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A Daily Process Examination of the Temporal Association Between Alcohol Use and Verbal and Physical Aggression in Community Couples

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Abstract

Alcohol use has been associated with intimate partner aggression perpetration and victimization; however, much of the evidence is based on survey research. Few studies have addressed the proximal effects of drinking episodes on the subsequent occurrence of partner aggression. The current study used daily diary methodology to consider the daily and temporal association between drinking episodes and episodes of partner verbal and physical aggression among a community sample of married and cohabiting couples ($N = 118$). Male and female partners each provided 56 days of independent daily reports of drinking and partner conflict episodes, including verbal and physical aggression, using interactive voice response technology. Dyadic data analyses, guided by the actor-partner interdependence model, were conducted using hierarchical generalized linear modeling with multivariate outcomes. Daily analyses revealed that alcohol consumption was associated with perpetration of verbal and physical aggression the same day, but not with victimization. Temporal analyses revealed that the likelihood of perpetrating verbal and physical aggression, and the likelihood of being verbally and physically victimized, increased significantly when alcohol was consumed in the previous four hours. Findings did not differ according to gender of perpetrator or victim, and the interaction between perpetrator and victim's alcohol use was not significant in any analysis. The study provides clear evidence that, within a sample of community couples without substance-use disorders or other psychopathology, alcohol consumption by men and women contributes to the occurrence of partner aggression episodes.

Keywords

intimate partner violence; alcohol-drinking patterns; couples

A substantial body of research, mostly using survey methods, has shown that alcohol consumption, particularly heavy or problematic use, is positively associated with intimate partner aggression, both perpetration and victimization (Foran & O'Leary, 2008; Leonard, 2008; Rothman, Reyes, Johnson, & Lavalley, 2012; Stuart, O'Farrell, & Temple, 2009). Moreover, reduction or cessation of alcohol use following treatment is associated with reduction in partner aggression (Murphy & Ting, 2010). It is often presumed that alcohol

intoxication leads to subsequent aggression. However, although survey studies demonstrate a consistent positive association between drinking patterns and the occurrence of partner aggression, they cannot discern whether drinking episodes trigger aggressive episodes. With recent advances in daily data collection methods and analyses, it is now possible to examine the temporal association between naturally occurring episodes of alcohol consumption and episodes of relationship aggression. The current daily report study examined whether episodes of alcohol consumption, by male and female intimate partners, increase the odds of subsequent intimate partner aggression by either partner.

Proximal Effects of Alcohol Consumption

Does alcohol consumption or intoxication trigger aggressive behavior toward—or from—one's intimate partner? Experimental analog studies demonstrate that administered alcohol, particularly under conditions of provocation, results in increased displays of aggression toward a fictitious partner (see Bushman & Cooper, 1990; Ito, Miller, & Pollock, 1996 for reviews). Aggression following intoxication has been explained via the Alcohol Myopia Model (Steele & Josephs, 1990), which maintains that intoxication results in a narrowing of perceptual and cognitive focus toward the more salient cues, in this case those provoking aggression, relative to inhibitory cues. Although it is plausible that this process applies to intimate partner aggression as well (see Clements & Schumacher, 2010), experimental analog studies have not typically considered intimate partners as targets. Thus, caution must be used in extrapolating the results of these experimental studies of alcohol and aggression against fictitious, unacquainted targets.

A smaller number of studies have considered the impact of alcohol consumption on problem solving interactions within couples. In a sample of newlywed couples recruited from the community, Leonard and Roberts (1998) found that after administration of alcohol to husbands, both husbands and wives displayed more negativity in a subsequent conflict interaction compared with placebo or no alcohol conditions. Wives were not administered alcohol in this study. Jacob, Leonard, and Haber (2001) compared the interactions of couples with an alcoholic husband on an occasion on which alcohol was available compared with an occasion when no alcohol was available. They found increased negativity among high antisocial alcoholics on drink nights compared with nondrink nights although there were no differences among low antisocial alcoholic couples. Wives were allowed to drink alcohol in this paradigm but mean BAL for wives was quite low compared with that of husbands, making it difficult to draw conclusions about the effects of women's drinking on marital interaction.

As an alternative approach to considering the proximal effects of alcohol on aggression, critical event studies have compared the prevalence of alcohol consumption prior to verbally aggressive events versus physically aggressive events. In a community sample of newlyweds, Leonard and Quigley (1999) found support for the hypothesis that episodes of husband physical aggression were more likely than episodes of husband verbal aggression to follow husband drinking. A similar pattern was found among a sample of men in substance abuse treatment (Murphy, Winters, O'Farrell, Fals-Stewart, & Murphy, 2005). Within episodes of physical aggression, alcohol consumption, at least by the man, appears to

increase the severity of the event and likelihood of injury to the partner compared with episodes of sober aggression (Martin & Bachman, 1997; Testa, Quigley, & Leonard, 2003; Thompson & Kingree, 2006). These studies did not consider the association between women's drinking and their perpetration of aggression. Although these critical event studies indicate that conflicts that occur under the influence of alcohol are more severe than sober episodes, they cannot address the question of whether aggression is more likely to occur when partners are drinking compared with when they are sober.

Recent years have seen a burgeoning of research using daily report methods. In contrast to survey studies which consider associations between patterns of behavior across individuals, with daily or more than daily reports it is possible to consider whether episodes of drinking and episodes of aggression tend to co-occur within an individual or couple over several days or weeks (Bolger, Davis, & Rafaeli, 2003; Reis & Gable, 2000). That is, we can determine whether relationship aggression is more likely to occur on occasions when a partner has been drinking compared with occasions when that same individual is sober.

Daily report studies provide some evidence of a proximal association between alcohol consumption and both the perpetration and receipt of aggression in general. For example, in a sample of female college students involving 12 weeks of daily reports, Parks, Hsieh, Bradizza, and Romosz (2008) found that the odds of involvement in an episode of verbal, physical or sexual aggression (as a victim or perpetrator) were significantly increased on days of heavy drinking. In another college sample, daily intoxication was positively associated with the subsequent occurrence of several behavioral risks later that day, including perpetration of aggression, for both men and women (Neal & Fromme, 2007). In these studies, the measure of aggression was not specific to intimate partner aggression.

A few studies have used daily report methods to consider the relationship between drinking episodes and episodes of intimate partner aggression. Using Time Line Follow Back methodology in a sample of men and women entering alcohol treatment, Stuart, Moore et al. (2009) found that episodes of alcohol consumption increased the odds of male and female physical aggression perpetration and victimization occurring on the same day. In a sample of college students involved in dating relationships, using 10 days of paper diaries, Fischer et al. (2005) found that episodes of heavy episodic drinking resulted in modest increases in negative interactions, disagreements, and discussion regarding alcohol occurring later that day. In a study of college students in dating relationships, using two months of electronic reports, Moore, Elkins, McNulty, Kivisto, and Handsel (2011) found significantly increased odds of perpetrating both verbal and physical aggression on days of alcohol consumption. This association was stronger for men than for women. To ensure that drinking episodes occurred prior to aggression, rather than the other way around, Moore et al.'s analysis included only drinking episodes that preceded aggression; drinking episodes that occurred after aggression were recoded as 0. In sum, daily report studies provide evidence that alcohol consumption increases the odds of intimate-partner aggression occurring later that same day.

Individual Versus Couple Reports

The nascent daily report literature on alcohol and aggression described above has relied thus far on reports of a single partner regarding his or her own alcohol use and own perpetration and/or victimization. However, by definition intimate partner aggression is a dyadic behavior that cannot occur without both partners involved. Moreover, the alcohol use of both partners can contribute to the occurrence of intimate partner aggression. Thus, fully accounting for the interpersonal nature of intimate partner aggression and its association with partner alcohol use requires daily reports from both partners (Graber, Laurenceau, & Carver, 2011; Laurenceau & Bolger, 2005). Despite the increased complexity involved both in collecting and analyzing dual-partner daily reports, the approach has recently been shown to be feasible (Cranford, Tennen, & Zucker, 2010). The Actor-Partner Interdependence Model (APIM, Kenny, Kashy, & Cook, 2006) has emerged as a framework for conceptualizing and analyzing these interdependent reports (see Figure 1). Guided by this model, reports from each member of the dyad are considered nested within couple, which accounts for the interdependence of their outcomes and allows for estimation of both individual and dyadic effects on a given outcome. That is, we can examine the effects of the male partner's drinking on male-perpetrated aggression (Path p , for perpetrator) and the female partner's drinking on female-perpetrated aggression (Path p'), as well as the effect of the female's drinking on male-perpetrated aggression (Path v , for victim) and the male's drinking on female-perpetrated aggression (Path v') (Cook & Kenny, 2005; Kashy & Donnellan, 2012). The APIM accounts for the impact of each partner's influence on the other, even when that influence is not directly recognized. For example, Gable, Reis, and Downey (2003) found that an individual's daily relationship well-being was predicted not only by that person's reports of negative partner behaviors received the previous day, but also by negative behaviors that the partner recorded that were not recalled by the individual. Importantly, the APIM controls for the correlation between the two partners' outcomes, in this case, between male-perpetrated aggression and female-perpetrated aggression, which are known to be highly correlated (e.g., Schumacher & Leonard, 2005).

Present Study

The present study was designed to consider the temporal association between episodes of alcohol consumption and episodes of conflict and aggression within intimate relationships. Using a community sample of married and cohabiting heterosexual couples, we collected eight weeks (56 days) of daily reports regarding episodes of alcohol use and partner conflict, including verbal and physical aggression within conflicts. Reports were made independently by each partner and included the hour that each episode started, allowing us to consider temporal ordering of the events. We hypothesized, based on the Alcohol Myopia Model and prior laboratory and survey findings, that episodes of drinking would increase the odds of verbal and physical aggression occurring within the next few hours. Guided by the APIM, the availability of independent data from both partners allowed us to consider whether there were effects of one's own drinking and also of partner's drinking on subsequent aggression, and whether there were gender differences in these alcohol effects. Previous survey (Foran & O'Leary, 2008) and experimental (Giancola, 2002; Giancola et al., 2009) studies suggest that the association between drinking and aggression is stronger for men than for women.

Daily report studies have found effects of both male and female alcohol consumption on general aggression perpetration (e.g., Neal & Fromme, 2007). However, in a daily report study specific to intimate partner aggression, the effect of alcohol was stronger for men (Moore et al., 2011). We tested the hypothesis that the association between alcohol and aggression would be stronger for male versus female perpetrators. The dyadic data also permitted examination of potential gender differences in the effects of alcohol on victimization, although we offered no a priori hypothesis.

Method

Participants

Married and cohabiting couples between the ages of 21 and 45 ($N = 120$ couples) were recruited in one of three ways. The majority responded to screening questionnaires that were sent to approximately 20,000 households in the Buffalo metropolitan area thought to contain a couple in the intended age range ($n = 77$ couples). The remainder responded to newspaper ($n = 16$ couples) or Facebook advertisements ($n = 27$ couples) seeking couples who drink alcohol. Participants initially were recruited for an alcohol administration study involving couple communication and, as such, had to meet several eligibility criteria to ensure safety. Both partners had to report drinking four or more drinks on an occasion at least once a month. Couples were excluded if either partner had medical or psychiatric contraindications to alcohol administration, including a score of 9 or higher on the Alcohol Dependence Scale (ADS, Skinner & Allen, 1982), or treatment for substance-use disorders, psychiatric disorders, recent treatment for depression, pregnancy, or medical conditions or treatments that would preclude safe consumption of alcohol (e.g., high blood pressure). Finally, couples were excluded if either partner reported partner violence involving use of knife or gun or requiring medical attention, or if multiple severe violence items were reported in the past year.

Of 120 couples who began the diary study, 98 of them had completed the alcohol-administration study approximately 6 months earlier. The remaining 22 couples met eligibility criteria for the alcohol-administration study but were unable or unwilling to schedule a laboratory session. These couples did not differ from those who completed the laboratory study on demographic or alcohol variables. All couples were rescreened for eligibility just prior to the start of the daily report study to ensure that they were both consuming alcohol at least once a week, not pregnant, not seeking treatment for substance abuse, and still living together in the Western New York area; couples with long-term separations (i.e., military service) were excluded. Both partners had to be willing to participate in the study. Despite the substantial subject burden involved in committing to 56 days of daily reports, approximately two thirds of eligible couples agreed to participate. Only one participant (within a couple) failed to complete the study, dropping out in the first week. Although his partner completed the diary, the couple was not included in the present analyses, leaving 119 couples.

Procedure

Couples who agreed to participate in the 56-day daily report study were scheduled for a 45-min orientation session. The orientation included training in the reporting of drinking episodes by providing examples of standard drinks, using wine and cocktail glasses and beer bottles. Couples also were provided training in the interactive voice response (IVR) system. IVR involves respondent-initiated phone calls to a recorded daily interview. Responses to the interview, which takes about 5 min to complete, are made by pressing numbers on the keypad. Following IVR instruction, each participant separately made his or her first day's report. They were reminded that partner reports were to be made independently and not discussed or shared. Although previous IVR studies have used an evening reporting period (e.g., Cranford et al., 2010), we were concerned that because both drinking and conflict are likely to occur in early evening hours, this time frame might interfere with accurate reporting, or worse, with marital processes. Participants were instructed to call the IVR system each day at approximately the same time to provide a report for the previous day. Although they were encouraged to call early in the day if possible, our preference was for establishing a convenient daily routine by which calls would be made regularly. Reports were spread almost evenly from 6 a.m. through 11 p.m. (approximately 3–8% of reports occurred within each hour), with fewer than 3% of all reports occurring between midnight and 5:00 a.m.

To maintain regular reporting, couples were called weekly to thank them for their ongoing participation and to remind them of the importance of continued daily reports. As an incentive for participation, each partner was compensated for completed IVR reports in the following manner: \$1 for each report, \$10 for each complete week, and a \$30 bonus for 8 complete weeks. If a respondent missed a prior daily report, the IVR system provided the option to make up a report for the missed day at the end of the current day's report. If a respondent missed two or more days, a research assistant called and attempted to obtain a report for missing days via telephone. Because of these opportunities to make up missing data, there were very few missing reports. Men completed 5810/6608 (87.9%) reports on time, but with the addition of 688 make-up reports and 93 reports made to research assistants, only 17 reports were missed completely for a total completion rate of 99.7% (6591/6608). Completion rates for women were similar: 6602/6608 (99.9%) complete, with 5763 (87.2%) made on time, 715 make-up reports, and 123 made more than one day late to a research assistant.

Daily Report Measures

In each daily interview, the participant was asked, "At any time yesterday, did you and your partner have a conflict, argument, or disagreement, whether major or minor?" Participants who responded positively were then asked to record the hour the conflict began and its duration. In addition, they were asked whether or not the conflict included seven behaviors derived from the Conflict Tactics Scales (CTS-2, Straus, Hamby, Boney-McCoy, & Sugarman, 1996), i.e., yelled; tried to work out a solution; sulked or withdrew; threw things, kicked, or hit something; made threats; pushed, grabbed, or hit; and insulted or called names. Each was asked twice to assess behaviors directed toward the partner as well as the partner's behavior toward the self. A positive response to yelled, made threats, or insulted

was scored as verbal aggression, whereas a positive response to threw/kicked/hit something or pushed/grabbed/hit was scored as physical aggression. Not included were worked out a solution or withdrew and sulked. Participants who reported a conflict also were asked whether any other conflict occurred that day, and if so, follow-up questions were repeated. Reports of verbal and physical aggression within conflict episodes constituted the primary dependent measure.

As part of each day's report, respondents were asked whether or not they drank any alcoholic beverages the previous day. If they responded positively, they were asked the hour the drinking episode began, its duration, the number of drinks, and how intoxicated they felt. Respondents who reported a drinking episode were asked whether there was another drinking episode that day, and if so, were asked the same follow-up questions.

Although not included in the present analyses, each daily report began with assessment of mood and couple functioning. Also, to make the focus of the investigation less obvious, prior to asking about the occurrence of conflicts, respondents were asked whether at any time yesterday they had experienced an interaction with the partner that involved intimacy, love, caring, or support.

Analytic Strategy

To examine the effects of alcohol use on partner aggression in the context of the dyad, we followed recommendations of the APIM (Kenny et al., 2006), described above and depicted in Figure 1. The effect of male alcohol use on male-perpetrated aggression (see Figure 1, path p) corresponds to the male “actor” effect—we use the term “perpetrator” to be more clear in the current context. Similarly, the effect of female alcohol use on female-perpetrated aggression (path p′) corresponds to the female perpetrator effect. The effect of female alcohol use on male-perpetrated aggression (path v) corresponds to the female “partner” effect. We use the term “victim” to be more clear in the current context. Similarly, the effect of male alcohol use on female-perpetrated aggression (path v′) corresponds to the male victim effect.

In testing gender differences, we constrained the p and p′ paths to be equal (a χ^2 test with 1 *df*) to determine whether the effects of alcohol use on the perpetration of partner aggression differed by gender. We also constrained the v and v′ paths to be equal to determine whether the effects of alcohol use on victimization differed by gender. When these effects were not significant, we followed the accepted practice of pooling the coefficients across gender (see Kashy & Donnellan, 2012; Kenny et al., 2006). In other words, we tested the effects of two-way Gender $\times$ Perpetrator Alcohol Use and two-way Gender $\times$ Victim Alcohol Use interactions. When these interactions are not significant, we confine our textual discussion to the interpretation of the main effects of alcohol use on perpetration and victimization. We present the results for male and female perpetration and victimization separately in the tables for those who are interested; however, any apparent gender differences should be interpreted with caution in the case of a nonsignificant interaction.

Analyses proceeded in three main steps. First, we used descriptive statistics to characterize the couples, alcohol-use episodes, and the occurrence of conflict incidents and verbal and

physical aggression within conflicts. Second, we analyzed the likelihood of aggression occurring on a given day as a function of alcohol use that same day using a two-level hierarchical, generalized linear model with multivariate outcomes. Finally, in our third set of analyses, we analyzed the likelihood of aggression occurring in a given hour as a function of alcohol use in the previous four hours using a three-level, hierarchical, generalized linear model with multivariate outcomes. We provide additional details regarding each step in our analyses below.

Results

Sample Descriptive Statistics

Men averaged 33.9 (range = 22–45, $SD = 6.8$) and women 32.7 (range = 21–46, $SD = 6.9$) years of age. Most participants were White (91.5% of men and 95.8% of women), well-educated (87% of men and 95% of women had at least some college education), and employed at least part time (91.5% of men and 77.1% of women). The median household income was \$60,000–\$75,000. Most couples were married (76% vs. 24% cohabiting), and had been living together (cohabiting or married) for an average of 6.3 years (range = 0–22, $SD = 5.1$). The majority (63%) had children living in the home. Of those who had children, the median number was 2 (range = 1–5).

Reports of Conflict and Aggression

One woman reported conflict on 46 of 56 days (82%); her partner reported conflict on 12 of 56 days (21%). Given this large discrepancy, and given that no other participant reported conflict on more than 20 of 56 days (36%), this couple was dropped from all further analyses. Of the remaining 118 couples, men reported 460 conflicts on a total of 448 days, an average of 3.8 conflict days per man (range = 0–17, $SD = 3.6$). Men reported perpetrating verbal aggression in 212 of these conflicts (46.1%) and receiving verbal aggression in 266 conflicts (57.8%). They reported perpetrating physical aggression in 14 conflicts (3.0%) and receiving physical aggression in 16 conflicts (3.5%). Women reported 591 conflicts on 586 days, an average of 5.0 conflict days per woman (range = 0–20, $SD = 4.3$). Women reported perpetrating verbal aggression in 348 (58.9%) conflicts and receiving verbal aggression in 298 (50.4%) conflicts. They reported perpetrating physical aggression in 29 (4.9%) conflicts and receiving physical aggression in 23 (3.9%) conflicts.

Table 1 presents agreement between men and women regarding the occurrence of verbal and physical aggression within a given day. On most days, male and female partners agreed that there was no verbal or physical aggression. However, as shown in the other columns, there were some days on which both reported aggression. More commonly, one partner but not the other reported aggression on a given day, a pattern that is consistent with survey studies showing low partner agreement regarding aggression (Caetano, Schafer, Field, & Nelson, 2002; Cunradi, Bersamin, & Ames, 2009). Also consistent with previous survey research (e.g., Testa et al., 2012), for both perpetration and victimization, uncorroborated reports from the female partner were significantly more common than uncorroborated reports from the male partner, as shown by McNemar's test. It has been common practice in IPV research to use the maximum report of aggression from either partner as a way of minimizing

underreporting (Szinovacz & Egley, 1995). Thus, as our primary dependent measures, we use any report of male- and female-perpetrated verbal aggression and physical aggression, regardless of whether it was reported by the self or the partner (see “either” reports of aggression, in Table 1). Table 2 provides descriptive statistics and bivariate Spearman correlations for these dichotomous daily report measures. As shown in Table 2, although the number of days on which physical aggression was reported appears small, when aggregated over 56 days across all couples, 18.6% of couples (11.0% of men and 13.6% of women) report at least one act of male-perpetrated physical aggression and 20.3% of couples (12.7% of women and 10.2% of men) report female-perpetrated physical aggression.

Reports of Alcohol Use

During the 56 days of daily reporting, men reported a total of 2,912 drinking episodes on 2,712 drinking days. On average, male partners reported 23.0 drinking days (41.1% of days) per man (range = 1–56, $SD = 13.4$). They consumed an average of 4.06 drinks per drinking day (range = 1–20, $SD = 3.25$), and consumed five or more drinks on 23.1% of drinking days. Women reported a total of 2,455 drinking episodes on 2,320 drinking days, an average of 19.7 drinking days (35.2%) per woman (range = 1–56, $SD = 10.7$). They consumed an average of 2.87 drinks per drinking day (range = 1–6, $SD = 2.14$), and consumed four or more drinks on 17.3% of drinking days. Within couples, about half of the days involved no drinking by either partner (3,249 or 49.3% of days). Both partners drank on 1,692 (25.7%) days. On 1,019 days (15.5%) only the man drank and on 625 (9.5%) days only the woman drank.

It is common in daily diary analyses to control for day of the week, given that various types of events, such as drinking, are more likely to occur on weekends compared with weekdays (e.g., Neal & Fromme, 2007). We speculated that conflict might be more common on weekends, when couples typically spend more time together. Although likelihood of conflict was not significantly higher on weekend days compared with weekdays, 6.9% vs. 6.7%, $\chi^2(1) = 0.03$, $p = .855$ for men, and 9.2% vs. 8.7%, $\chi^2(1) = 0.49$, $p = .482$ for women; both men and women were more likely to drink on weekend days compared with weekdays, 51.3% vs. 33.5%, $\chi^2(1) = 210.98$, $p < .001$ for men and 47.3% vs. 26.0%, $\chi^2(1) = 321.30$, $p < .001$ for women. Thus we controlled for weekday versus weekend in daily and temporal analyses.

Daily Analyses

We hypothesized that alcohol use on a given day would be positively associated with reports of male- and female-perpetrated verbal and physical aggression on that same day. Examining this association at the daily level requires specialized analytic techniques because the data are not independent (i.e., there are repeated assessments for each individual, and there are assessments from both members of each couple). Accordingly, we conducted multilevel modeling analyses using the multivariate feature in MLwiN 2.26 (Rasbash, Browne, Healy, Cameron, & Charlton, 2012). Our analytic approach followed a two-level nested structure: Within-person assessments of alcohol use each day made up Level 1, couple made up Level 2, and male-perpetrated and female-perpetrated aggression were treated as multivariate outcomes. This approach estimates two sets of equations

simultaneously: one set for male perpetration and one set for female perpetration, controlling for the correlation between the two. The method is statistically equivalent to the APIM approach for analyzing dyadic data (Kenny et al., 2006; Laurenceau & Bolger, 2005) and has been used in prior research (e.g., Derrick, Leonard, & Homish, 2012; Homish & Leonard, 2005).

Occurrence of Alcohol Use and Partner Aggression

To examine the association between alcohol use and verbal aggression at the daily level, we estimated the following prototypical equations:

$$\text{logit} \left(Y_{ijMt} \right) = \beta_{0jM} + \beta_{1jM} Y_{t-1} + \beta_{2jM} D_t + \beta_{3jM} P_t + \beta_{4jM} V_t + \beta_{5jM} P \times V_t \quad (1)$$

$$\text{logit} \left(Y_{ijFt} \right) = \beta_{0jF} + \beta_{1jF} Y_{t-1} + \beta_{2jF} D_t + \beta_{3jF} P_t + \beta_{4jF} V_t + \beta_{5jF} P \times V_t \quad (2)$$

$$\beta_{0jM} = \gamma_{00M} + \gamma_{01M} T_M + \gamma_{02M} T_F + r_{0jM} \quad (3)$$

$$\beta_{0jF} = \gamma_{00F} + \gamma_{01F} T_F + \gamma_{02F} T_M + r_{0jF} \quad (4)$$

Verbal aggression is a dichotomous variable, so these equations were estimated using a binomial distribution with a logit link. Equation 1 represents the Level 1 (i.e., daily level) effects on male-perpetrated aggression (M); Equation 2 represents the Level 1 effects on female-perpetrated aggression (F). We predicted one day's verbal aggression (Y_{ij}) from an intercept term (β_{0j} , the typical level of verbal aggression for that day for couple j), yesterday's level of verbal aggression (β_{1j} , a fixed effect, to control for autocorrelation), day of the week (β_{2j} , a dummy-coded fixed effect, uncentered), the perpetrator's alcohol use on that day (β_{3j} , a dummy-coded fixed effect, uncentered), the victim's alcohol use on that day (β_{4j} , a dummy-coded fixed effect, uncentered), and the two-way Perpetrator Alcohol Use $\times$ Victim Alcohol Use interaction (β_{5j} , a multiplicative interaction term, treated as a fixed effect). Because this two-way interaction term was never significant in any analysis, we present results in the tables from analyses that omit the interaction term. Equations 3 and 4 represent the Level 2 (i.e., couple level) effects on male-perpetrated and female-perpetrated aggression, respectively. These equations contain an intercept term (γ_{00} , the typical level of verbal aggression for the sample), the perpetrator's total number of drinking days over the diary period (γ_{01} , grand mean centered), the victim's total number of drinking days over the diary period (γ_{02} , grand mean centered), and an error term (r_{0j}) that reflects the deviation of each couple's level of verbal aggression from the typical level of verbal aggression for the overall sample.¹ We estimated nearly identical equations to examine the influence of alcohol use on physical aggression. We omitted the lagged effect of physical aggression (i.e., the

¹We also estimated equations in which the slopes for either perpetrator alcohol use or victim alcohol use were treated as random effects. The variance components were not significant, suggesting that the size and direction of the slope did not vary significantly across couples. Accordingly, we omitted the random slope coefficients to simplify the analyses.

autocorrelation), however, because the occurrence of physical aggression was so rare that it did not occur on sequential days.

Results for within-day analyses examining the effect of alcohol use on the occurrence of verbal aggression are presented in the top half of Table 3. The intercepts for male- and female-perpetrated verbal aggression differed significantly, indicating that female-perpetrated verbal aggression was more likely to occur than male-perpetrated verbal aggression. No other significant differences emerged, thus, we pooled the coefficients across male and female partners. The lagged effect of verbal aggression (i.e., the autocorrelation) was significant and positive. In other words, when verbal aggression occurred on a given day, it was more likely to occur the following day. The likelihood of perpetrating verbal aggression on a given day increased when alcohol was consumed on that day, relative to days with no consumption (i.e., the effect of perpetrator alcohol use was significant; see paths p and p' in Figure 1). The likelihood of receiving verbal aggression on a given day (paths v and v' in Figure 1) was marginally higher on days of alcohol consumption.

Similar analyses examining the effects of alcohol use on the occurrence of physical aggression are presented in the bottom half of Table 3. There were no significant gender differences, so we pooled the coefficients across men and women. The likelihood of perpetrating physical aggression on a given day increased when alcohol was consumed that day, relative to days with no consumption. However, the likelihood of receiving physical aggression was not significantly higher when alcohol was consumed that day.

We repeated the daily analyses described above using total number of drinks consumed on a given day as the independent variable (not shown). We used person-mean centering for this variable, so that effects reflect the effect of drinking more than usual quantity for that person. Results for analyses examining the effect of alcohol quantity on occurrence of verbal aggression and physical aggression are nearly identical to those presented previously for any alcohol use. The likelihood of perpetrating verbal aggression or physical aggression on a given day increased on days when people consumed more drinks than usual. The likelihood of receiving verbal aggression or physical aggression on a given day was not affected by the number of drinks consumed that day.

Temporal Ordering: Does Alcohol Use Lead to Later Aggression?

A more stringent test of the association between alcohol consumption and aggression involves temporal ordering rather than same-day associations. Our theoretical perspective maintains that the pharmacological effects of alcohol consumption, via the resulting cognitive impairment, will increase the likelihood of partner aggression occurring during the period of intoxication. Thus, we considered the occurrence of aggression as a function of alcohol consumption in the previous four hours. Four hours was chosen as the lag to approximate the average length of time that the pharmacological effects of alcohol consumption might be expected to last. We began by dividing each day into 24 1-hr segments. Then, we created four lags for each predictor variable: values for one hour, two hours, three hours, and four hours prior to the current hour. If alcohol was consumed at hour 1, 2, 3, or 4, participants were coded as positive for alcohol use in that time period. We summed the number of drinks consumed across those four hours to create the value for

alcohol quantity.² If participants reported more than one drinking episode or conflict per day, both episodes were used as separate reports.

These within-day assessments of alcohol use (“floating” 4-hr intervals) were then included at Level 1 as a third level to our previous analysis structure. We treated between-day effects as Level 2, between-couple effects as Level 3, and we continued to treat male-perpetrated and female-perpetrated aggression in each hour as multivariate outcomes. This approach drastically increases the size of the data set (56 days $\times$ 24 hours = 1344 reports per person), and the increase is completely made up of zeroes. Thus, events that were originally rare became even less common, and the amount of variation in the data decreases greatly. We examined the hours of the day when alcohol use and conflict occurred to determine whether it would be possible to omit any of the reports at Level 1, thus potentially decreasing the number of zeroes in the data and increasing variation in the outcome variables. The frequencies of these events during each hour of the day are depicted in Figure 2. As shown in the Figure, virtually no alcohol use or conflict episodes were initiated from 1 a.m. through 6 a.m. Accordingly, we omitted the hours from 1 a.m. through 6 a.m. from all analyses. Thus, analyses were conducted on a total possible 1008 reports per person (56 days $\times$ 18 hr).

Occurrence of alcohol use and partner aggression—To examine the occurrence of verbal aggression in a given hour as a function of alcohol consumption in the previous four hours, we estimated the following prototypical equations:

$$\text{logit} \left(Y_{ijkMt} \right) = \pi_{0jkM} + \pi_{1jkM} D_t + \pi_{2jkM} P_{t-x} + \pi_{3jkM} V_{t-x} + \pi_{4jkM} P_x V_{t-x} \quad (5)$$

$$\text{logit} \left(Y_{ijkFt} \right) = \pi_{0jkF} + \pi_{1jkF} D_t + \pi_{2jkF} P_{t-x} + \pi_{3jkF} V_{t-x} + \pi_{4jkF} P_x V_{t-x} \quad (6)$$

$$\pi_{0jkM} = \beta_{00kM} + r_{0jkM} \quad (7)$$

$$\pi_{0jkF} = \beta_{00kF} + r_{0jkF} \quad (8)$$

$$\beta_{00kM} = \gamma_{000M} + \gamma_{001M} T_M + \gamma_{002M} T_F + u_{00kM} \quad (9)$$

$$\beta_{00kF} = \gamma_{000F} + \gamma_{001F} T_F + \gamma_{002F} T_M + u_{00kF} \quad (10)$$

The structure of the Level 1 equations (Equations 5 and 6) is essentially identical to the structure of the Level 1 equations in our daily analyses (i.e., Equations 1 and 2). There are three main differences. First, the intercept term (π_{0jk}) now represents the typical level of verbal aggression for day j for couple k . Second, perpetrator (π_{2jk}), victim (π_{3jk}), and Perpetrator $\times$ Victim (π_{4jk}) alcohol use are from the previous one to four hours, rather than

²SPSS syntax for creating these lags is available upon request from the authors.

the same hour as the verbal aggression. Third, we omitted the lagged effect of verbal aggression because conflict never occurred in sequential hours. Again, the two way Perpetrator Alcohol Use X Victim Alcohol Use interactions (π_{4jk}) were never significant, so we report analyses that omit the interaction terms in the tables. Equations 7 and 8 represent the Level 2 effects: the random intercept (β_{00k}), and an error term (r_{0jk}) that reflects the deviation of that day's typical level of verbal aggression from couple k 's overall typical level of verbal aggression. Equations 9 and 10 represent the Level 3 effects, the random intercept (γ_{000}), the perpetrator's total number of drinking days over the diary period (γ_{001} , grand mean centered), the victim's total number of drinking days over the diary period (γ_{001} , grand mean centered), and an error term (u_{00k}) that reflects the deviation of that couple's typical level of verbal aggression from the overall sample typical level of verbal aggression. We estimated identical equations to examine the influence of alcohol use on physical aggression.

Results for analyses examining the temporal association of alcohol use and verbal aggression are presented in the top half of Table 4. As in the daily analyses, the intercepts for male- and female-perpetrated verbal aggression differed significantly, indicating that female-perpetrated verbal aggression was more likely to occur than male-perpetrated verbal aggression. None of the other effects differed significantly by gender, and thus we pooled the coefficients across men and women. The likelihood of perpetrating verbal aggression in a given hour increased when alcohol was consumed in the preceding four hours (e.g., the likelihood of aggression occurring at 8 p.m. increased if there was alcohol use at 4, 5, 6 or 7 p.m.). Moreover, the likelihood of receiving verbal aggression in a given hour also increased when alcohol was consumed in the preceding four hours.

Results for analyses examining the occurrence of physical aggression are presented in the bottom half of Table 4. There were no significant gender differences, so we pooled the coefficients across men and women. The likelihood of perpetrating physical aggression in a given hour increased when drinking had begun in the preceding four hours. The likelihood of receiving physical aggression in a given hour also increased when alcohol was consumed in the preceding four hours.

To increase confidence in these temporal findings, we repeated them using slightly different time periods and found identical results. That is, aggression was increased 1) by use of alcohol 3 hours prior to the hour that aggression began (e.g., likelihood of aggression at 8 p.m. increased if there was alcohol use at 5, 6, or 7 p.m.), 2) by alcohol use beginning 3 hours prior and including the same hour that aggression began (e.g., likelihood of aggression at 8 p.m. increased if there was alcohol use at 5, 6, 7, or 8 p.m.), and 3) by alcohol use beginning 4 hours prior and including the same hour that the aggression began (e.g., likelihood of aggression at 8 p.m. increased if there was alcohol use at 4, 5, 6, 7, or 8 p.m.). We also repeated analyses using "fixed" 3 hour blocks to determine whether initiation of alcohol use in one 3 hour block (e.g., 4–6 p.m.) predicted aggression in the next 3 hour block (7–9 p.m.). We repeated these analyses 3 times so that all possible time periods were considered (e.g., 5–7 p.m. predicting 8–10 p.m.; 6–8 p.m. predicting 9–11 p.m., etc.). Again, the pattern of results was identical for all of these fixed block analyses and there were no significant gender differences, further supporting the temporal analyses reported in Table 4.

Quantity of alcohol consumed and partner aggression—We also used equations nearly identical to Equations 5–10 to estimate the likelihood of partner aggression occurring in a given hour as a function of quantity of alcohol consumed in the preceding four hours (not shown). However, we exchanged the uncentered dummy-coded alcohol use variable for a continuous quantity variable. We centered this variable at the mean for each person, so significant effects reflect the effect of deviations from the mean for the person over time (e.g., greater than typical consumption) rather than just in comparison to other hours that day. The effects of perpetrator and victim quantity consumed did not differ significantly by gender in either set of analyses. The likelihood of perpetrating both verbal aggression and physical aggression in a given hour increased when people consumed more drinks than usual in the preceding four hours (not shown). The likelihood of receiving both verbal aggression and physical aggression in a given hour also increased when people consumed more drinks than usual in the preceding four hours. As in the analyses for the occurrence of any alcohol use, we repeated the analyses for quantity using multiple time frames (e.g., 3-hr lags and 4-hr lags; including and excluding the same hour). Findings were identical.

Discussion

The study provides a rare glimpse into the association between naturally occurring episodes of alcohol consumption and the occurrence of partner aggression within a community sample of heterosexual couples. Results are unique in providing clear evidence of a temporal association between drinking episodes and subsequent occurrence of both verbal and physical aggression, perpetrated both by male and female partners. Specifically, the odds of perpetrating verbal and physical aggression increased when alcohol was consumed in the previous four hours. Moreover, there were significant effects of alcohol consumption on victimization, with increased likelihood of verbal and physical victimization when alcohol had been consumed in the previous three hours for both men and women. Results were consistent across multiple analyses, including those conducted with any use of alcohol versus quantity of alcohol, and conducted with floating versus fixed time segments. The strength and consistency of these findings are all the more impressive given that they were obtained using a moderate drinking, community sample as opposed to a treatment or college sample with higher levels of heavy episodic drinking and aggression. Although there were relatively few episodes of physical aggression in this community sample, our findings are clear in establishing physical as well as verbal aggression as a consequence of male and female drinking episodes.

An important objective of the study was comparison of the effects of alcohol consumption for male versus female partners. Based on prior survey and laboratory findings, we had hypothesized that the link from alcohol consumption to perpetration would be stronger for men than for women. However, contrary to this hypothesis, we found no gender differences in the strength of the effect of drinking on either perpetration or victimization. Although women reported fewer episodes of drinking and more episodes of aggression, the relationship between alcohol and aggression was comparable for women compared with men. The importance of women's drinking as a precursor to aggression may be obscured in survey studies due to the typically heavier and more frequent alcohol consumption of male relative to female partners. Participants in the current study were screened to ensure that

both partners drank alcohol regularly and engaged in at least occasional heavy episodic drinking (4–5 drinks per occasion). Thus, alcohol consumption by women in this sample was higher and more similar to their male partner's drinking than is typically be the case in an unselected community sample. Moreover, the availability of 56 days of daily report data provided ample numbers of episodes of both concurrent and independent drinking by male and female partners. Although there were many days on which both partners drank, in no analysis was there an interaction between male and female drinking on the likelihood of aggression. Thus, we failed to find evidence that aggression was particularly likely (or unlikely) to occur when both partners were drinking. Rather, drinking by either partner increased the odds of subsequent aggression in an additive manner.

Methodological Contributions

This study is one of the first to use independent daily reports of naturally occurring episodes of conflict from both intimate partners, and as such makes methodological contributions to this area of study and analysis. Study of intimate partner aggression has been complicated by controversies around measurement of male and female partner aggression. Our findings and our methodology offer some insight in this regard. First, using daily reports, we replicate the well-established finding that female partners perpetrate more verbal and moderate physical aggression than their male partners (see Archer, 2000; Desmarais, Reeves, Nicholls, Telford, & Martin, 2012 for meta-analytic reviews). Consistent with findings from survey studies (e.g., Schafer, Caetano, & Clark, 2002; Testa et al., 2003), agreement regarding the occurrence of conflict, verbal aggression, and physical aggression even within short, recently completed timeframes (e.g., yesterday) was modest. Lack of agreement may reflect memory failure, but given the short reporting frame, it seems more likely that there are individual or gender differences in labeling or interpretation of conflict events. It was much more common for verbal and physical aggression on a given day to be reported by a single partner as opposed to being agreed upon by both partners. Agreement regarding the occurrence of physical aggression was particularly poor and somewhat surprising given that such events would appear to be more severe and more clearly defined than verbal aggression. Women seemed to have a lower threshold for reporting conflict and partner aggression, both as victims and as perpetrators. Although not completely consistent with the conclusion that perpetrators of both genders underreport their own aggression relative to victims (Archer, 1999), the tendency for women to report more episodes of conflict and aggression than men is consistent with findings from our own and others' survey research (Schafer, Caetano, & Clark, 1998; Testa et al., 2012).

We believe that our method of analyzing these data also breaks new ground. Previous studies considering the association of alcohol and aggression or similar outcomes have looked at relationships within day, sometimes after removing drinking episodes that occurred after the target event (e.g., Moore et al., 2011; Parks et al., 2008). Our within day analyses showed modest positive relationships between alcohol use and perpetration of aggression and weaker, nonsignificant relationships between alcohol use and victimization. However, an important innovation of the study was the more direct examination of the temporal effects of alcohol consumption on subsequent aggression, focusing on the narrower window of time in which pharmacological effects are likely to be present. This novel

method of testing the hypothesized pharmacological effect of alcohol on aggression reveals significant temporal effects of alcohol consumption by men and women on both perpetration and victimization, effects that were stronger than the within-day effects. These findings were remarkably robust and consistent across multiple variations, using both floating and fixed time segments, of slightly different lengths (3 hours, 4 hours), and beginning at different hours. Another innovation was our use of the Actor-Partner Interdependence Model (Kenny et al., 2006) in considering the effects of male and female partners' alcohol consumption. By treating the dyad as the unit of analysis, rather than the individual, we are able to examine the effects of both partners' alcohol use on either partner's perpetration, accounting for the other partner's alcohol use and perpetration.

Limitations

Although the use of a community sample may be considered a strength, in showing that the alcohol-aggression relationship is not limited to clinical samples, this was not a representative sample. Study participation was limited to heterosexual couples who were recruited initially for an alcohol administration study, and as such, were excluded for a host of reasons including probable alcohol dependence, treatment for substance use disorders, psychological disorders, medical contraindications to alcohol consumption, or extremely severe violence. Moreover, both partners had to drink at comparable levels and be willing to participate. Men drink more on average than women do (Wilsnack, Wilsnack, Kristjanson, Vogeltanz-Holm, & Gmel, 2009), thus our requirement that women drink at comparable levels excluded many couples, making the sample less representative. Although it is difficult to know what, if any, effects sample characteristics might have had on the results, we speculate that some of these limitations would have the effect of limiting variance and thus making results more conservative. For example, couples with discrepant substance use have been shown to have lower marital satisfaction (Homish & Leonard, 2005) and higher rates of IPV (Leadley, Clark, & Caetano, 1999).

Use of daily reports presumably limits recall error and bias, because reports are made close to the occurrence of conflict and drinking episodes. However, as in survey research, we found relatively poor agreement between partners regarding the occurrence of conflict and aggression. This lack of agreement may be a limitation, reflecting limits to accurate recall even within a day or two of an event. Recall bias may be reduced by reporting even more proximal to the time of the event, for example using Ecological Momentary Sampling (ESM). However, it is plausible that these discrepancies reflect actual differences in individuals' perceptions of events. Previous studies of couples using daily reports also reveal modest agreement, particularly for negative as opposed to positive relationship events (Gable et al., 2003). A nascent literature suggests that perceptions of marital events, independent of reality, have important implications for relationship functioning (e.g., Murray, Bellavia, Rose, & Griffin, 2003). Future research is needed to understand discrepancies in perceptions of partner aggression as well.

Finally, despite the availability of nearly 13,000 daily reports (56 days of reports from 118 couples), power to detect gender differences in alcohol's effects on physical aggression may have been insufficient. There were only 32 episodes of male physical aggression and 40 of

female physical aggression reported and confidence intervals were wide. Thus, it is possible that there are gender differences that could be detected with greater power.

Implications

The robust and consistent effects of alcohol consumption on partner aggression within a community sample have important clinical and particularly public health implications. Although this was a high-functioning community sample, selected for its lack of psychopathology, severe violence, and substance-use disorders, we found clear evidence that episodes of alcohol consumption contribute to the occurrence of subsequent verbal and physical aggression episodes. Given the large number of couples who drink alcohol at these moderate levels, the aggregate impact of alcohol on the occurrence of partner aggression is significant. Our findings suggest that reductions in the frequency or intensity of these episodes may reduce the number of episodes of partner aggression.

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References

- Archer J. Assessment of the reliability of the conflict tactics scales: A meta-analytic review. *Journal of Interpersonal Violence*. 1999; 14:1263–1289. doi:10.1177/088626099014012003.
- Archer J. Sex differences in aggression between heterosexual partners: A meta-analytic review. *Psychological Bulletin*. 2000; 126:651–680. doi:10.1037/0033-2909.126.5.651. [PubMed: 10989615]
- Bolger N, Davis A, Rafaeli E. Diary methods: Capturing life as it is lived. *Annual Review of Psychology*. 2003; 54:579–616. doi:10.1146/annurev.psych.54.101601.145030.
- Bushman BJ, Cooper HM. Effects of alcohol on human aggression: An integrative research review. *Psychological Bulletin*. 1990; 107:341–354. doi:10.1037/0033-2909.107.3.341. [PubMed: 2140902]
- Caetano R, Schafer J, Field C, Nelson SM. Agreements on reports of intimate partner violence among White, Black and Hispanic couples in the United States. *Journal of Interpersonal Violence*. 2002; 17:1308–1322. doi:10.1177/088626002237858.
- Clements K, Schumacher JA. Perceptual biases in social cognition as potential moderators of the relationship between alcohol and intimate partner violence: A review. *Aggression and Violent Behavior*. 2010; 15:357–368. doi:10.1016/j.avb.2010.06.004.
- Cook WL, Kenny DA. The actor–partner interdependence model: A model of bidirectional effects in developmental studies. *International Journal of Behavioral Development*. 2005; 29:101–109. doi:10.1080/01650250444000405.
- Cranford JA, Tennen H, Zucker RA. Feasibility of using interactive voice response to monitor daily drinking, moods, and relationship processes on a daily basis in alcoholic couples. *Alcoholism: Clinical and Experimental Research*. 2010; 34:499–508. doi:10.1111/j.1530-0277.2009.01115.x.
- Cunradi CB, Bersamin M, Ames GM. Agreement on intimate partner violence among a sample of blue-collar couples. *Journal of Interpersonal Violence*. 2009; 24:551–568. doi:10.1177/0886260508317189. [PubMed: 18430971]
- Derrick JL, Leonard KE, Homish GG. Dependence regulation in newlywed couples: A prospective examination. *Personal Relationships*. 2012; 19:644–662. doi:10.1111/j.1475-6811.2011.01384.x.
- Desmarais SL, Reeves KA, Nicholls TL, Telford RP, Martin F. Prevalence of physical violence in intimate relationships, Part 2: Rates of male and female perpetration. *Partner Abuse*. 2012; 3:170–198. doi:10.1891/1946-6560.3.2.170.

- Fischer JL, Fitzpatrick J, Cleveland B, Lee J-M, McKnight A, Miller B. Binge drinking in the context of romantic relationships. *Addictive Behaviors*. 2005; 30:1496–1516. doi:10.1016/j.addbeh.2005.03.004. [PubMed: 15885923]
- Foran HM, O'Leary KD. Alcohol and intimate partner violence: A meta-analytic review. *Clinical Psychology Review*. 2008; 28:1222–1234. doi:10.1016/j.cpr.2008.05.001. [PubMed: 18550239]
- Gable SL, Reis HT, Downey G. He said, she said: A quasi-signal detection analysis of daily interactions between close relationship partners. *Psychological Science*. 2003; 14:100–105. doi: 10.1111/ 1467-9280.t01-1-01426. [PubMed: 12661669]
- Giancola PR. Irritability, acute alcohol consumption and aggressive behavior in men and women. *Drug and Alcohol Dependence*. 2002; 68:263–274. doi:10.1016/S0376-8716(02)00221-1. [PubMed: 12393221]
- Giancola PR, Levinson CA, Corman MD, Godlaski AJ, Morris DH, Phillips JP, Holt JCD. Men and women, alcohol and aggression. *Experimental and Clinical Psychopharmacology*. 2009; 17:154–164. doi:10.1037/a0016385. [PubMed: 19586230]
- Graber EC, Laurenceau J-P, Carver CS. Integrating the dynamics of personality and close relationship processes: Methodological and data analytic implications. *Journal of Personality*. 2011; 79:1403–1439. doi:10.1111/j.1467-6494.2011.00725.x. [PubMed: 21299559]
- Homish GG, Leonard KE. Marital quality and congruent drinking. *Journal of Studies on Alcohol*. 2005; 66:488–496. [PubMed: 16240556]
- Ito TA, Miller N, Pollock VE. Alcohol and aggression: A meta-analysis on the moderating effects of inhibitory cues, triggering events, and self-focused attention. *Psychological Bulletin*. 1996; 120:60–82. doi:10.1037/0033-2909.120.1.60. [PubMed: 8711017]
- Jacob T, Leonard KE, Haber JR. Family interactions of alcoholics as related to alcoholism type and drinking condition. *Alcoholism: Clinical and Experimental Research*. 2001; 25:835–843. doi: 10.1111/j.1530-0277.2001.tb02287.x.
- Kashy, DA.; Donnellan, MB. Conceptual and methodological issues in the analysis of data from dyads and groups.. In: Deaux, K.; Snyder, M., editors. *The Oxford handbook of personality and social psychology*. Oxford University Press; Oxford, UK: 2012. p. 209-238. doi:10.1093/oxfordhb/9780195398991.013.0009
- Kenny, DA.; Kashy, DA.; Cook, WL. *Dyadic data analysis*. Guilford Press; New York, NY: 2006.
- Laurenceau J-P, Bolger N. Using diary methods to study marital and family processes. *Journal of Family Psychology*. 2005; 19:86–97. doi:10.1037/0893-3200.19.1.86. [PubMed: 15796655]
- Leadley K, Clark CL, Caetano R. Couples' drinking patterns, intimate partner violence, and alcohol-related partnership problems. *Journal of Substance Abuse*. 1999; 11:253–263. [PubMed: 11026124]
- Leonard, KE. Alcohol and violence: Exploring patterns and responses. International Center for Alcohol Policies; Washington, DC: 2008. The role of drinking patterns and acute intoxication in violent interpersonal behaviors.; p. 29-55.
- Leonard KE, Quigley BM. Drinking and marital aggression in newlyweds: An event-based analysis of drinking and the occurrence of husband marital aggression. *Journal of Studies on Alcohol*. 1999; 60:537–545. [PubMed: 10463811]
- Leonard KE, Roberts LJ. The effects of alcohol on the marital interactions of aggressive and nonaggressive husbands and their wives. *Journal of Abnormal Psychology*. 1998; 107:602–615. doi:10.1037/ 0021-843X.107.4.602. [PubMed: 9830248]
- Martin, SE.; Bachman, R. The relationship of alcohol to injury in assault cases.. In: Galanter, M., editor. *Recent Developments in Alcoholism*. Plenum Press; New York, NY: 1997. p. 41-56.
- Moore TM, Elkins SR, McNulty JK, Kivisto AJ, Handsel VA. Alcohol use and intimate partner violence perpetration among college students: Assessing the temporal association using electronic diary technology. *Psychology of Violence*. 2011; 1:315–328. doi: 10.1037/a0025077.
- Murphy CM, Ting L. The effects of treatment for substance use problems on intimate partner violence: A review of empirical data. *Aggression and Violent Behavior*. 2010; 15:325–333. doi:10.1016/j.avb.2010.01.006.

- Murphy CM, Winters J, O'Farrell TJ, Fals-Stewart W, Murphy M. Alcohol consumption and intimate partner violence by alcoholic men: Comparing violent and non-violent conflicts. *Psychology of Addictive Behaviors*. 2005; 19:35–42. doi:10.1037/0893-164X.19.1.35. [PubMed: 15783276]
- Murray SL, Bellavia GM, Rose P, Griffin DW. Once hurt, twice hurtful: How perceived regard regulates daily marital interactions. *Journal of Personality and Social Psychology*. 2003; 84:126–147. doi:10.1037/0022-3514.84.1.126. [PubMed: 12518975]
- Neal DJ, Fromme K. Event-level covariation of alcohol intoxication and behavioral risks during the first year of college. *Journal of Consulting and Clinical Psychology*. 2007; 75:294–306. doi: 10.1037/0022-006X.75.2.294. [PubMed: 17469887]
- Parks KA, Hsieh Y-P, Bradizza CM, Romosz AM. Factors influencing the temporal relationship between alcohol consumption and experiences with aggression among college women. *Psychology of Addictive Behaviors*. 2008; 22:210–218. doi:10.1037/0893-164X.22.2.210. [PubMed: 18540718]
- Rasbash, J.; Browne, WJ.; Healy, M.; Cameron, B.; Charlton, C. MLwiN: Version 2.26 [Computer software]. University of Bristol; London, UK: 2012.
- Reis, HT.; Gable, SL. Event-sampling and other methods for studying everyday experience.. In: Reis, HT.; Judd, CM., editors. *Handbook of research methods in social and personality psychology*. Cambridge University Press; New York, NY: 2000. p. 190-222.
- Rothman EF, Reyes LM, Johnson RM, Lavalley M. Does the alcohol make them do it? Dating violence perpetration and drinking among youth. *Epidemiologic Reviews*. 2012; 34:103–119. doi: 10.1093/epirev/mxr027. [PubMed: 22128086]
- Schafer J, Caetano R, Clark CL. Rates of intimate partner violence in the United States. *American Journal of Public Health*. 1998; 88:1702–1704. doi:10.2105/AJPH.88.11.1702. [PubMed: 9807541]
- Schafer J, Caetano R, Clark CL. Agreement about violence in U.S. couples. *Journal of Interpersonal Violence*. 2002; 17:457–470. doi: 10.1177/0886260502017004007.
- Schumacher JA, Leonard KE. Husbands' and wives' marital adjustment, verbal aggression, and physical aggression as longitudinal predictors of physical aggression in early marriage. *Journal of Consulting and Clinical Psychology*. 2005; 73:28–37. doi:10.1037/0022-006X.73.1.28. [PubMed: 15709829]
- Skinner HA, Allen BA. Alcohol dependence syndrome: Measurement and validation. *Journal of Abnormal Psychology*. 1982; 91:199–209. doi:10.1037/0021-843X.91.3.199. [PubMed: 7096790]
- Steele CM, Josephs RA. Alcohol myopia: Its prized and dangerous effects. *American Psychologist*. 1990; 45:921–933. doi:10.1037/0003-066X.45.8.921. [PubMed: 2221564]
- Straus MA, Hamby SL, Boney-McCoy S, Sugarman DB. The revised conflict tactics scales (CTS2): Development and preliminary psychometric data. *Journal of Family Issues*. 1996; 17:283–316. doi:10.1177/019251396017003001.
- Stuart, GL.; Moore, TM.; Elkins, S.; O'Farrell, TJ.; Leonard, KE.; Bucossi, MM.; Temple, JR. The temporal association between substance use and intimate partner violence perpetration and victimization in men and women in treatment for substance abuse.. Paper presented at the 2009 Association for Behavioral and Cognitive Therapies Conference; New York, NY. Nov. 2009
- Stuart GL, O'Farrell TJ, Temple JR. Review of the association between treatment for substance misuse and reductions in intimate partner violence. *Substance Use & Misuse*. 2009; 44:1298–1317. doi: 10.1080/10826080902961385. [PubMed: 19938919]
- Szinovacz ME, Egley LC. Comparing one-partner and couple data on sensitive marital behaviors: The case of marital violence. *Journal of Marriage and the Family*. 1995; 57:995–1010. doi: 10.2307/353418.
- Testa M, Kubiak A, Quigley BM, Houston RJ, Derrick JL, Levitt A, Leonard KE. Husband and wife alcohol use as independent or interactive predictors of intimate partner violence. *Journal of Studies on Alcohol and Drugs*. 2012; 73:268–276. [PubMed: 22333334]
- Testa M, Quigley BM, Leonard KE. Does alcohol make a difference? Within-participants comparison of incidents of partner violence. *Journal of Interpersonal Violence*. 2003; 18:735–743. doi: 10.1177/0886260503253232. [PubMed: 14675506]

- Thompson MP, Kingree JB. The roles of victim and perpetrator alcohol use in intimate partner violence outcomes. *Journal of Interpersonal Violence*. 2006; 21:163–177. doi: 10.1177/0886260505282283. [PubMed: 16368759]
- Wilsnack RW, Wilsnack SC, Kristjanson AF, Vogeltanz-Holm ND, Gmel G. Gender and alcohol consumption patterns from the multinational Genacis Project. *Addiction*. 2009; 104:1487–1500. doi:10.1111/j.1360-0443.2009.02696.x. [PubMed: 19686518]

Figure 1.
Actor-Partner Interdependence Model.

Figure 2.
Number of total reports of alcohol use and conflict by hour of the day.

Table 1

Perpetrator and Victim Reports of Verbal and Physical Aggression

Variable	Source of report					McNemar's Test
	Neither	Perpetrator	Victim	Both	Either	
Verbal Aggression						
Male perpetration	6168	115	202	97	414	$\chi^2(1) = 24.43^{***}$
Female perpetration	6100	218	134	130	482	$\chi^2(1) = 20.53^{***}$
Physical Aggression						
Male perpetration	6550	9	18	5	32	$\chi^2(1) = 3.70^{+}$
Female perpetration	6542	24	11	5	40	$\chi^2(1) = 5.60^{*}$

⁺
 $p < .10$.

^{*}
 $p < .05$.

^{***}
 $p < .001$.

Table 2

Frequency, Proportion, and Bivariate Spearman Correlations of Daily Alcohol and Aggression Reports

Variable	Percent of people	Days	Percent of days	1	2	3	4	5
1. Male-perpetrated verbal aggression	76.3	414	6.3					
2. Female-perpetrated verbal aggression	80.5	483	7.3	.79**				
3. Male-perpetrated physical aggression	18.6	32	0.5	.26**	.25**			
4. Female-perpetrated physical aggression	20.3	40	0.6	.25**	.23**	.47**		
5. Male alcohol use	100	2712	41.1	.03*	.01	.02	.02	
6. Female alcohol use	100	2320	35.2	.03*	.03**	.00	.02*	.48**

Note. Values included in the table are based on same-day analyses, or a total possible 6,608 reports. Numbers differ slightly when examining variables at the level of the 3-hour block, but all patterns are the same. Percent of people refers to the number of people out of 118 who reported the event on at least one of 56 days. Percent of days refers to the number of reports (of 6,608 reports; 118 People $\times$ 56 Days) that an event was reported.

*
 $p < .05$.

**
 $p < .01$.

Table 3

Verbal and Physical Aggression as a Function of Alcohol Use on the Same Day

Variable	Male perpetration		Female perpetration		Gender difference	Pooled across gender of perpetrator	
	OR	95% CI	OR	95% CI	$\chi^2(1)$	OR	95% CI
Verbal aggression							
Intercept	0.06 ^{***}	[0.04, 0.09]	0.07 ^{***}	[0.05, 0.11]	3.84 [*]	—	—
Lagged verbal aggression	1.91 ^{***}	[1.44, 2.53]	1.78 ^{***}	[1.39, 2.27]	0.38	1.83 ^{***}	[1.45, 2.32]
Weekday vs. weekend	1.23 ⁺	[1.00, 1.53]	1.09	[0.89, 1.33]	3.22	1.14	[0.94, 1.38]
Perpetrator total drinking days	0.99	[0.97, 1.01]	1.01	[0.98, 1.03]	1.24	1.00	[0.99, 1.01]
Victim total drinking days	1.00	[0.98, 1.03]	0.99	[0.97, 1.00]	0.85	0.99	[0.98, 1.00]
Perpetrator alcohol use	1.36 [*]	[1.04, 1.77]	1.22 ⁺	[0.96, 1.56]	0.24	1.27 ^{**}	[1.10, 1.47]
Victim alcohol use	1.14	[0.88, 1.47]	1.18	[0.92, 1.50]	0.03	1.15 ⁺	[0.99, 1.33]
Physical aggression							
Intercept	0.007 ^{***}	[0.003, 0.020]	0.006 ^{***}	[0.002, 0.016]	0.36	0.006 ^{***}	[0.002, 0.016]
Weekday vs. weekend	0.68	[0.32, 1.43]	0.99	[0.52, 1.90]	0.92	0.84	[0.46, 1.53]
Perpetrator total drinking days	0.98	[0.94, 1.03]	1.00	[0.94, 1.06]	0.09	0.98	[0.96, 1.01]
Victim total drinking days	0.99	[0.93, 1.04]	0.98	[0.94, 1.03]	0.00	0.99	[0.96, 1.02]
Perpetrator alcohol use	2.54 [*]	[1.07, 6.03]	1.60	[0.74, 3.45]	0.54	1.97 [*]	[1.13, 3.44]
Victim alcohol use	0.93	[0.39, 2.24]	1.84	[0.83, 4.06]	1.10	1.29	[0.74, 2.27]

Note. Alcohol use, verbal aggression, and physical aggression are dichotomous variables, scored 0 = *no*, 1 = *yes*. Verbal and physical aggression are scored *yes* if either the perpetrator or the victim reported the occurrence of aggression. Weekday is a dichotomous variable scored 0 = *Monday–Thursday*, 1 = *Friday–Sunday*. Perpetrator total drinking days and Victim total drinking days refer to the total number of days the perpetrator and the victim each used alcohol across the 56 days of the study.

⁺ $p < .10$.

^{*} $p < .05$.

^{**} $p < .01$.

^{***} $p < .001$.

Table 4

Verbal and Physical Aggression as a Function of Alcohol Use in the Previous Four Hours

Variable	Male perpetration		Female perpetration		Gender difference	Pooled across gender of perpetrator	
	OR	95% CI	OR	95% CI	$\chi^2(1)$	OR	95% CI
Verbal aggression							
Intercept	0.004 ^{***}	[0.002, 0.006]	0.005 ^{***}	[0.003, 0.007]	3.26 ⁺	—	—
Weekday vs. weekend	1.23 [*]	[1.01, 1.50]	1.13	[0.94, 1.35]	2.02	1.16 ⁺	[0.98, 1.39]
Perpetrator total drinking days	0.99	[0.97, 1.01]	1.00	[0.98, 1.03]	0.43	1.00	[0.99, 1.01]
Victim total drinking days	1.00	[0.98, 1.03]	0.99	[0.98, 1.01]	0.26	1.00	[0.99, 1.00]
Perpetrator alcohol use	1.39 [*]	[1.01, 1.92]	1.37 [*]	[1.01, 1.87]	0.00	1.36 ^{***}	[1.14, 1.63]
Victim alcohol use	1.60 ^{**}	[1.15, 2.22]	1.36 [*]	[1.01, 1.86]	0.41	1.45 ^{***}	[1.22, 1.72]
Physical aggression							
Intercept	0.001 ^{***}	[0.000, 0.001]	0.001 ^{***}	[0.000, 0.001]	0.03	0.001 ^{***}	[0.000, 0.001]
Weekday vs. weekend	0.67	[0.32, 1.40]	0.99	[0.52, 1.91]	1.00	0.82	[0.43, 1.54]
Perpetrator total drinking days	1.00	[0.96, 1.04]	0.99	[0.94, 1.04]	0.19	0.99	[0.97, 1.01]
Victim total drinking days	0.97	[0.92, 1.02]	1.00	[0.96, 1.04]	0.55	0.99	[0.96, 1.02]
Perpetrator alcohol use	2.53 ⁺	[0.91, 7.02]	4.78 ^{***}	[2.01, 11.35]	0.72	3.64 ^{***}	[1.92, 6.92]
Victim alcohol use	3.27 [*]	[1.16, 9.27]	1.40	[0.55, 3.58]	1.19	2.04 [*]	[1.02, 4.06]

Note. Alcohol use, verbal aggression, and physical aggression are dichotomous variables, scored 0 = *no*, 1 = *yes*. Verbal and physical aggression are scored *yes* if either the perpetrator or the victim reports the occurrence of aggression. Weekday is a dichotomous variables scored 0 = *Monday–Thursday*, 1 = *Friday–Sunday*. Perpetrator total drinking days and victim total drinking days refer to the total number of days the perpetrator and the victim each used alcohol across the 56 days of the study.

⁺ $p < .10$.

^{*} $p < .05$.

^{**} $p < .01$.

^{***} $p < .001$.