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Factors Influencing the Temporal Relationship between Alcohol Consumption and Experiences with Aggression among College Women

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Abstract

Temporal relationships among alcohol use, aggression, and mood were assessed using daily data from 179 college women. Participants called an Interactive Voice Response (IVR) system over an 8-week period. The odds of experiencing verbal, sexual and physical aggression ($ORs = 2.25, 19.44, 11.84$, respectively) were significantly higher on heavy drinking days ($M = 7.46$ drinks), compared to non-drinking days. Both a history of victimization and greater psychological symptom severity influenced the odds of involvement in verbal aggression. The odds of alcohol consumption were three times higher during the 24 hours following verbal aggression compared with days in which verbal aggression did not occur. On the day immediately following involvement in either verbal or physical aggression, positive mood decreased and negative mood increased. During the week (2–7 days) following sexual aggression women's positive mood was decreased. These findings reinforce the need for interventions aimed at reducing heavy episodic drinking on college campuses.

Keywords

Alcohol Consumption; College Women; Victimization; Daily Data; Multilevel Modeling

A number of studies have found an association between alcohol and aggression experienced by college women (Dowdall, Crawford, Wechsler, 1998; Fisher, Cullen, & Turner, 2000; Humphrey & White, 2000; Palmer, 1996). The experiences of aggression range from serious verbal arguments and abuse, through physical assault and rape. Abbey (2002) estimates that 50% of sexual assaults on college campuses involve alcohol use by the victim, perpetrator, or both. Palmer (1996) found that female dormitory staff reported 67% of physical aggression directed toward them and the female students living in their dormitories involved alcohol consumption by the perpetrator. These studies rarely provide information about the association between female victims' alcohol use and risk for verbal and physical aggression; however, victim and perpetrator alcohol use are often highly correlated (Abbey, Zawacki, Buck, Clinton, & McAuslan, 2004).

Little has been done to assess immediate consequences of involvement in aggression on women's substance use and psychological health. Substantial evidence exists to suggest that long-term consequences of victimization, particularly severe physical and sexual

We used both formats for measuring sexual aggression to capture both acknowledged and unacknowledged experiences of sexual aggression. In previous studies that have used the SES as well as a direct question about sexual aggression or rape, a large percentage of women who endorsed SES items corresponding to completed rape did not endorse the direct rape item (e.g., Koss, Dinero, Seibel, & Cox, 1988).

victimization, can be profound for women. These include chronic pain, anxiety and depression, frequent visits to physicians, and attempted suicide (Koss & Heslet, 1992; Koss, Koss, & Woodruff, 1991; Stepakoff, 1998). Some studies have found that prior victimization, both childhood and adult, increases the likelihood of future substance use (Kilpatrick, Acierno, Resnick, Saunders, & Best, 1997; Miller, Downs, Gondoli, & Keil, 1987). These studies clearly establish an association between alcohol use, victimization, and long-term negative consequences. However, the short-term negative effects of experiencing alcohol-related aggression have not been explored.

The majority of studies assessing the relationship between women's alcohol use and experiences with aggression have used retrospective global measures of alcohol use. Global measures do not allow for assessment of the temporal relationship between alcohol and aggression, or for the assessment of the immediate consequences that follow aggression. A recent study by Parks and Fals-Stewart (2004) employed a calendar-based method, the TimeLine Follow-Back (TLFB), to obtain reports of daily drinking and experiences with aggression among a sample of 94 college women over six weeks. They found that the odds of experiencing sexual aggression were 9 times higher on heavy drinking days and 3 times higher on non-heavy drinking days, compared with non-drinking days. They found that the odds of experiencing physical aggression were 7 times higher on heavy drinking days and nearly 3 times higher on non-heavy drinking days, compared with non-drinking days. These findings indicate that drinking alcohol increases college women's risk for both sexual and physical aggression, with heavy drinking (5 or more drinks) further increasing this risk. Although this study provided daily reports of both alcohol use and aggression, women were asked to recall events up to four weeks in the past. Thus, data were still limited by some recall bias.

Hammersley (1994) suggests several strategies for reducing recall bias when collecting data about specific events of interest. One of these suggestions is to prospectively collect data within hours or days of the event of interest. Interactive voice response (IVR) technology provides a method for collecting prospective data on alcohol consumption and experiences with aggression on a daily basis. Individuals call an automated, computerized telephone system once each day. They use the key pad of a telephone to provide responses to a series of questions, typically no more than 4–5 minutes in duration. This method can allow for assessment of temporal ordering (e.g., time of drinking and aggression), a variety of daily measures (e.g., occurrence of drinking, rating of mood), and event specific measures (e.g., number of drinks, intoxication, context of drinking, type of aggression). IVR has been used successfully in a number of studies to assess substance use behaviors, medication adherence, mood, and stress (e.g., Helzer, & Searles, 2002; Kranzler, Abu-Hasaballah, Tennen, Feinn, & Young, 2004; Searles, Helzer, Walter, 2000; Toll, Cooney, McKee, & O'Malley, 2005).

In the present study, we used IVR technology to collect daily data on alcohol use, experiences with aggression (verbal, non-sexual physical and sexual), and ratings of positive and negative mood from college women. These data were collected in an effort to capture the temporal relationship between alcohol and aggression, as well as the temporal influence of an aggressive event on subsequent mood, and alcohol use. To our knowledge, this is the first use of IVR technology to collect data on aggressive events, and more specifically, alcohol-related aggressive events. Additionally, multilevel modeling was used to assess the influence of individual characteristics of the women on alcohol use and aggression, as well as, the temporal relationships between alcohol and aggression, and the immediate consequences of aggression on drinking and mood. History of victimization (i.e., prior to entering university) and heavy drinking, as well as number of sexual partners and psychological symptoms, were included in the analyses in an effort to assess a range of individual characteristics of the participants. These individual characteristics were chosen

because they have been associated with aggression or victimization in prior research (e.g., Gidycz, Hanson, & Layman, 1995; Greene & Navarro; Messman-Moore & Long, 2000; Wechsler, Dowdall, Davenport, Castillo, 1995).

We made several specific *a priori* hypotheses about the temporal relationship between alcohol and aggression, as well as the relationships among the individual characteristics and their influence on alcohol use and risk for involvement in aggression. We hypothesized that the probability of experiencing aggression (verbal, sexual, non-sexual physical) would be significantly higher on drinking days, particularly heavy drinking days, compared to non-drinking days. The theoretical underpinning for this hypothesis comes from the proximal effects model of the alcohol-violence relationship (Leonard & Quigley, 1999; Fals-Stewart, 2003). This model posits that alcohol increases women's likelihood of victimization through its acute effects on physical and cognitive impairment, as well as changes in behavior.

We further hypothesized that women with specific individual risk factors, for example, a history of prior victimization, greater psychological distress, or more sexual partners, would be at increased risk for experiencing aggression. These individual characteristics place women at greater risk for victimization by altering their daily routines or behavior in such a way as to place them in risky situations or contact with potential perpetrators at greater frequency than women without these individual characteristics. For example, women with a greater number of sexual partners are more likely to encounter one who is sexually aggressive.

Finally, we hypothesized that consequences of experiencing aggression would manifest themselves as increased alcohol consumption and negative mood in the immediate time period (i.e., days) following the aggressive event. It has been suggested that increased substance use and negative affect following victimization experiences reflect a negative coping strategy or trauma associated with the event (e.g., Epstein, Saunders, Kilpatrick, & Resnick, 1998; Messman-Moore & Long, 2000).

Method

Participants

The participants were a sub-sample of 179 women who took part in a larger 4 year longitudinal study of 995 first-time, freshmen, college women (see Place Holder, 2007). The larger study involved annual brief web surveys each fall about alcohol use, associated negative consequences, general and psychological health, sexual activity, and academic functioning beginning during the first Fall semester at university. The current study involved participation in an 8-week protocol during the spring semester of the second year at school, during which women provided daily reports of their mood, alcohol use, and experiences with aggression.

An extreme group sampling strategy was used to select the sub-sample of women for the current study. This was done in order to maximize the likelihood that events of aggression would occur and sufficient differences would be present between groups to allow for comparison of daily risk factors for aggression. Two factors, history of victimization and recent alcohol use, were used to determine risk for experiencing future aggression. Women's responses to the alcohol and victimization questions during the first wave of the web survey, from the larger study, were used to determine eligibility for the current study. Specifically, women were quartiled based on their history of experiencing severe violence (beaten or attacked with or without weapon, attempted or completed rape) prior to entering university. They also were quartiled based on their drinking (e.g., usual drinks per occasion) during their first semester at university. Based on these quartiles it was determined that women at

lowest risk for future experiences with aggression were those women without any history of violence who were abstainers during their first semester at university (17.5% of participants from larger study). Women at highest risk were those women who had experienced one or more severe experiences of violence prior to entering university and/or consumed an average of 7 or more drinks per occasion (21.9% of participants from larger study). Women designated as high risk had experienced an average of 1.13 (SD = 0.92) violent victimizations and reported consuming an average of 4.26 (SD = 3.11) drinks per occasion during the first semester at university.

Data for the current study were collected during a 10-week period (February – April) in the spring of the participants' second year at university. Average age was 18.7 (SD = 2.0) years when they entered the study during their first fall semester at university. The majority (61.3%) of women were of European descent, 15.0% of African descent, 13.3% of Asian descent, and the remaining 10.4% from other ethnic origins. Slightly more than half (53.7%) of the women were designated as low risk, while 46.3% were designated as high risk.

Procedure

Daily Reporting—Participation involved an initial paper and pencil questionnaire and training in daily (IVR) reporting, followed by 8-weeks of daily reporting, two brief web surveys (at 4 and 8 weeks), and the possibility of two in-person interviews. In-person, semi-structured, qualitative interviews were conducted with women who reported experiencing aggression during the study to obtain detailed event-level information about the aggressive event. Women were trained to provide daily reports by calling a toll-free number and responding to an automated series of questions generated through a computerized Interactive Voice Response system (IVR; Mundt, Perrine, Searles, & Walter, 1995), using the touch tone key pad of a telephone. Women were provided with web-links to complete the web-based surveys in individual e-mails sent to their preferred e-mail addresses after 4 and 8 weeks of daily reporting using similar methodologies to those used for the web survey. In-person interviews were conducted individually in private interview rooms at the university or at the Research Institute. Participants were paid \$25 for the initial questionnaire and training session, \$20 for each of the two web surveys, and \$25 for each in-person interview, if required. Compensation for daily reporting included daily compensation (\$.50/day), as well as differential bonuses based on consecutive calling (\$10 for 7 consecutive days) and provision of missing reports (\$7 if all missing provided for week). A similar compensation schedule has been used by Searles et al. (2000) to successfully encourage high rates (i.e., 98.8%) of daily reporting. Women had the potential to earn a maximum of \$223.

Measures

Larger Study

Web Survey: The second year web survey was administered during the fall of the participants' second year at university. The survey asked women to report on their experiences during their first full year at university (i.e., prior to beginning the current academic year). Several standardized and well-established measures were used to assess alcohol use (Daily Drinking Questionnaire [DDQ]; Collins, Parks, & Marlatt, 1985), alcohol-related negative consequences (Rutgers Alcohol Problem Index [RAPI]; Raskin-White & Labouvie, 1989), physical and sexual violence (range from mugging through assault with a weapon and rape; National Crime Victim Survey; US Dept. of Justice, 1993), and sexual aggression (adapted from the Sexual Experiences Survey [SES]; Koss, Gidycz, & Wisniewski, 1987).

Current Study

Initial Interview: This was a self-administered paper and pencil questionnaire composed of a number of standardized measures designed to provide a comprehensive assessment of women's experiences during the past month. These included her alcohol and other drug use (DDQ), consequences associated with alcohol use (RAPI), sexual history (e.g., number of sexual partners), and psychological symptoms (Brief Symptom Inventory, BSI; Derogatis, 1993).

The BSI was designed to assess psychological symptoms in both clinical and non-clinical populations (Derogatis, 1993). It consists of 53 items measured on a 5-point rating scale ("not at all" to "extremely") that encompass nine primary symptom dimensions: somatization, obsessive-compulsive, interpersonal sensitivity, depression, anxiety, hostility, phobic anxiety, paranoid ideation, and psychoticism. In addition to the nine symptom scales, the BSI provides three global indices: Global Severity Index (GSI), Positive Symptom Total (PST) and Positive Symptom Distress Index (PSDI) as indicators of general psychological distress. The reliability and validity of the BSI are well-established (Derogatis, 1993).

Daily Report: The daily report was designed to be completed in less than 4 minutes each day. Women could call the IVR system to provide their daily report between 12 am and 11:59 pm. Five initial questions asked women to report on their current mood (e.g., anxious, happy, angry/frustrated, calm, sad) on a 5-point scale ('not at all' to 'extremely'). The next few questions asked women to report on their alcohol and other drug use (e.g., quantity consumed, feeling of intoxication, drinking location) over the past 24 hours. If a woman reported using alcohol or drugs the time of first and last drink and drug use were obtained (i.e., "What time did you have your first drink?" "Was this time am or pm?"). Final questions asked about involvement in any aggression over the past 24 hours (e.g., type, injury, whether reported). If a woman was involved in aggression the time of first involvement in aggression was obtained (i.e., time, designation as am or pm). This information allowed us to determine the temporal order of substance use and aggression within a 24 hour period. If a woman did not report any substance use or aggression, a series of "filler" questions was asked to maintain consistency in the length of the call on a daily basis.

Women were asked to report on three types of aggression: verbal, physical non-sexual, and sexual. Women were first asked if they had been involved in any incidents of verbal aggression, and then were asked if they had been involved in any incidents of physical aggression. A distinction between involvement as a victim or perpetrator was not made in the daily reports. This was done because verbally and physically aggressive encounters often involve acts of aggression on the part of both parties involved in the incident (e.g., Parks, Miller, Collins, & Zetes-Zanatta, 1998; Schumacher & Leonard, 2005; Stets & Straus, 1992). In addition, it was our goal to capture all forms of aggression experienced by college women, regardless of their role in the incident. In the case of sexual aggression, it also was important not to label the woman's role (e.g., as victim) in the event. Through qualitative descriptions of many of the aggressive events it appears that less than 10% of the incidents involved only perpetration by the participant in our study; most participants were involved as victims or in reciprocal aggression. Therefore, throughout the manuscript we refer to women's involvement with aggression rather than women's victimization. Finally, women were asked about sexual aggression in two separate formats.¹ Women were asked "Have you been involved in any incidents of sexual aggression (for example, any forced sexual

¹It should be noted that every effort was made to retain women, in both the larger study and the current study, whether they remained at the university after their first semester or not. If a woman had left the area, her initial questionnaire packet was mailed to her and event-based interviews were conducted via telephone.

contact) since this time yesterday?” They were then asked, regardless of response to the previous question, five behaviorally based questions that did not include the word aggression or assault. These items were patterned after wording used in the 10-item SES (Koss et al., 1987), and were designed to provide a general measure of the four levels of sexual aggression (unwanted contact, coercion, attempted rape, completed rape) assessed in the SES.

Data Analyses

The data for the present study were multilevel in nature, with daily reports (within person or “Level 1” data) nested within people (between person or “Level 2” data). Because of the data structure, multilevel (or hierarchical) regressions were used as our statistical method to examine (a) the daily relationship between daily alcohol consumption and involvement in aggression, and (b) the acute consequences following involvement in aggression, such as alcohol use and mood change.

Relationship between Alcohol and Aggression—We assessed: (a) whether alcohol use, particularly heavy drinking (more than 4 drinks), increased the probability of involvement in aggression on the same day, and (b) whether this relationship varied by type of aggression (verbal, non-sexual physical or sexual). The multilevel regression equation for Level 1, therefore, specified involvement in aggression as the dependent variable, which consisted of four categories (sexual, physical, verbal, and no aggression on a day) with two indicators of drinking level (heavy, non-heavy), prior to any aggression on that day, as predictors. Because the dependent variable was categorical, a hierarchical generalized model for multinomial data was adopted for the analysis, and “no aggression” was specified as the reference category.

At Level 2, we modeled each intercept as a function of four individual risk factors which might be associated with involvement in aggression. These individual risk factors were (a) high versus low risk group status, (b) global severity index of the BSI (BSI-GSI) for the month prior to daily data collection, (c) history of multiple sexual partners over the month prior to daily data collection, and (d) any victimization during the first year at university (data from web survey). For the Level 2 model, the person-specific intercepts were assumed to vary randomly across individuals, while all other Level 1 regression coefficients were constrained to be fixed.

Acute Consequences following Aggression—To assess the acute consequences resulting from involvement in aggression, we investigated whether or not alcohol consumption and mood changed within 24 hours (1 day) and during the week (2–7 days) following involvement in aggression.

For the analysis of changes in drinking, hierarchical generalized linear modeling for binary outcomes was used, with alcohol consumption (dichotomous indicator) as the outcome variable. In the Level 1 model, six dichotomous indicators were created to indicate if an individual had ever experienced verbal, non-sexual physical, or sexual aggression within 24 hours prior to a given day and 2–7 days (one week) prior to a given day. Because of their potential relationship with alcohol consumption, the two indicators of mood, positive and negative, also were included as time-varying covariates in the Level 1 model. In the Level 2 model, four individual risk factors, which might be associated with alcohol consumption, were regressed onto the coefficients of the intercepts. These individual risk factors were (a) high versus low risk status, (b) global severity index of the BSI, (c) victimization during the first year at university, and (d) alcohol use during the first year at university.

For the analysis of changes in mood, two multilevel regression equations for Level 1 were used to examine the effect of involvement in aggression within one day and within one week on positive and negative mood. Positive and negative mood were created by summing the five mood ratings for a given day: happy and calm for positive; angry, anxious, and sad for negative. Internal consistency for the two composite mood variables was fair (Positive mood: Cronbach $\alpha = .71$, Negative mood: Cronbach $\alpha = .75$; Cicchetti, 1994). For this set of multilevel regressions, day of week, represented by six indicator variables (with Monday functioning as the reference category) were included in the Level 1 model. This allowed us to control for variations in alcohol consumption and mood by day of the week, while examining alcohol use and mood change on a specified day or week following aggression. In addition, for this set of analyses, the person-specific intercepts were assumed to vary randomly across individuals in the Level 2 models, while all other Level 1 regression coefficients were constrained to be zero.

Results

Drinking and Aggression

Most of the women ($n = 162$, 90.5%) provided daily reports for all 56 days during the 8 weeks of the study. A total of 9532 days of data were available for the HLM analyses (< 5% missing days). Of those days, 799 (8.4%) involved drinking. Of those days that involved drinking, 343 (42.9%) were non-heavy and 454 (57.1%) were heavy drinking days. The majority of women ($n = 118$, 65.9%) drank during the 8 weeks of the study. Among those women who drank, 61.9% ($n = 73$) had one or more days of heavy drinking. Women reported consuming an average of 1.86 ($SD = 0.78$) drinks on a non-heavy and 7.46 ($SD = 3.89$) drinks on a heavy drinking day. Women reported experiencing aggression on 127 (1.3%) days, with verbal aggression on 85 (66.9%), physical aggression on 16 (12.6%), and sexual aggression on 26 (20.5%) of those days. These reports of aggression were provided by slightly more than one third of the sample ($n=63$, 35.2%).

Individual Risk Factors

Slightly more women (53.6%) from the low risk compared with the high risk group (46.4%) participated. Average GSI score for the BSI during the month prior to the 8 weeks of daily reporting was 0.90 ($SD = 0.64$; $T\text{-score} = 54$, 68%). This average is higher than the normative average of 0.71 ($SD = 0.42$; $T\text{-score} = 50$; 50%) reported for college females, by Cochran and Hale (1985) and slightly higher than the normative average of 0.79 ($SD = 0.55$; $T\text{-score} = 52$, 60%) reported by Derogatis (1993) for nonpatient, adolescent females. The majority (61.5%) of women indicated that they had a sexual partner during the month prior to the 8 weeks of daily reporting. Among those women who had sexual partners, the average number was 1.25 ($SD = 0.61$, range 1–5) over the one month period. Data from the Year 2 web survey provided information on the women's drinking and victimization during the first year at university. The majority of women indicated that they consumed alcohol (71.9%) and 1 out of 5 (21.9%) experienced either physical or sexual victimization. Correlations among the risk factors indicated that BSI-GSI was correlated with risk status ($r = 0.22$, $p < .01$) and first year victimization ($\phi = 0.25$, $p < 0.01$), while first year drinking was correlated with first year victimization ($\phi = 0.21$, $p < 0.01$) and risk status ($\phi = 0.33$, $p < 0.01$).

Relationship between Alcohol and Aggression

The results displayed in Table 1 indicate that there were significant relationships between heavy alcohol consumption and involvement in sexual, physical, and verbal aggression. Women were more likely to be involved in sexual, physical, and verbal aggression on heavy drinking days compared to non-drinking days. Compared to non-drinking days, the odds of

involvement in sexual aggression increased by 19.44, the odds of involvement in physical aggression increased by 11.84, and the odds of involvement in verbal aggression increased by 2.25 on heavy drinking days. The odds of sexual, physical, and verbal aggression were not significantly different on non-heavy drinking days compared to non-drinking days.

In addition to the effect of alcohol consumption, Table 1 shows the effects of the risk factors on involvement in aggression. The first risk factor, risk group status, was associated only with involvement in verbal aggression. Compared to women in the low risk group, women in the high risk group were twice as likely to be involved in verbal aggression relative to no aggression over the 8 weeks of the study. The second risk factor, severity of psychological symptoms (BSI-GSI), was significantly associated with involvement in verbal aggression. For each one unit increase in severity of psychological symptoms, the odds of verbal aggression increased by three times. Neither having multiple sexual partners nor experiencing victimization during the first year at university were significantly associated with the three types of aggression during the 8 weeks of the study.

Acute Consequences following Aggression

Alcohol Consumption—The acute effects of aggression on drinking are presented in Table 2. The odds of alcohol consumption were three times higher for the 24 hour period following involvement in verbal aggression. However, the odds of alcohol consumption did not change following (1 day or 1 week) involvement in any of the other forms of aggression. Women were more likely to drink on days when their positive mood was higher. In addition, the heaviest drinking days were Thursdays, Fridays, and Saturdays (compared to Mondays).

Two individual risk factors (Level 2 predictors) were significantly associated with alcohol consumption over the 8 weeks. Women who reported alcohol use in the first year at university had more than six times the odds of drinking alcohol compared to those who did not report any alcohol use in the first year. In addition, women in the high risk group were more likely to use alcohol than women in the low risk group. Victimization during the first year at university and severity of psychological symptoms did not have significant effects on alcohol consumption.

Mood—The acute effects of aggression on positive and negative mood are presented in Table 3. For both verbal and physical aggression the significant negative coefficient for positive mood on the day following aggression indicates that positive mood decreased. This was accompanied by a significant positive coefficient for negative mood on the day following both verbal and physical aggression, indicating an increase in negative mood. Changes in mood on the day immediately following sexual aggression were not observed; however, a significant negative coefficient for positive mood was seen for the week following sexual aggression indicating that positive mood was lower than usual during that week. No other significant acute changes in mood were found following aggression. Positive and negative mood also were significantly associated with the global severity index of the BSI for the month prior to daily data collection. Women who reported more severe psychological distress were significantly more likely to report a higher level of negative mood and a lower level of positive mood over the 8-week-period of daily reporting. In addition, women in the high risk group were more likely to report greater negative mood than those in the low risk group. Positive mood was higher on Fridays, Saturdays, and Sundays compared with Mondays, while negative mood was lower on Saturdays. Positive mood was higher and negative mood lower on the day following a drinking day.

Discussion

While an association between alcohol use and aggression has been well established in the literature, the temporal relationship between alcohol consumption and aggressive events has received less attention. In addition, the specific nature of the relationship between alcohol consumption and different types of aggression, particularly verbal aggression, has not been well studied. In the current study, we replicated and extended the work of Parks and Fals-Stewart's (2004) by assessing the temporal relationship between alcohol consumption and verbal, physical, and sexual aggression, as well as the relationships among the aggressive event and immediate consequences (i.e., changes in alcohol consumption and mood). Finally, we included more complex multilevel modeling with person specific characteristics to begin to delineate individual factors that might place women at risk for involvement in aggression.

Similar to Parks and Fals-Stewart (2004), we found that the odds of both physical and sexual aggression were substantially higher on days of heavy drinking compared to days of no drinking. Our finding that the odds of verbal aggression were higher on heavy drinking days compared to days of no drinking is unique and important, given that physical aggression is often preceded by verbal aggression. This is particularly true when alcohol has been used by one or more individuals involved in the aggression, or the aggression occurs within a romantic relationship (i.e., dating, marital; Parks et al., 1998; Schumacher & Leonard, 2005; Stets & Henderson, 1991).

It is tempting to think that the findings for physical and sexual aggression are of limited significance given the low base rate at which these forms of aggression occurred in relation to verbal aggression; however, the consequences of these more severe forms of aggression for both the victims and society need to be considered (e.g., health care costs). In addition, women were at greater likelihood of drinking and having decreased positive mood and increased negative mood (e.g., greater negative affect) following involvement in verbal aggression – factors which could increase her vulnerability for additional more severe forms of aggression (e.g., sexual assault; Abbey et al., 2004; Greene & Navarro, 1998).

When we examined the individual risk factors for involvement in aggression, risk status and the global severity index of the BSI were associated with aggression, alcohol consumption, and mood changes. The odds of involvement in verbal aggression, but not physical or sexual aggression, increased with greater severity of psychological symptoms. Verbal aggression would be consistent with the manifestation of more severe psychological symptoms (e.g., anxiety, depression) in women. Our sample of women scored above previously reported normative scores for college women (Cochran & Hale, 1985) and non-psychiatric adolescent female populations (Derogatis, 1993) on severity of psychological symptoms. Given our extreme groups sampling strategy we assessed the GSIBSI by risk status and found that women in the low risk group had a significantly lower average ($M = 0.76$, $SD = 0.63$) than women in the high risk group ($M = 1.05$, $SD = 0.62$). Women in the low risk group had a GSIBSI raw score that did not differ significantly from the normative raw scores for college and adolescent females, while the women in the high risk group had a significantly higher raw score with an associated clinical T Score of 56 (75%). Thus, the elevated severity of current psychological symptoms among our sample of university women is most likely explained by a history of victimization and increased drinking. Furthermore, the association of greater psychological symptom severity with increased drinking is consistent with prior research (Geisner, Larimer, & Neighbors, 2004).

In the current study, we examined changes in alcohol use and mood on the day and during the week (2–7 days) immediately following an aggressive event in an effort to assess the

acute consequences of involvement in aggression. We found limited evidence for use of alcohol following aggression, with alcohol use only increasing during the 24 hours immediately following verbal aggression. However, both positive and negative mood appeared to be more influenced by aggression, with immediate changes in mood noted after verbal and physical aggression and slightly delayed (2–7 days) changes in positive mood following sexual aggression. Notably, there were no changes in negative mood following sexual aggression. The absence of change in negative mood, as well as the delay in positive mood change following sexual aggression may reflect differences that occur over the first week (and beyond) in recognizing, processing, and coping with a sexual event compared with a verbal or physical event. The majority (74%) of the sexually aggressive incidents reported through the IVR system were not acknowledged as “sexual aggression” by the participant (i.e., she responded affirmatively to the behavioral questions, not to the question “have you experienced any sexual aggression”). These findings suggest that different types of aggression may have subtle, acute effects on other daily experiences of female college students.

In summary, our findings provide support for several of our *a priori* hypotheses. The odds of experiencing all three types of aggression, verbal, sexual and physical non-sexual, were significantly higher on heavy drinking days compared to non-drinking days. Women in our high risk group did appear to be at somewhat greater risk for aggression and other problems associated with risk for aggression than women in the low risk group. Finally, we found some support for immediate changes in alcohol use and mood following involvement in aggression.

Several limitations of the current study need to be noted. This study was conducted at one university, with one cohort of women from that university, and thus the findings may not be generalizable to all college women. However, the replication of temporal relationships found by Parks and Fals-Stewart (2004) diminish this concern somewhat – as the current study was conducted at a different, larger, public university. When assessing the acute changes following aggression, we only found an increase in alcohol consumption following verbal aggression. Because of the wide confidence intervals seen in Table 2, there is some possibility that we lacked sufficient power to detect changes in alcohol consumption during the 24 hours immediately following physical and sexual aggression.

Collection of data through the IVR system does not allow for extensive detailed assessment of the incident of aggression and relies on the participant’s subjective interpretation of the event as aggressive. Therefore, greater variability exists in the operational definition of verbal, physical, and sexual aggression in the daily data compared with traditional survey or interview data. Specific information about aggressive events that involve alcohol need to be obtained through detailed qualitative interviews. We currently are collecting these event-level data in conjunction with the IVR reports during the semi-structured, qualitative, in-person interviews mentioned in the method section.

Our findings provide several important advances to what is known about the relationship between alcohol consumption and risk for aggression among college women. We found that not all drinking puts women at risk for experiencing aggression; rather heavy drinking (consuming 4 or more drinks) increased women’s risk for involvement in sexual, physical, and, to a lesser degree, verbal aggression. These findings provide support for the need to develop targeted programs to reduce heavy episodic drinking on college campuses. Our findings further define characteristics that put women at increased risk for aggression, regardless of alcohol consumption. Women who enter university with a history of prior victimization or a history of heavy drinking are at greater risk for later victimization, as are women who show more severe psychological symptoms during their time at university.

These findings suggest that screening at university physical health and psychological service centers may provide points for early intervention programs designed to educate women on ways to reduce their risk for involvement in aggression and to reduce their alcohol use.

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Table 1

Multilevel Regression Models for Relationship of Alcohol Consumption Level to Aggression.

Fixed Effect	β	s.e.	t	OR	C.I.
<u>Sexual Aggression</u>					
Intercept	-7.03	0.32	-21.75		
Risk Status	0.23	0.60	0.38	1.25	(0.383, 4.103)
GSIBSI	0.43	0.36	1.19	1.53	(0.753, 3.123)
Multiple sexual partner	-0.28	0.41	-0.68	0.76	(0.336, 1.696)
Y1 aggression	0.78	0.43	1.80	2.18	(0.927, 5.142)
Non-heavy drinking	1.37	0.81	1.69	3.95	(0.806, 19.372)
Heavy drinking	2.97	0.56	5.32	19.44	(6.521, 57.968)
<u>Physical Aggression</u>					
Intercept	-8.14	0.69	-11.74		
Risk Status	1.33	0.76	1.74	3.76	(0.836, 16.953)
GSIBSI	0.32	0.44	0.73	1.38	(0.579, 3.266)
Multiple sexual partner	0.07	0.85	0.09	1.08	(0.201, 5.791)
Y1 aggression	0.53	0.67	0.79	1.70	(0.451, 6.408)
Non-heavy drinking	0.94	1.06	0.89	2.56	(0.319, 20.512)
Heavy drinking	2.47	0.56	4.41	11.84	(3.945, 35.523)
<u>Verbal Aggression</u>					
Intercept	-5.59	0.25	-22.53		
Risk Status	0.75	0.32	2.36*	2.12	(1.133, 3.983)
GSIBSI	0.69	0.21	3.33**	2.00	(1.326, 3.016)
Multiple sexual partner	-0.10	0.34	-0.28	0.91	(0.460, 1.794)
Y1 aggression	0.08	0.30	0.27	1.08	(0.595, 1.977)
Non-heavy drinking	0.46	0.38	1.21	1.59	(0.752, 3.322)
Heavy drinking	0.81	0.31	2.64**	2.25	(1.233, 4.115)

* p < .05,

** p < .01,

*** p < .001,

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Table 2

Multilevel Regression Model for Effects of Aggression on Alcohol Consumption.

Fixed Effect	β	s.e.	t	OR	C.I.
Intercept	-5.90	0.29	-20.51		
Risk Status	1.19	0.21	5.62	3.27	(2.159, 4.965)
GSIBSI	0.04	0.18	0.24	1.04	(0.729, 1.493)
Y1 Aggression	0.30	0.24	1.27	1.35	(0.847, 2.158)
Y1 Drinking	1.84	0.28	6.55	6.30	(3.621, 10.959)
Within 1 Day - Verbal Agg	1.19	0.23	5.11	3.28	(2.080, 5.170)
Within 1 Day - Physical Agg	0.29	1.13	0.25	1.33	(0.145, 12.253)
Within 1 Day - Sexual Agg	0.50	0.61	0.82	1.65	(0.499, 5.451)
Within 1 Week - Verbal Agg	0.08	0.22	0.37	1.08	(0.703, 1.675)
Within 1 Week - Physical Agg	-0.30	0.42	-0.72	0.74	(0.326, 1.679)
Within 1 Week - Sexual Agg	0.16	0.30	0.52	1.17	(0.648, 2.112)
Positive Affect	0.19	0.06	3.07	1.22	(1.073, 1.376)
Negative Affect	-0.11	0.06	-1.74	0.90	(0.799, 1.013)
Tuesday	0.50	0.19	2.71	1.65	(1.148, 2.378)
Wednesday	0.32	0.17	1.88	1.37	(0.987, 1.909)
Thursday	1.25	0.20	6.18	3.48	(2.349, 5.195)
Friday	1.80	0.19	9.62	6.20	(4.208, 8.783)
Saturday	1.69	0.20	8.37	5.43	(3.639, 8.023)
Sunday	0.04	0.18	0.21	1.04	(0.733, 1.468)

*
p < .05,**
p < .01,***
p < .001,****
p < .000

Table 3

Multilevel Regression Model for Effects of Aggression on Positive and Negative Mood.

Fixed Effect	Positive Mood			Negative Mood		
	β	s.e.	t	β	s.e.	t
Intercept	3.28	0.07	48.22	1.97	0.06	31.46
Risky status	0.08	0.08	0.97	0.21	0.09	2.41*
GSIBSI	-0.45	0.07	-6.87***	0.38	0.07	5.50***
Multiple sexual partner	0.01	0.15	0.07	0.06	0.12	0.55
Y1 Aggression	-0.10	0.09	-1.09	-0.09	0.09	-0.98
Alcohol used within a day before	0.10	0.04	2.33*	-0.10	0.04	-2.37*
Within 1 Day - Verbal Agg	-0.81	0.14	-5.61***	0.91	0.13	7.02***
Within 1 Day - Physical Agg	-0.88	0.23	-3.81***	0.83	0.29	2.86**
Within 1 Day - Sexual Agg	-0.08	0.20	-0.41	0.21	0.24	0.88
Within 1 Week - Verbal Agg	-0.01	0.07	-0.22	0.05	0.06	0.71
Within 1 Week - Physical Agg	-0.16	0.09	-1.79	0.05	0.10	0.55
Within 1 Week - Sexual Agg	-0.14	0.07	-1.99*	0.15	0.08	1.91
Tuesday	-0.02	0.03	-0.82	0.04	0.02	1.67
Wednesday	0.01	0.03	0.47	0.02	0.03	0.80
Thursday	0.02	0.03	0.54	-0.004	0.03	-0.16
Friday	0.10	0.03	2.99**	-0.01	0.03	-0.34
Saturday	0.16	0.03	5.17***	-0.09	0.03	-2.94**
Sunday	0.06	0.03	2.05*	-0.04	0.03	-1.65

* p < .05,

** p < .01,

*** p < .001