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Characterizing High School Students Who Play Drinking Games Using Latent Class Analysis

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Abstract

Heavy alcohol use and its associated negative consequences continue to be an important health issue among adolescents. Of particular concern are risky drinking practices such as playing drinking games. Although retrospective accounts indicate that drinking game participation is common among high school students, it has yet to be assessed in current high school students. Utilizing data from high school students who reported current drinking game participation ($n = 178$), we used latent class analysis to investigate the negative consequences resulting from gaming and examined underlying demographic and alcohol-related behavioral characteristics of students as a function of the resultant classes. Three classes of “gamers” emerged: (1) a “lower-risk” group who had a lower probability of endorsing negative consequences compared to the other groups, (2) a “higher-risk” group who reported that they experienced hangovers and difficulties limiting their drinking, got physically sick, and became rude, obnoxious, or insulting, and (3) a “sexual regret” group who reported that they experienced poor recall and unplanned sexual activity that they later regretted. Although the frequency of participating in drinking games did not differ between these three groups, results indicated that the “lower-risk” group consumed fewer drinks in a typical gaming session compared to the other two groups. The present findings suggest that drinking games are common among high school students, but that mere participation and frequency of play is not necessarily the best indicator of risk. Instead, examination of other constructs such as game-related alcohol consumption, consequences, or psychosocial variables such as impulsivity may be more useful.

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Keywords

Drinking Games; Alcohol Use; Latent Class Analysis; Adolescents

1. Introduction

Heavy drinking among adolescents and its associated health risks continue to be an important public health concern. According to the 2009 Youth Risk Behavior Survey, 24.2% of high school students consumed five or more drinks in a row on at least one day in the past month (Centers for Disease Control and Prevention [CDC], 2010). Furthermore, 9.7% of high school students reported driving after drinking in the past 30 days, and 21.6% of sexually active students consumed alcohol or used drugs before their last sexual intercourse. Notably, 21.1% of high school students initiated alcohol use before the age of 13. Early alcohol initiation has been linked to subsequent alcohol misuse and other alcohol-related problems years later (Buchmann et al., 2010; Dawson, Grant, & Li, 2007). Moreover, the initiation and establishment of risky drinking patterns in high school have been shown to predict problematic drinking later in life (e.g., Hersh & Hussong, 2006; Zucker, 2008). Studies on risky drinking practices among high school students are needed to further researchers' understanding of such behaviors and to inform prevention efforts in this population.

Participation in drinking games has been identified as a common drinking practice among high school students. In drinking games, alcohol consumption is governed by rules often with the goal to get each drinking game participant (or "gamer") intoxicated (for reviews, see Borsari, 2004; Kenney, Hummer, & Labrie, 2010). Consequently, it is common for gamers to consume large amounts of alcohol in a short time period. Three retrospective studies conducted with incoming or first-year college students in the United States indicate that participation in drinking games is widespread during high school. In one study, a survey of 1,252 high school graduates attending a pre-college orientation program found that 63% reported lifetime participation in drinking games (Borsari, Bergen-Cico, & Carey, 2003), while in another study approximately 20% of 1,891 incoming first-year college students reported that they currently played drinking games (Croom et al., 2009). A third study with 477 first-year college students by Kenney, Hummer, and LaBrie (2010) showed that approximately 54% played drinking games during the last months of high school. Despite these retrospective indications that drinking games are common in high school, drinking game participation and related consequences has yet to be assessed in current high school students in the US. Research conducted in a large sample of Norwegian high school students found that older students and heavier drinkers reported participation in drinking games (Pedersen, 1990). The limited research on drinking games in high school students extends to our understanding of the negative consequences associated with drinking games participation in this population. Drinking games have a strong association with alcohol-related social, psychological, and health consequences in the college setting (e.g., Cameron et al., 2010; Johnson & Stahl, 2004; Pedersen & Labrie, 2006; Zamboanga, Leitkowski, Rodriguez, & Cascio, 2006; Zamboanga, Schwartz, Ham, Borsari, & Van Tyne, 2010), but no research has examined game-specific consequences in high school students.

The purpose of the present study was to examine the demographic and alcohol-related behavioral characteristics of current high school students who reported playing drinking games. This study contributes to the limited research on adolescent participation in drinking games in three important ways. First, we sought to explore the association of student characteristics such as age, gender, and engagement in other forms of risky drinking (e.g., pre-gaming) with participation in drinking games in a sample of high school students. For

example, prior research has found that those who used alcohol before the age of 14 were more likely to drink to deal with negative stressors and to develop alcohol-related problems later in life than those who used alcohol after the age of 14 (e.g., Buchmann et al., 2010). In addition, patterns of adolescent drinking have been linked to a variety of constructs such as impulsivity, motives, alcohol-related expectancies, self-esteem, and parental monitoring (e.g., Colder, Campbell, Ruel, Richardson, & Flay, 2002; Kuntsche, Stewart, & Cooper, 2008; Stice, Barrera, & Chassin, 1998). Therefore, we examined differences in these constructs among students who participate in drinking games and those who do not.

Second, given the complete lack of research on drinking-game related consequences in high school students, we measured a variety of negative social, psychological, behavioral, and health consequences experienced as a result of playing drinking games in order to directly link alcohol-related consequences with gaming behaviors. This approach is in contrast with previous drinking games research (e.g., Adams & Nagoshi, 1999) that focuses on general alcohol-related consequences making it difficult to ascertain whether reported consequences are directly related to drinking games participation, as opposed to other risky drinking practices (e.g., heavy episodic drinking, pre-gaming, hazing practices, 21st birthday celebrations that involve the heavy use of alcohol).

Finally, to further explore these consequences explicitly linked to drinking game participation, we used Latent Class Analysis (LCA) to classify high school drinking gamers based on their endorsement of negative gaming consequences. We then examined the differences among these classes on our battery of demographic and alcohol-related behaviors and cognitions. In this way, we sought to determine whether these classifications could prove to be useful in identifying particular subgroups within the population of high school gamers who are experiencing negative consequences.

Given the lack of data on the correlates and consequences of drinking game participation among current high school students, our approach to data analysis was descriptive and exploratory. However, given the previous work of Pedersen (1990), we hypothesized that the classes of drinking game participants would differ significantly by age and alcohol consumption.

2. Materials and Method

2.1 Participants

Participants were drawn from a larger, high school-based study of adolescent substance use behaviors and attitudes conducted at a single high school in the northeastern United States ($N = 594$; 595 questionnaires were administered, 594 were completed as instructed; ~70% of the student body participated in the study). For the purpose of this study, we restricted the sample to those students who reported that they consumed alcohol at least once in the past 30 days. This subsample ($n = 252$) represents 42% of the total study sample (48% boys; mean age=16.1, $SD=1.11$, range=14–18; 76% White, 2% Black, 2% Hispanic, 1% Asian, 1% American Indian, 16% Mixed/Other; 13% Freshmen, 22% Sophomores, 30% Juniors, 35% Seniors).

2.2 Procedures

Researchers mailed information about study participation and a parental consent form to parents of all students enrolled at the study site. This study used an active consent procedure in which parents were asked to sign and return the consent form indicating whether or not they permitted their child's participation. Only those students with parental permission were allowed to participate. All students who returned a signed parental consent form, regardless of whether participation was permitted or declined, were entered into a drawing to win one

of several prizes. The school also received a monetary donation for helping with the data collection logistics and classroom teachers were eligible to receive monetary compensation (for classroom supplies/activities) for having high rates of returned signed parental consent forms (regardless of participation decision). Students who received parental permission to participate completed anonymous surveys (which were administered by a trained research assistant) during one class period while students without parental consent worked at their desks. The questionnaire took ~30–45 minutes to complete. Participants returned their completed survey to a “ballot” box and then received a written debriefing form from the research assistant. Students were assured that the information they provided would be anonymous. The Smith College Institutional Review Board (IRB) and the local school district approved all procedures and granted a *waiver of written assent*; thus, the research assistants read the students their rights as a participant in the study and the students in turn provided their verbal assent to participate.

2.3 Measures

2.3.1 Demographics—Participants reported their age, gender, membership on a varsity athletic team, and grades. Student were asked to describe their grades using a response scale that ranged from 0 (*mostly Fs*) to 9 (*mostly As*) (taken from Kerr, Beck, Shattuck, Kattar, & Uriburu, 2003). Students also indicated their age of first use of alcohol (excluding sips, religious activities).

2.3.2 Risky-Drinking Behaviors

Alcohol Use Disorders Identification Test (AUDIT; Saunders, Aasland, Babor, De La Fuente, & Grant, 1993): Students completed the AUDIT, a 10-item measure of past-year hazardous alcohol use (i.e., alcohol consumption levels, psychological dependence on alcohol, negative drinking consequences). The items are summed to derive AUDIT total scores, with higher scores indicating elevated levels of hazardous use. The AUDIT has been validated for use with adolescents in assessing level of risk for problematic drinking outcomes (for review see Reinert & Allen, 2007). The Cronbach’s raw alpha of the AUDIT for the present sample was .69.

Pregaming: Participants reported how many times in the past month they “pregamed” or “prepartied.” We stratified students according to whether or not they pregamed at least once in the past month. In the survey, pregaming was defined as drinking before going out for the night (e.g., in your home/room, or a friend’s home/room) which includes drinking while waiting for people to gather for the evening, or drinking in order to “get buzzed” before going to a party/function at which alcohol will be expensive (e.g., at a bar or club) or difficult to obtain (e.g., at a school event). This item has been used in previous research (Borsari et al., 2007; Zamboanga, Schwartz, Ham, et al., 2010).

Hazardous Drinking Games Measure (HDGM; Appendix 1): To date, a standard measure of drinking games participation has yet to be developed (Borsari, 2004). Therefore, we developed this pilot measure from our own research (Borsari et al., 2007; Zamboanga et al., 2006; Zamboanga, Schwartz, Ham, et al., 2010). In the HDGM, a drinking game was defined as an activity that has rules governing the consumption of alcoholic beverages. There are three components to the HDGM: drinking behaviors (3 items), types of games (8 items), and game-related consequences (8 items).

Drinking Behaviors: Participants indicated how often they played drinking games in the past 30 days using a 5-point scale (0=*Never*, 1=*Once*, 2=*Two to Four Times a Month*, 3=*Two to Three Times a Week*, 4=*Four or More Times a Week*). This response scale is identical to the frequency of alcohol consumption scale on the AUDIT. In order to index

high frequency of drinking game participation, we classified the sample according to whether or not they reported playing drinking games at least twice a week in the past month. Students also reported how many total drinks they typically consumed when playing drinking games, and how many minutes they played on a typical night when they played drinking games.

Types of games: Participants indicated from the following options the types of drinking games they played in the past 30 days: Consumption (e.g., *Chugging/Keg Stands*); Team (e.g., *Beer Pong*); Media (game involving a TV show, movie, or song); Dice (e.g., 7–11, *Doubles*); Card (e.g., *Kings*); Verbal (e.g., *Never Have I Ever*); Motor Skills (e.g., *Quarters*); and Board (e.g., *Pictionary*). This manner of classifying drinking games according to type follows Borsari's (2004) and Kenney et al.'s (2010) approach.

Consequences: Participants indicated negative consequences they had experienced as a result of playing drinking games (e.g., engaged in unplanned sexual activity that one later regretted; had a hangover the morning after).

2.3.3 Alcohol-Related Cognitions and Psychosocial Variables

Alcohol Expectancies: Students completed the 15-item Brief Comprehensive Effects of Alcohol Scale (BCEOA; Ham, Stewart, Norton, & Hope, 2005). The BCEOA measures positive (e.g., "It would be easier to talk to people") and negative (e.g., "I would be clumsy") alcohol outcome expectancies and valuations of these expectancies (i.e., the degree to which a student believes that the effect is "good" or "bad"). Students reported their level of agreement with each expectancy statement using a 4-point scale (1 = *Disagree* to 4 = *Agree*), as well as their valuations of these expectancy outcomes using a 5-point scale (1 = *Bad* to 5 = *Good*). We computed average scores for positive and negative outcome expectancies and valuations for each student. In the current sample, the Cronbach's alphas were .65 (positive expectancies), .74 (negative expectancies), .76 (positive valuations), and .76 (negative valuations).

Drinking Motives. (DMQ-R; Cooper, 1994): Students reported their reasons for alcohol use on the DMQ-R using a 5-point scale (1 = *Never/Almost Never* to 5 = *Almost Always/Always*). We calculated average scores for each subscale: social, coping, enhancement, and conformity motives. In the current sample, the Cronbach's alphas for these subscales were .83 (social motives), .88 (coping motives), .91 (enhancement motives), and .90 (conformity motives).

Impulsivity: Students completed the 22-item Impulsiveness subscale of the Impulsivity-Venturesomeness-Empathy scale (IVE; Eysenck & Eysenck, 1978). This subscale measures rash, unplanned behavior without consideration of consequences (e.g., "Do you often get into a jam because you do things without thinking?", "Do you usually work quickly without bothering to check if you've made mistakes?"). Students indicated yes (1) or no (0) to each question and the total impulsiveness score was the average. In the current sample, the Cronbach's alpha for this subscale was .77.

Self-Esteem: Students completed the 10-item Rosenberg (1965) Self-Esteem Scale (e.g., "On the whole, I am satisfied with myself"). Participants rated the extent to which they agreed or disagreed with each statement (0 = *Strongly Disagree* to 3 = *Strongly Agree*). Scores were derived by summing the items. In the current sample, Cronbach's alpha was .91.

Perceived Parental Monitoring: Students completed a 6-item measure indicating how often (1 = *Never* to 4 = *All of the Time*) their parent/guardian knows their whereabouts (e.g., “My parent/guardian knows where I am after school”) (taken from Kerr et al., 2003). Monitoring scores were derived by taking the mean of the 6 items. In the current sample, the Cronbach’s alpha for this measure was .86.

2.4 Analysis Plan

First, we compared gamers and non-gamers on demographic, risky-drinking behaviors, and alcohol-related cognitions and psychosocial variables. Second, using the subsample of students who reported participating in drinking games, we constructed a latent class model derived from gamers’ endorsement of negative gaming consequences. Latent Class Analysis (LCA), a subtype of structural equation modeling, produces the probability of item endorsement by class membership, grouping study participants by their endorsement patterns. LCA is particularly useful for classifying “symptom” or consequence patterns. We used the aBIC criteria to select the appropriate number of classes. We compared the distributions of demographic and drinking behavior characteristics between these classes using the Kruskal-Wallis Rank Sum and Fisher’s Exact tests for continuous and categorical outcomes, respectively. An alpha level of 0.05 was used to establish statistical significance. Because of the exploratory nature of the study, no adjustment for multiplicity was undertaken for the 28 multiple comparisons undertaken in the post-hoc comparison of classes. We examined differences in demographic and risky-drinking variables as a function of class membership using non-parametric procedures (Kruskal Wallis and Fisher’s Exact Tests; see Table 3). We employed Cramér’s Phi as an index of effect size for the categorical tests. All analyses were conducted in R 2.15.1 (R Development Core R Development Core Team, 2012).

3. Results

3.1 Descriptive Statistics

Descriptive statistics were conducted to examine the representativeness of the overall sample. Results showed that the larger study sample was similar to the high school student body (at the time of data collection) in mean age (15.7 vs. 15.6; respectively), gender (proportion girls, 53% vs. 50%), and ethnicity (proportion non-White, 24% vs. 21%). We also compared the prevalence of alcohol use in the school-based sample to that in a national sample (CDC, 2010). We found that 42.6% of the students (girls, 46.6%; boys, 39.1%) in the school-based sample indicated having at least one drink in the 30 days prior to assessment. Similarly, national and statewide data indicate that 41.8% (girls, 42.9%; boys, 40.8%) and 43.6% (girls, 44.5%; boys, 42.7%) of students, respectively, reported having at least one drink in the 30 days prior to testing (CDC, 2010).

3.2 Comparison Between Gamers and Non-Gamers

As can be seen in Table 1, students who reported playing drinking games are older, play varsity sports, exhibit riskier drinking as measured by the AUDIT. Regarding alcohol-related cognitions and psychosocial variables, gamers expect and value positive outcomes of drinking as well as endorse greater social and enhancement motives for drinking than non-gamers.

3.3 Latent Class Analysis

Table 2 displays the results from fitting latent class models (two to four classes) for the eight consequence indicators (engaged in unplanned sexual activity that one later regretted; had a hangover the morning after; got physically sick; found it difficult to limit how much one

drank; became rude, obnoxious or insulting; was unable to recall large stretches of time; passed out; and/or drove a car when one knew he/she had too much to drink to drive safely).

Following the model selection process detailed by Collins and Lanza (2010) and Nylund, Asparouhov, and Muthén (2007), a three-class model (aBIC = 970.8) was chosen relative to a two-class (aBIC = 974.6) or four-class model (aBIC = 978.7). Furthermore, prior research indicates that the discriminatory power of LCA is important in choosing a model; that is, distinguishable and unique classes are preferable (Riehm, Stephens, & Schurig, 2009). Thus, the three-class model was also chosen because of the discernibly differing patterns of endorsement across the classes. We classified students into the class with the largest posterior probability. We then labeled the classes that emerged as “lower-risk”, “higher-risk”, and “sexual regret” based on the overall probability of endorsing negative consequences as well as the severity of such consequences. Table 2 provides the endorsement of each consequence by the entire sample and each of the three classes.

As illustrated in Figure 1, the “lower-risk” class (68% of the sample) endorsed relatively few negative consequences as a result of playing drinking games. The “higher-risk” class (20% of the sample) reported that they experienced hangovers, became rude, obnoxious, or insulting, got physically sick, and experienced difficulties limiting their drinking as a result of playing drinking games. In contrast, the “sexual regret” class (12% of the sample) reported a high prevalence of two serious consequences: experienced unplanned sexual activity that they later regretted and were unable to recall large stretches of time resulting from playing drinking games.

3.4 Differences among Classes

We present descriptive statistics with respect to demographics, risky-drinking behaviors, drinking game participation, alcohol-related cognitions, and psychosocial variables for the total gaming sample in Table 3. In addition, we examined differences in demographic and risky-drinking variables as a function of class membership using non-parametric procedures (Kruskal Wallis and Fisher’s Exact Tests; see Table 1). We employed Cramér’s Phi as an index of effect size for the categorical tests.

3.4.1 Demographics—There were no significant differences across the three classes in age, grades, and membership on a varsity sports team. There was a higher proportion of boys (compared to girls) in the “higher-risk” and “sexual regret” classes than the “lower-risk” class, $\chi^2(2)=8.57$, $p=.014$, $\phi_c=.22$. In addition, students in the “lower-risk” class initiated alcohol use later (14 years) than those in the “higher-risk” and “sexual regret” classes.

3.4.2 Risky-Drinking Behaviors—Median levels of hazardous alcohol use were higher in the “higher-risk” and “sexual regret” classes than in the “lower-risk” class, $p<0.001$. There was no difference among the classes in rates of pre-gaming.

3.4.3 Hazardous Drinking Games Measure (HDGM)—As shown in Table 3, the percentage of gamers who frequently participated in drinking games (at least twice a week in the past month) did not significantly differ across the three groups. Results, however, indicated a significant difference in the number of drinks consumed in a typical gaming session (2 df overall test $p=.0001$, $\eta^2=.17$), with the “lower-risk” and “higher-risk” classes reporting fewer drinks than the “sexual regret” classes. A significantly greater proportion of gamers in the “sexual regret” group reported that they played consumption games as compared to gamers in the “lower-risk” and “higher-risk” groups (overall test $p=.012$, $\phi_c=$

22). The “lower-risk” class endorsed experiencing all of the consequences less than the “higher-risk” and “sexual regret” classes.

3.4.4 Alcohol-Related Cognitions and Psychosocial Variables—The “lower-risk” class reported lower rates of negative alcohol-related expectancies than the other two classes, and also reported less frequent social and enhancement motives for alcohol use than the “higher-risk” and “sexual regret” classes (all overall test p -values <0.022). The “sexual regret” class reported higher levels of impulsivity (overall test $p=0.007$) and lower perceived parental monitoring (overall test $p=0.004$) compared to the “lower-risk” and “higher-risk” classes.

4. Discussion

To our knowledge, this is the first study to examine drinking game behavior among current high school students in the United States. In addition, it is the first study to utilize LCA procedures to classify different groups of high school gamers based on game-related consequences. Findings indicate that drinking games appear to be prevalent in the high school setting: In our sample, 30% of the students reported playing drinking games at least once in the past month, with 12% reporting having played 2 or more times in the past week. The 30% current participation rate is comparable to previous reports using retrospective accounts of drinking game playing during high school, which ranged from 20% (Croom et al., 2009) to 63% (Borsari et al., 2003). In addition, comparison of gamers to non-gamers indicates that, as has been found amongst college student samples, participation in drinking games is linked to elevated alcohol consumption, positive expectancies of alcohol use, and social and enhancement motivations for drinking. Furthermore, findings suggest that drinking game participation alone does not inevitably result in the experience of negative consequences. Examination of the three classes of gamers indicates several factors that are related to consequences resulting from drinking game participation.

4.1 Comparison of Distinct Classes of Gamers

Consistent with other research with adolescents linking risky alcohol use to earlier ages of onset (Zucker, 2008), members of the “higher-risk” and “sexual regret” classes reported that they started drinking at an earlier age. Therefore, drinking experience does not appear to make one less vulnerable to consequences from drinking games; instead, the opposite appears to be the case. Likewise, the gamers in the “higher-risk” and “sexual regret” risk classes reported greater risky drinking behaviors, as measured by the AUDIT, than those in the “lower-risk” class. Although the percentage of gamers who participated in drinking games frequently did not differ across the three groups, results indicated that the average number of drinks typically consumed while gaming was highest in the “sexual regret” group, followed by the “higher-risk” group, and then the “lower-risk” group. This pattern is consistent with prior research with college students which suggested that engaging in one type of risky drinking behavior is often associated with participation in other risky drinking practices (cf. Zamboanga, Schwartz, Ham, et al., 2010) as well as previous studies indicating a positive association between drinking games participation and heavy alcohol consumption (Borsari et al., 2003; Cameron et al., 2010). However, the percentage of gamers who participated in drinking games frequently (at least twice weekly) did not differ significantly across the three classes of gamers. If frequent participation in drinking games alone is not a sufficient indicator of consequences (cf. Zamboanga, Schwartz, Van Tyne, et al., 2010), what other aspects of gaming could be responsible?

We posit that not all games pose the same type of health risks for gamers (cf., Cameron, Leon, & Correia, 2011; Zamboanga et al., 2006). Specifically, the current findings indicated that consumption games (e.g., *Chugging*, *Key Stands*) are over twice as prevalent among

“higher-risk” and “sexual regret” gamers than for “lower-risk” gamers. Therefore, the type of game played may be a proxy for the amount of alcohol consumed during gaming. However, the type of game played is not the sole determinant of negative consequences: Our findings indicate that many adolescents are able to limit their consumption and negative consequences despite engaging in drinking games (including consumption games). Differences among the classes on demographic, alcohol-related cognitions, and psychosocial variables suggest some protective factors for adolescent gamers.

First, gender may play a role, as a higher proportion of boys were found in the “higher-risk” and “sexual regret” classes, while more girls were in the “lower-risk” class. This finding is consistent with one study which found that college men experienced more negative consequences as a result of playing drinking games than college women (Johnson & Sheets, 2004), but contradicts research which found college women to be at greater risk for experiencing negative alcohol consequences as a result of drinking games participation than men (e.g., sexual experiences that one regretted afterward, Johnson & Stahl, 2004; social problems, Pedersen & Labrie, 2006). One interpretation of this finding is that high school boys may have more opportunities to get out of the house and engage in drinking games than girls do at this age. In college, however, the level of parental supervision is equally reduced for both sexes, resulting in the observed differential risk for college women. To examine this possibility, we conducted a supplemental regression analysis of perceived parental monitoring for boys and girls, controlling for drinking game participation. The model was not significant ($p = .12$), however, suggesting that other factors may be at work.

Regarding alcohol-related cognitions and psychosocial variables, members of the “lower-risk” class reported lower social and enhancement motives for drinking than the other two classes, indicating that alcohol use may not be viewed as integral to socialization. Lesser importance of social and enhancement motives may in turn decrease the appeal of drinking heavily in the highly social context of drinking games. Such a relationship has been observed in the adolescent drinking literature (e.g., Kuntsche et al., 2008). In addition, the “lower-risk” class also reported lowest levels of impulsivity, perhaps indicative of an ability to monitor and control alcohol use in the drinking game setting. The lower degree of impulsivity may also have been reflected in the fewer minutes the “lower-risk” class engaged in drinking games than the other two classes (30 minutes versus 60). Research linking impulsivity with adolescent substance use and gambling (Vitaro, Ferland, Jacques, & Ladouceur, 1998; Vitaro & Wanner, 2011) may be especially relevant to these findings, given the intersection of competition and alcohol use in many drinking games (e.g., card games).

The pattern of class differences in alcohol-related expectancies was also of interest. Specifically, the “lower-risk” students also reported lower levels of agreement with negative effects of alcohol (e.g., clumsy, dizzy, take risks) and also valued them more negatively than the other two classes. Two possible explanations may account for these observed differences. On the one hand, these perceptions may be developed due to lack of experience of heavy drinking associated with such effects, reflected in the low rate of endorsement of the negative consequences from drinking games (although a quarter of the “lower-risk” students did report having a hangover following drinking game participation). On the other hand, these expectancies may also reflect a conscious awareness of the negative effects of alcohol (which can be construed as resulting from higher levels of intoxication), and this awareness may lead to greater levels of self-monitoring in the drinking game context. Finally, perceived parental monitoring did not appear to be a protective factor, as the “lower-risk” and the “higher-risk” classes reported the highest degree of monitoring. This is in contrast with research linking higher degrees of perceived parental monitoring with lower levels of alcohol use (e.g., Webb, Bray, Getz, & Adams, 2010). It is possible that in this

sample the perceived parental monitoring may have been reactive in the “higher-risk” students (increased monitoring as a result of risky behaviors) and protective in the “lower-risk” students, but future research will have to provide confirmation of this conjecture.

4.2 Prevention and Research Implications

The observed difference in alcohol-related behaviors and cognitions between the LCA-derived classes may inform assessment and intervention efforts in several ways. Regarding assessment, our results highlight the importance of assessing a range of drinking game behaviors as well as the specific type of negative consequences that student gamers are experiencing in order to determine risk. Incorporating gaming-specific consequences along with global assessments of alcohol use and its consequences could prove useful in identifying general hazardous alcohol use in this student population. Future research work is needed to continue to develop a standardized measure of drinking games behavior and determine its utility for identifying students at heightened risk for consequences resulting from drinking games.

In terms of intervention efforts, psychoeducational alcohol programs might include a personalized feedback component (e.g., Martens, Kilmer, Beck, & Zamboanga, 2010) tailored towards the specific health consequences experienced by gamers. For example, “lower-risk” and “higher-risk” students might benefit from an intervention that focuses on the negative physical consequences that can result from elevated alcohol consumption while gaming. In contrast, interventions that target “sexual regret” gamers could highlight the link between heavy alcohol use and risky sexual activities. Gamers may also be responsive to interventions that provide specific strategies to reduce negative consequences directly related to their drinking game participation. Intervention could be used to foster the use of strategies during drinking games, perhaps through the adaptation of general protective behavioral strategies (e.g., counting number of drinks; (LaBrie, Hummer, Neighbors, & Larimer, 2010) could be adapted to focus specifically on drinking games. Avoidance of particular types of games (e.g., consumption games) may also be useful.

The differences in alcohol-related cognitions amongst classes of gamers also suggest possible content for prevention and intervention efforts above and beyond the discussion of alcohol use and gaming. As the “higher-risk” and “sexual regret” gamers endorse negative expectancies of alcohol (e.g., I would feel guilty) more than the “lower-risk” gamers, indicating an awareness of the adverse aspects of alcohol use, solely focusing on the actual risks involved in alcohol use may not be compelling for these students (i.e., may not be an effective intervention). Rather, one might have to consider targeting students’ evaluations of the desirability of these risks, for instance. Students may also be responsive to feedback about how their involvement in drinking games impacts their specific academic, relationship, or athletic pursuits. The “higher-risk” and “sexual regret” gamers endorsed social and enhancement motives for alcohol use significantly more than the “lower-risk” gamers, indicating that it may be useful to identify potential discrepancies between students’ goals and values in relation to specific motives to play drinking games. Students may be responsive to feedback about how their involvement in drinking games negatively impacts their personal social, academic, or athletic aspirations. Likewise, the “sexual regret” class reported higher levels of impulsivity and lower levels of perceived monitoring. Therefore, interventions targeting impulsivity (e.g., Castellanos & Conrod, 2006) or facilitating increased parental involvement (e.g., Stanton et al., 2000) may be particularly effective with this group. In sum, in the ways described here information about drinking game participation and its consequences can inform early intervention efforts designed to prevent the escalation of this type of risky drinking in adolescents.

4.3 Study Limitations

There are a number of study limitations worth noting. First, we used self-report data without collateral verification and although we took several precautions to help facilitate accuracy of self-report (i.e., waiver of written assent, anonymous survey completion) it is possible that participants underestimated or overestimated their drinking behaviors. Future studies that utilize laboratory (Cameron et al., 2011; Correia & Cameron, 2010) and field-based (Clapp et al., 2008) methods to observe and assess drinking game participation are needed. Second, as researchers currently use a wide range of “home grown” measures to assess drinking games, the HDGM was used here as a pilot tool to assess this activity among high school students. Further development and standardization of the HDGM would facilitate invaluable comparisons of drinking game involvement across settings and populations. Likewise, replication of the classes identified by the LCA in other samples would enhance confidence in the existence of discrete classes of gamers. Third, there may be other constructs that were not measured in this study that better predict drinking game participation and consequences. For example, impulsivity has been found to mediate the relationship between positive and negative affect and alcohol use in adolescents (Colder & O’Connor, 2002; Hussong & Chassin, 1994). Third, the cross-sectional design of our study precludes any inferences about the temporal sequence of students’ engagement in risky drinking practices. In other words, did students engage in other risky drinking practices (as indexed by the AUDIT and their involvement in pre-gaming) prior to their involvement in drinking games, or vice versa? Likewise, the “higher-risk” gamers perceive the highest level of parental monitoring. It is possible that the monitoring has increased due to heavy drinking episodes; alternatively, it could be that the reported alcohol use is a type of reactance to an overly-controlled environment. Prospective research is needed to ascertain the order in which these risky drinking practices and their correlates might unfold. Longitudinal work in this area would also allow researchers to explore whether or not gamers follow some kind of developmental progression from “lower-risk” to “higher-risk” and/or “sexual regret” gaming practices and if so, what precursors might highlight these progressions? Finally, because of the exploratory nature of the study, we did not adjust our post-hoc comparisons by latent class grouping, so conclusions should be tempered. Given that we undertook 28 tests, we would expect there to be 1.4 tests that are statistically significant just due to chance (we found 12 with p-values <0.05, and 7 with p-values < 0.01).

5. Conclusion

Given the associations amongst risky drinking practices, only a small percentage of studies that examined the link between drinking games participation and negative consequences have focused on the negative consequences that resulted specifically from playing drinking games. The findings of this study highlight the need for continued research on gaming behaviors and their relevance to assessment and intervention efforts by researchers, health professionals, and school personnel. The different classes derived from the LCA in this study also suggest the population of high school gamers to be a heterogeneous one, which has clear implications for future research and prevention efforts.

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Highlights

- Conducted assessments with high school students reporting drinking game participation
- Latent class analysis used to investigate negative consequences from gaming
- Three classes emerged: lower-risk, higher-risk, and sexual regret groups
- Participation and frequency of playing drinking games not ideal indicator of risk

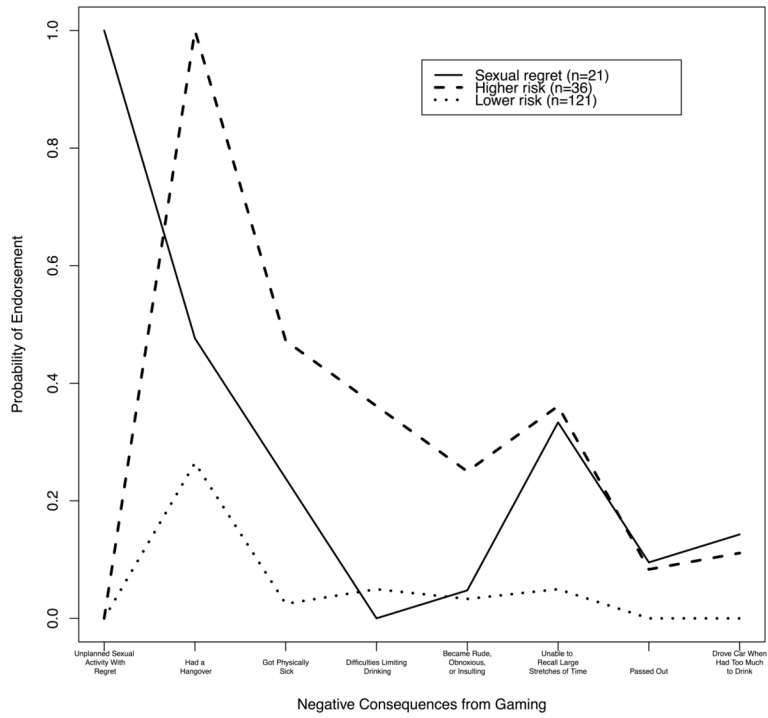


Figure 1. Figure A. Negative Consequences Resulting from Playing Drinking Games across Latent Classification of Gamers

Table 1

Demographics, Risky Drinking, and Alcohol-Related Cognitions for Non-Gamers and Gamers

Variable	Non-Gamers (N=74) %/Mean (SD)	Gamers (N = 176) %/Mean (SD)	p-value
Demographics			
Age *	15.7 (1.2)	16.3 (1.1)	$p = 0.0001$
Male	46%	49%	$p = 0.068$
Typical Grade	A's and B's	A's and B's	$p = 0.386$
Varsity Sport Participation	56%	65%	$p = 0.018$
Alcohol Initiation Age	13.6 (2.5)	13.7 (1.7)	$p = 0.064$
Risky Drinking Behaviors			
AUDIT*	3.8 (3.4)	8.0 (4.6)	$p < 0.0001$
Alcohol-Related Cognitions and Psychosocial Variables			
Positive Expectancies*	2.54 (0.50)	2.74 (0.52)	$p = 0.004$
Positive Valuations*	3.24 (0.78)	3.46 (0.74)	$p = 0.04$
Negative Expectancies	2.44 (0.58)	2.44 (0.61)	$p = 0.94$
Negative Valuations	2.31 (0.78)	2.31 (0.75)	$p = 1.0$
Social Motives*	2.67 (1.11)	3.52 (0.93)	$p < 0.0001$
Coping Motives	1.70 (0.92)	1.88 (0.99)	$p = 0.19$
Enhancement Motives*	3.01 (1.22)	3.73 (1.03)	$p < 0.0001$
Conformity Motives	1.34 (0.67)	1.22 (0.56)	$p = 0.18$
Impulsivity	0.44 (0.21)	0.43 (0.21)	$p = 0.74$
Self Esteem	21.2 (6.6)	21.7 (5.7)	$p = 0.58$
Perceived Parental Monitoring	3.19 (0.61)	3.12 (0.63)	$p = 0.39$

Note. Results that were significant at the alpha=0.05 level are marked with an *.

Table 2

Latent class model comparisons and fit criteria

	2 class	3 class	4 class
AIC	974	970	978
BIC	1028	1053	1090
cAIC	1029	1054	1091
aBIC	975	971	979
Smallest class size	58	21	6

Table 2. Latent class model comparisons and fit criteria

Variable	%	n	Class 1 "Lower-Risk" Gamers (n=121, 68%)	Class 2 "Higher-risk" Gamers (n=36, 20%)	Class 3 "Sexual Regret" Gamers (n=21, 12%)	p-value/ Effect Size
Regretted Sexual Activity	12%	178	0%	0%	100%	$p < .0001/\phi_c = 1.0$
Had a Hangover	44%	178	26%	100%	48%	$p < .0001/\phi_c = .59$
Got Physically Sick	14%	178	2%	47%	24%	$p < .0001/\phi_c = .52$
Difficult to Limit Drinking	11%	178	5%	36%	0%	$p < .0001/\phi_c = .42$
Rude/Obnoxious/Insulting	8%	178	3%	25%	5%	$p = .0001/\phi_c = .32$
Unable to Recall Time	15%	178	5%	36%	33%	$p < .0001/\phi_c = .40$
Passed Out	3%	178	0%	8%	10%	$p = .0035/\phi_c = .25$
Drove Car after Drinking	4%	178	0%	11%	14%	$p = .0002/\phi_c = .30$

Table 3

Demographics, Risky Drinking, Gaming Specific Behaviors, Game-Related Consequences, and Alcohol-Related Cognitions for Total Gaming Sample and Three Classes of Gamers

Variable	% /Mean	n	Class 1 "Lower-Risk" Gamers (n=121, 68%)	Class 2 "Higher-risk" Gamers (n=36, 20%)	Class 3 "Sexual Regret" Gamers (n=21, 12%)	p-value/ Effect Size
Demographics						
Age (Mean, Median)	16.3, 16	178	16	17	17	$p = 0.085$
Male *	49%	178	43%	56%	76%	$p = 0.014/\phi_c = .22$
Typical Grade	A's and B's	176	A's and B's	Mostly B's	Mostly B's/B's & C's	$p = 0.080$
Varsity Sport Participation	65%	171	64%	78%	53%	$p = 0.141/\phi_c = .15$
Alcohol Initiation 14 Years *	61%	175	68%	46%	45%	$p = 0.017/\phi_c = .22$
Risky-Drinking Behaviors						
AUDIT score (Median) *	7.5	178	6.0	10.5	10.0	$p < 0.0001$
Pregaming	91%	108	88%	96%	92%	$p = 0.628/\phi_c = .12$
Gaming Specific Drinking						
Played Drinking Games						
At Least Twice a Week	12%	178	10%	19%	10%	$p = .328/\phi_c = .11$
Total Drinks Typically						
Consumed While Gaming *	4.4 ⁺ , 3.75	162	3	4	6	$p < .0001$
Time Spent Playing Drinking Games	58.9	159	30	60	60	$p = 0.089$
Types of Drinking Games						
Played Consumption Games *	21%	178	15%	31%	38%	$p = 0.012/\phi_c = .22$
Played Team Games	93%	178	93%	97%	86%	$p = 0.255/\phi_c = .12$
Played Media Games	4%	178	2%	11%	5%	$p = 0.065/\phi_c = .17$
Played Card Games *	3%	178	2%	3%	14%	$p = 0.023/\phi_c = .22$
Played Verbal Games	49%	178	49%	50%	48%	$p = 1.00/\phi_c = .01$
Played Board Games	21%	178	20%	25%	19%	$p = 0.749/\phi_c = .05$
Alcohol-Related Cognitions and Psychosocial Variables						
Positive Expectancies	2.74	175	2.69	2.88	2.88	$p = 0.055$
Positive Valuations	3.46	174	3.50	3.50	3.62	$p = 0.772$

Variable	% /Mean	n	Class 1 "Lower-Risk" Gamers (n=121, 68%)	Class 2 "Higher-risk" Gamers (n=36, 20%)	Class 3 "Sexual Regret" Gamers (n=21, 12%)	p-value/ Effect Size
Negative Expectancies *	2.44	176	2.29	2.71	2.64	p = 0.005
Negative Valuations *	2.31	174	2.14	2.29	2.43	p = 0.022
Social Motives *	3.52	173	3.6	4.0	4.0	p = 0.010
Coping Motives	1.88	171	1.6	1.6	1.5	p = 0.558
Enhancement Motives *	3.73	172	3.8	4.2	4.0	p = 0.007
Conformity Motives	1.22	172	1.2	1.2	1.25	p = 0.824
Impulsivity *	0.43	168	0.368	0.487	0.605	p = 0.007
Self-Esteem	21.7	170	22	20	22	p = 0.526
Perceived Parental Monitoring *	3.12	169	3.17	3.50	2.75	p = 0.004

Note. Results that were significant at the alpha=0.05 level are marked with an *. Effect sizes: Chi-Square tests indexed by Cramér's Phi.