	.26***	.32***	.45***	.50***	1												
10. MP Sex	.11**	.22***	.13**	.28***	.23***	.33***	.19***	.42***	.21***	1											
11. MP Bored	.36***	.41***	.35***	.31***	.37***	.35***	.47***	.40***	.41***	.30***	1										
12. NU	.20***	.40***	.24***	.15***	.18***	.12**	.24***	.13**	.12**	.13**	.19***	1									
13. PU	.15***	.34***	.20***	.21***	.19***	.18***	.25***	.21***	.19***	.23***	.25***	.67***	1								
14. SS	.09*	.14***	.18***	.05	.29***	.02	.28***	.17***	.17***	.09*	.10*	.21***	.38***	1							
15. Premed	.02	.12***	.15***	.01	.02	-.01	.12**	.06	.04	.10*	0.04	.39***	.41***	.36***	1						
16. Pers	.06	.20***	.10*	.07	-.05	.07	.04	.04	.02	.08*	.09*	.40***	.34***	0.05	.50***	1					
17. AUDIT	.39***	.43***	.45***	.24***	.26***	.14***	.45***	.22***	.15***	.19***	.29***	.39***	.38***	.19***	.27***	.19***	1				
18. DW	.33***	.28***	.39***	.10*	.19***	.07	.37***	.14**	.11*	.18***	.19***	.17***	.23***	.15**	.19***	.11**	.62***	1			
19. DG Times	.18***	.15***	.24***	.05	.23***	.06	.34***	.15***	.11**	.08*	.22***	.13**	.17***	.20***	.14***	0.05	.39***	.44***	1		
20. DG Cons	.32***	.36***	.31***	.28***	.19***	.25***	.40***	.24***	.18***	.14***	.27***	.32***	.29***	.14**	.13**	.09*	.52***	.28***	.23***	1	
21. DG Drinks	.12**	.13**	.12**	.10*	.11**	.06	.22***	.11**	.05	.13**	.14***	.15***	.17***	.14**	.14**	.10*	.19***	.29***	.13**	.24***	1

Note. DM = Drinking Motives; MP = Motives for Playing Drinking Games; Soc = social, Cop = coping; Enh = enhancement; Con = conformity; Com = competition; ET = enhancement and thrills; Lub = social lubrication; Nov = novelty; Bored = boredom; NU = negative urgency; PU = positive urgency; SS = sensation seeking; Premed = lack of premeditation; Pers = lack of perseverance; DW = typical weekly drinks; DG Times = number of times playing drinking games in past 30 days; DG Cons = number of drinking game consequences endorsed; DG Drinks = typical number of drinks consumed while playing; * $p < .05$, ** $p < .01$, *** $p < .001$.

Table 3

Model Fit Information for LCA with 1-4 Classes

Model	LL	*n* par	AIC	BIC	a-BIC	BLRT
1 Class	-1764.79	8	3545.585	3581.474	3556.074	N/A
2 Class	-1617.19	17	3268.388	3344.653	3290.667	< .01
3 Class	**-1603.67**	**26**	**3259.337**	**3375.977**	**3293.427**	**0.02**
4 Class	-1594.75	35	3260.532	3417.548	3306.422	0.23

Note. LL = log-likelihood; *n* par = number of parameters; AIC = Akaike information criterion; BIC = Bayesian information criterion; a-BIC = sample-size adjusted Bayesian information criterion; BLRT = bootstrap likelihood ratio test; bolded class = final selected model.

Figure 1

Estimated Prevalence of Negative Consequences for a 3-class Solution

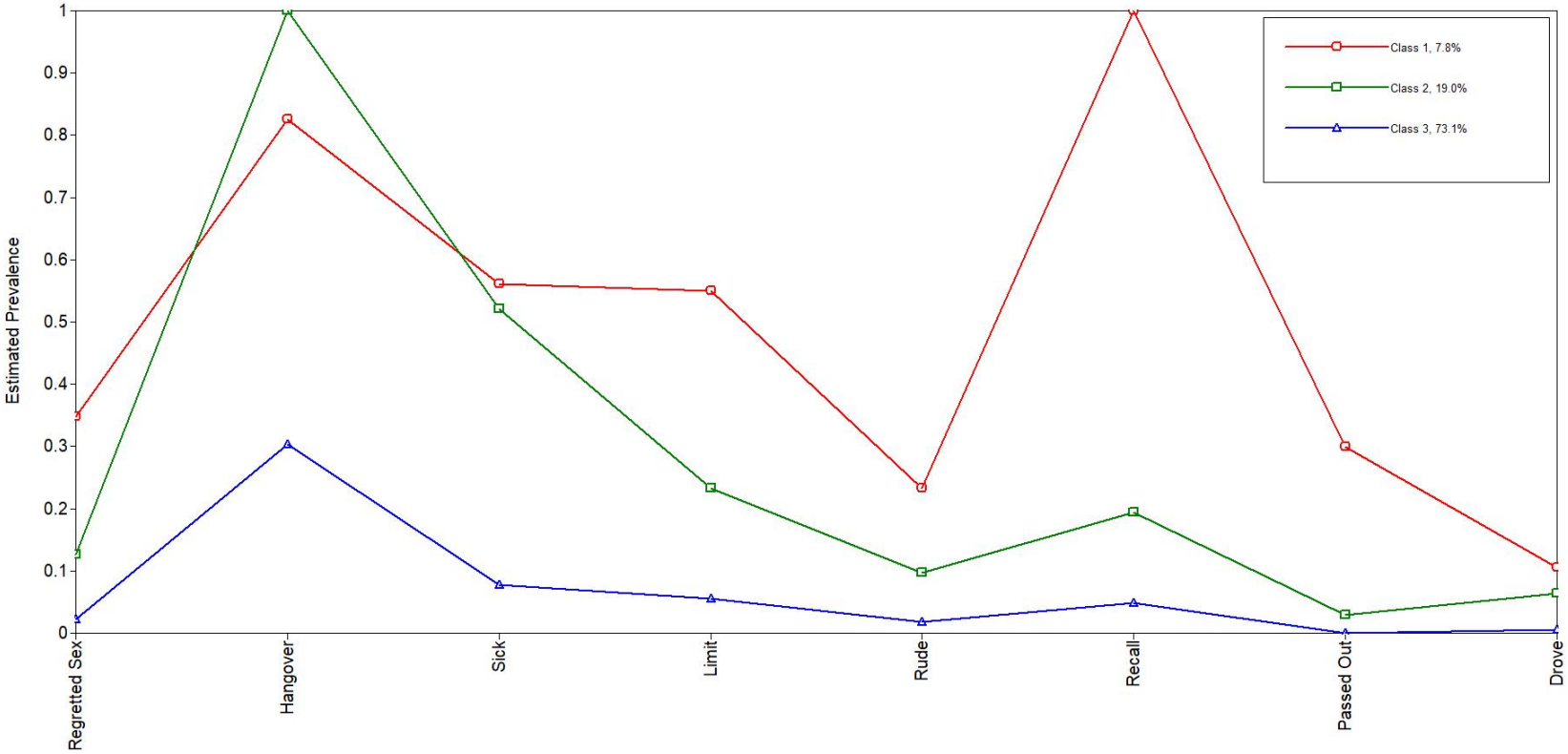


Table 4.

Descriptive Statistics and Prevalence Rates for Full Sample and Classes in Most Likely Class Membership Model

	Full Sample		Class 3		Class 2		Class 1	
	M	SD	M	SD	M	SD	M	SD
Days Drinking	7.94	4.60	7.53	4.38	8.51	4.78	10.34	5.34
Max Number of Drinks	7.31	4.20	6.61	3.72	9.09	5.09	9.58	4.11
Typical Weekly Drinks	10.78	9.00	9.52	8.41	12.56	8.56	17.21	11.23
Max Weekly Drinks	21.11	19.38	17.95	15.2	28.24	23.59	33.74	30.92
DG Consequences	1.13	1.32	0.47	0.54	2.41	0.64	4.11	1.22
	Full Sample		Class 3		Class 2		Class 1	
	Percent		Percent		Percent		Percent	
Female	74.70		75.83		68.29		79.25	
Greek Affiliated	56.42		57.29		50.41		60.38	
Caucasian	93.75		93.54		95.12		92.45	
Freshman	51.83		53.03		45.53		56.60	
Sophomore	21.04		20.25		21.95		26.42	
Junior	13.87		13.36		16.26		13.21	
Senior	13.11		13.36		16.26		3.77	
DG Regretted Sex	6.71		1.46		12.20		41.51	
DG Hangover	47.71		29.79		100.00		88.68	
DG Sick	19.97		5.42		63.41		50.94	
DG Limit	12.80		4.17		25.20		62.26	
DG Rude	5.03		1.46		9.76		26.42	
DG Recall	15.09		4.17		21.14		100.00	
DG Passed Out	2.90		0.00		2.44		30.19	
DG Drove	2.44		0.42		6.50		11.32	

Note. Days Drinking = number of days drinking in past 28 days; Max Number of Drinks = maximum number of drinks consumed at one time in past 28 days; Typical weekly drinks = total number of drinks consumed in typical week in past 28 days; Max Weekly Drinks = total number of drinks consumed in week for which drinking the most in past 28 days; DG consequences = number of drinking game consequences endorsed. DG = drinking games. Given slight differences in the estimated model (described in the text and depicted in Figure 1) and a most likely class membership model (described in the current table), prevalence rates for negative consequences may vary slightly from item thresholds reported in the estimated model.

Table 5

Multinomial Logistic Regression for Full Sample

	Class 3 (REF) vs. Class 2	Class 3 (REF) vs. Class 1	Class 2 (REF) vs. Class 1
Factor	OR (95% CI)	OR (95% CI)	OR (95% CI)
MPDG			
Competition	1.09 (0.95, 1.25)	0.82 (0.65, 1.03)	**0.75 (0.58, 0.97)**
Conformity	**1.18 (1.03, 1.36)**	1.18 (.995, 1.40)	1.00 (0.85, 1.18)
Enhancement and Thrills	**1.21 (1.09, 1.33)**	**1.42 (1.22, 1.64)**	**1.17 (1.001, 1.38)**
Lubrication	0.99 (0.86, 1.14)	1.02 (0.85, 1.21)	1.02 (0.85, 1.24)
Novelty	0.95 (0.72, 1.25)	0.93 (0.67, 1.27)	0.98 (0.67, 1.41)
Sexual Pursuit	0.91 (0.68, 1.22)	1.06 (0.70, 1.60)	1.16 (0.68, 1.97)
Boredom	1.03 (0.82, 1.28)	1.21 (0.93, 1.59)	1.18 (0.86, 1.62)
DMQ			
Social	**1.11 (1.02, 1.21)**	1.14 (0.99, 1.32)	1.03 (0.87, 1.21)
Coping	1.07 (0.97, 1.18)	**1.21 (1.10, 1.34)**	**1.14 (1.03, 1.26)**
Enhancement	1.06 (0.96, 1.16)	1.06 (0.94, 1.21)	1.01 (0.87, 1.17)
Conformity	**1.14 (1.04, 1.25)**	**1.18 (1.07, 1.29)**	1.03 (0.94, 1.13)
UPPS-P			
Negative Urgency	**1.09 (1.02, 1.16)**	**1.18 (1.09, 1.29)**	1.09 (0.99, 1.21)
Positive Urgency	1.03 (0.98, 1.08)	1.02 (0.96, 1.08)	0.99 (0.93, 1.51)
Sensation Seeking	1.01 (0.95, 1.07)	1.05 (0.98, 1.13)	1.04 (0.95, 1.14)
Lack of Premeditation	1.02 (0.94, 1.11)	1.00 (0.91, 1.10)	0.98 (0.87, 1.10)
Lack of Perseverance	0.93 (0.86, 1.01)	0.96 (0.88, 1.04)	1.03 (0.93, 1.15)
DG Variables			
Days Played	1.10 (0.99, 1.22)	1.09 (0.98, 1.21)	0.99 (0.89, 1.12)
Typical Drinks	**1.42 (1.08, 1.87)**	**1.35 (1.04, 1.74)**	0.95 (0.82, 1.09)
Type Consumption	**4.96 (2.13, 11.6)**	**5.46 (1.76, 16.95)**	1.10 (0.28, 4.33)
Type Skill	1.24 (0.56, 2.72)	3.24 (0.86, 12.23)	2.63 (0.51, 13.42)
Type IQ	2.21 (0.96, 5.06)	N/A	N/A
Type Unity	1.95 (0.92, 4.15)	1.09 (0.30, 4.00)	0.56 (0.12, 2.55)
Type Team	1.82 (0.79, 4.20)	2.58 (0.74, 9.07)	1.42 (0.31, 6.56)
AUDIT			
	1.37 (1.24, 1.51)	**1.62 (1.45, 1.81)**	**1.18 (1.07, 1.31)**

Note. OR = odds ratios; MPDG = Motives for Playing Drinking Games; DMQ = Drinking Motives Questionnaire-Revised; UPPS-P = UPPS-P Impulsive Behavior Scale; DG = drinking game; Times Played = times played in last 30 days; Typical Drinks = drinks typically consumed while playing; N/A = unable to be estimated due to lack of variance; bold values = significant class differences.

Table 6

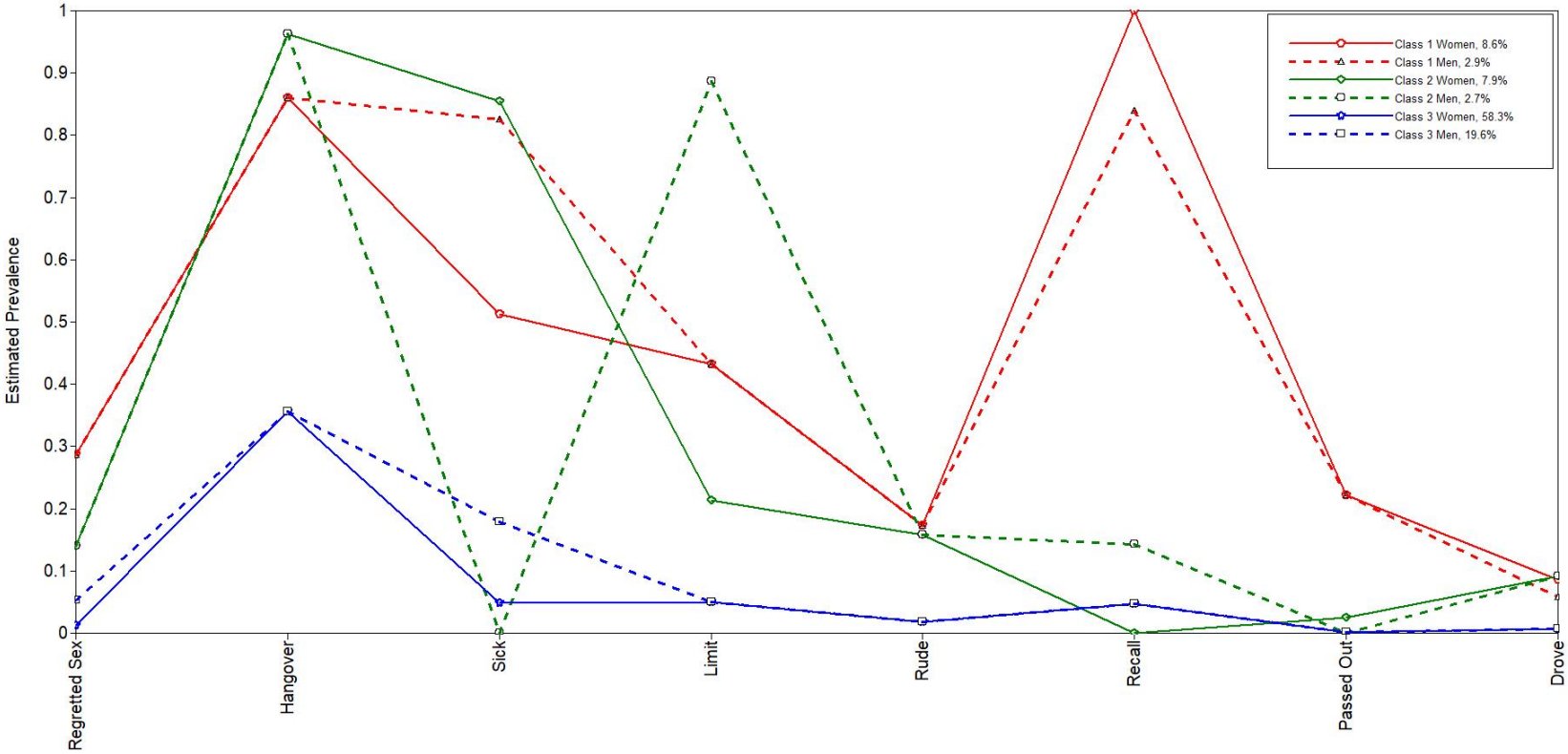
Wald Tests for Each Class by Gender

	Wald	*p* value	Higher For:
Class 1			
Regretted Sex	0.48	.49	
Hangover	0.00	1.00	
Sick	**86.66**	**< .001**	**Men**
Limit	0.01	.94	
Rude	0.49	.48	
Recall	**102.30**	**< .001**	**Women**
Passed out	2.95	.09	
Drove	**123.65**	**< .001**	**Women**
Class 2			
Regretted Sex	2.71	.10	
Hangover	0.18	.68	
Sick	**4.02**	**.045**	**Women**
Limit	**209.99**	**< .001**	**Men**
Rude	1.5	.22	
Recall	**188.58**	**< .001**	**Men**
Passed out	**166.78**	**< .001**	**Women**
Drove	0.68	.41	
Class 3			
Regretted Sex	**6.16**	**.01**	**Men**
Hangover	0.01	.91	
Sick	**7.92**	**.004**	**Men**
Limit	0.07	.79	
Rude	0.01	.92	
Recall	0.53	.47	
Passed out	0.38	.54	
Drove	1.15	.28	

Note. Bold values = significant differences at $p < .05$.

Figure 2

Estimated Prevalence of Negative Consequences for Multigroup LCA



Note. Item thresholds were allowed to vary where significant differences were found by gender in each respective class. Item thresholds with no significant differences by gender in each respective class were constrained.

Table 7

Multinomial Logistic Regression for Women in Multigroup LCA

	Class 3 (REF) vs. Class 2	Class 3 (REF) vs. Class 1	Class 2 (REF) vs. Class 1
Factor	OR (95% CI)	OR (95% CI)	OR (95% CI)
MPDG			
Competition	0.99 (0.83, 1.17)	**0.79 (0.67, 0.94)**	**0.80 (0.66, 0.98)**
Conformity	**1.21 (1.04, 1.41)**	1.17 (0.997, 1.36)	0.96 (0.84, 1.10)
Enhancement and Thrills	**1.15 (1.02, 1.28)**	**1.37 (1.20, 1.55)**	**1.19 (1.04, 1.37)**
Lubrication	1.10 (0.94, 1.28)	**1.17 (1.01, 1.35)**	1.07 (0.90, 1.27)
Novelty	1.02 (0.76, 1.36)	0.91 (0.70, 1.20)	0.90 (0.65, 1.24)
Sexual Pursuit	0.68 (0.34, 1.34)	0.86 (0.64, 1.16)	1.27 (0.68, 2.40)
Boredom	0.93 (0.70, 1.24)	1.08 (0.85, 1.37)	1.16 (0.85, 1.57)
DMQ			
Social	**1.13 (1.03, 1.24)**	1.10 (0.97, 1.25)	0.98 (0.85, 1.12)
Coping	1.01 (0.91, 1.12)	**1.14 (1.05, 1.23)**	**1.13 (1.02, 1.25)**
Enhancement	1.04 (0.93, 1.15)	1.05 (0.95, 1.15)	1.01 (0.89, 1.14)
Conformity	1.08 (0.97, 1.21)	**1.17 (1.07, 1.27)**	1.08 (0.98, 1.19)
UPPS-P			
Negative Urgency	1.03 (0.96, 1.09)	**1.14 (1.07, 1.22)**	**1.11 (1.03, 1.21)**
Positive Urgency	1.02 (0.97, 1.07)	1.02 (0.98, 1.07)	1.01 (0.95, 1.07)
Sensation Seeking	0.95 (0.90, 1.01)	1.04 (0.98, 1.11)	**1.09 (1.01, 1.18)**
Lack of Premeditation	1.05 (0.97, 1.14)	0.97 (0.89, 1.05)	0.92 (0.82, 1.02)
Lack of Perseverance	0.96 (0.88, 1.05)	0.98 (0.91, 1.06)	1.03 (0.93, 1.14)
DG Variables			
Days Played	1.02 (0.89, 1.18)	1.06 (0.96, 1.17)	1.04 (0.89, 1.20)
Typical Drinks	1.15 (0.75, 2.89)	1.51 (0.83, 2.77)	1.03 (0.90, 1.18)
Type Consumption	**3.77 (1.66, 8.54)**	**3.89 (1.75, 8.65)**	1.03 (0.43, 2.49)
Type Skill	0.98 (0.45, 2.13)	1.31 (0.64, 2.65)	1.34 (0.54, 3.33)
Type IQ	1.41 (0.60, 3.7)	1.18 (0.45, 3.12)	0.84 (0.29, 2.41)
Type Unity	1.05 (0.47, 2.31)	1.35 (0.62, 2.94)	1.29 (0.51, 3.25)
Type Team	1.25 (0.47, 3.28)	1.91 (0.72, 5.12)	1.53 (0.48, 4.86)
AUDIT			
	1.22 (1.12, 1.33)	**1.42 (1.31, 1.55)**	**1.17 (1.05, 1.29)**

Note. OR = odds ratios; MPDG = Motives for Playing Drinking Games; DMQ = Drinking Motives Questionnaire-Revised; UPPS-P = UPPS-P Impulsive Behavior Scale; DG = drinking game; Times Played = times played in last 30 days; Typical Drinks = drinks typically consumed while playing; bold values = significant class differences.

Table 8

Multinomial Logistic Regression for Men in Multigroup LCA

	Class 3 (REF) vs. Class 2	Class 3 (REF) vs. Class 1	Class 2 (REF) vs. Class 1
Factor	OR (95% CI)	OR (95% CI)	OR (95% CI)
MPDG			
Competition	1.21 (0.88, 1.67)	0.94 (0.72, 1.24)	0.78 (0.54, 1.12)
Conformity	1.02 (0.68, 1.52)	1.23 (0.91, 1.68)	1.21 (0.77, 1.90)
Enhancement and Thrills	1.14 (0.95, 1.37)	**1.24 (1.06, 1.46)**	1.09 (0.88, 1.35)
Lubrication	0.86 (0.56, 1.32)	0.93 (0.67, 1.29)	1.08 (0.66, 1.79)
Novelty	1.24 (0.70, 2.19)	1.01 (0.64, 1.58)	0.81 (0.42, 1.57)
Sexual Pursuit	1.32 (0.77, 2.29)	**0.55 (0.30, 0.99)**	**0.41 (0.20, 0.87)**
Boredom	0.92 (0.46, 1.82)	**1.36 (1.01, 1.81)**	1.48 (0.73, 3.00)
DMQ			
Social	1.06 (0.90, 1.26)	1.06 (0.89, 1.25)	0.99 (0.79, 1.26)
Coping	1.04 (0.85, 1.27)	1.10 (0.91, 1.33)	1.06 (0.83, 1.34)
Enhancement	1.04 (0.84, 1.27)	**1.18 (1.01, 1.39)**	1.14 (0.89, 1.47)
Conformity	1.07 (0.90, 1.27)	1.10 (0.92, 1.28)	1.02 (0.83, 1.26)
UPPS-P			
Negative Urgency	1.22 (0.97, 1.52)	**1.21 (1.01, 1.45)**	1.00 (0.81, 1.23)
Positive Urgency	1.09 (0.95, 1.24)	1.00 (0.9, 1.12)	0.92 (0.79, 1.08)
Sensation Seeking	1.02 (0.93, 1.12)	1.07 (0.92, 1.26)	1.06 (0.89, 1.25)
Lack of Premeditation	1.01 (0.87, 1.18)	1.04 (0.91, 1.19)	1.03 (0.87, 1.22)
Lack of Perseverance	0.85 (0.67, 1.08)	0.97 (0.84, 1.12)	1.14 (0.91, 1.42)
DG Variables			
Days Played	1.08 (0.83, 1.40)	1.24 (0.85, 1.82)	1.16 (0.88, 1.51)
Typical Drinks	1.24 (0.98, 1.56)	1.06 (0.85, 1.31)	0.85 (0.68, 1.07)
Type Consumption	**5.22 (1.10, 24.88)**	3.26 (0.48, 22.32)	0.62 (.07, 5.87)
Type Skill	3.43 (0.33, 35.72)	N/A	N/A
Type IQ	1.79 (.13, 24.34)	1.74 (0.25, 11.91)	0.97 (0.10, 9.24)
Type Unity	1.03 (0.20, 5.23)	1.01 (0.12, 8.63)	0.98 (.09, 10.69)
Type Team	N/A	1.27 (0.29, 5.52)	N/A
AUDIT			
	1.33 (1.08, 1.64)	**1.44 (1.19, 1.74)**	1.08 (0.93, 1.25)

Note. OR = odds ratios; MPDG = Motives for Playing Drinking Games; DMQ = Drinking Motives Questionnaire-Revised; UPPS-P = UPPS-P Impulsive Behavior Scale; DG = drinking game; Times Played = times played in last 30 days; Typical Drinks = drinks typically consumed while playing; N/A = unable to be estimated due to lack of variance; bold values = significant class differences.