Published in final edited form as:

J Dual Diagn. 2016 ; 12(1): 36–42. doi:10.1080/15504263.2016.1146516.

PTSD and Daily Co-Occurrence of Drug and Alcohol Use Among Women Experiencing Intimate Partner Violence

Tami P. Sullivan^a, Nicole H. Weiss^a, Julianne C. Flanagan^b, Tiara C. Willie^c, Stephen Armeli^d, and Howard Tennen^e

Nicole H. Weiss: nicole.weiss@yale.edu; Julianne C. Flanagan: hellmuth@muscul.edu; Tiara C. Willie: tiara.willie@yale.edu; Stephen Armeli: armeli@fdu.edu; Howard Tennen: tennen@uchc.edu

^aDepartment of Psychiatry, Yale University School of Medicine, 389 Whitney Avenue, New Haven, CT 06511

^bDepartment of Psychiatry and Behavioral Sciences, Medical University of South Carolina, 5 Charleston Center Drive Suite 151, Charleston, SC 29401

^cCenter for Interdisciplinary Research on AIDS, School of Public Health, Yale University, College St. New Haven, CT 06511

^dDepartment of Psychology, Fairleigh Dickenson University, 1000 River Road, Teaneck, NJ 07666

^eDepartment of Community Medicine and Health Care, University of Connecticut Health Center School of Medicine, 263 Farmington Avenue, Farmington, CT 06030

Abstract

Objective—Women with posttraumatic stress disorder (PTSD) are at high risk for substance use and intimate partner violence. Considering the effects of both PTSD and substance use such as poorer treatment outcomes and greater health/behavior problems, women experiencing intimate partner violence are a high-risk, under-researched group.

Methods—We utilized a micro-longitudinal study design to assess daily drug and alcohol use over 21 days among 41 women experiencing intimate partner violence recruited from the community.

Results—Participants were about 45 years old ($M = 45.1$, $SD = 8.5$) and mostly African American ($n = 32$, 78%). Co-occurrence of drug and alcohol use was reported on 19.0% of days, while drug use alone occurred on 13.4% of days and alcohol use on 12.1%. Fifteen percent of participants met current PTSD criteria, with a mean symptom severity rating of 15.90 ($SD = 10.94$, range 0 – 47). Women with PTSD, compared to those without, were nearly 15 times more likely to have days of co-occurrence of drug and alcohol use ($p = .037$), and nearly 7 times more likely to have days of drug use alone ($p = .044$).

Correspondence concerning this article should be sent to Tami P. Sullivan, Ph.D., Division of Prevention and Community Research and The Consultation Center, Department of Psychiatry, Yale University School of Medicine, 389 Whitney Ave, New Haven, CT, 06511, or tami.sullivan@yale.edu.

DISCLOSURES

The authors report no financial relationships with commercial interests.

Conclusions—These findings indicate that the combination of intimate partner violence and PTSD may make women especially prone to daily combined drug and alcohol use or drug use alone. Further research is needed to explore this association and examine the need for integrated programs to support victims' health, prevent the development of substance use problems, and facilitate recovery from PTSD and substance use.

Keywords

alcohol and drug use; PTSD; intimate partner violence; daily data; community; women

Posttraumatic stress disorder (PTSD) is a widespread health problem among women who experience intimate partner violence (see Golding, 1999 for a review) and is often associated with drug and alcohol use (Sullivan & Holt, 2008). In general, rates of concurrent drug and alcohol misuse are heightened among people with PTSD (Najavits, Sullivan, Schmitz, Weiss, & Lee, 2004; Zatnick et al., 2012) and associated with poorer substance use treatment outcomes and greater health and behavior problems, such as increased likelihood for relapse following substance use treatment, more co-occurring psychiatric diagnoses, and greater impairment in functioning (Cohen & Hien, 2014; Karno, Grella, Niv, Warda, & Moore, 2008; López-Castro, Hu, Papini, Ruglass, & Hien, 2015; Midanik, Tam, & Weisner, 2007; Zhao et al., 2015). Despite these pervasive health consequences and the association between PTSD and intimate partner violence, there are no studies that have prospectively examined the relation between PTSD and the daily occurrence/co-occurrence of drug and alcohol use among women experiencing intimate partner violence. To advance knowledge of addictive behaviors and complex comorbidities, it is essential to examine daily drug and alcohol use and to do so utilizing methods that reduce error and recall bias such as micro-longitudinal data collection (Searles, Perrine, Mundt, & Helzer, 1995; Simpson et al., 2011).

The complex relation between PTSD and substance use among women experiencing intimate partner violence is consistent with negative affect regulation models (for a review see Brady, Back, & Coffey, 2004; Chilcoat & Breslau, 1998), which posit that women use substances to alleviate the negative sequelae of victimization including PTSD symptoms (Cohen, Field, Campbell, & Hien, 2013; Kaysen et al., 2007). Yet, despite evidence that PTSD and substance use are functionally related and highly prevalent among women experiencing intimate partner violence, the influence of PTSD on the daily occurrence/co-occurrence of drug and alcohol use remains understudied. Emerging research utilizing methods that assess behaviors closer to real-time provides support for the role of PTSD in daily substance use (e.g., Beckham et al., 2008; Kaysen et al., 2014; Simpson et al., 2011). For example, Beckham and colleagues' showed that stress and ad libitum tobacco use are related among smokers with PTSD (compared to those without PTSD). However, these studies did not focus on women experiencing intimate partner violence. Further, whereas existing research raises the possibility that women with PTSD have greater instances of daily co-occurrence of drug and alcohol use than women in the general population (e.g., Cohen et al., 2013; Sullivan, Ashare, Jaquier, & Tennen, 2012), it is unclear whether having PTSD increases the likelihood of same-day use of drugs and alcohol among women experiencing intimate partner violence.

The purpose of this study is to examine, using micro-longitudinal methods, the association between current PTSD and the daily occurrence/co-occurrence of drug and alcohol use among women in the community who are experiencing intimate partner violence. We hypothesized that the presence (vs. absence) of PTSD would be associated with more days of co-occurring drug and alcohol use as well as more days of each type of substance use alone.

Methods

Participants

Participants were 41 women who participated in a larger study examining the feasibility of daily reporting of sensitive information among women currently experiencing intimate partner violence (see Sullivan, Khondkaryan, Dos Santos, & Peters, 2011); these women reported information for 90 days using paper and pencil diaries. The current study focused on the first 21 days of participation for each woman given that compliance dropped after 21 days (see Procedures and Results sections for greater detail about compliance). Focusing on this initial period provides the most reliable data, the least missing data and therefore, the greatest power to address the study questions.

Procedures

Recruitment materials were posted in community establishments such as grocery stores, laundromats and shops, selected state offices such as the Departments of Adult Education and Employment, and in waiting rooms, bathrooms, and exam rooms of urban-area primary care clinics. Eligibility was determined via a phone screen. The central inclusion criteria were that a woman had experienced physical victimization in the past 30 days by her current male partner and used any amount of drugs or alcohol during that time. Additional inclusion criteria were: (a) age 18 or older, (b) current involvement in a relationship of at least six months duration with current contact at least twice a week, and (c) residency in the greater-urban area. Exclusion criteria were (a) inpatient psychiatric hospitalization within the last year and (b) current residence in a shelter/group home (because these living arrangements can limit substance use).

There was a complete discussion of the study with potential participants. Written informed consent was obtained after this discussion. The study was conducted in accordance with the Declaration of Helsinki, and was approved and monitored by the Yale University Human Investigation Committee. All participants completed: (a) a baseline interview; (b) daily data collection, and (c) a follow-up interview subsequent to the completion of daily data collection. Daily data on substance use were collected via brief surveys (i.e., paper diary sheets). During the baseline interview, participants received training regarding daily data collection and were given daily brief surveys, each pre-printed with study questions and pre-filled with a participant's identification number and appropriate date. Participants were instructed to record daily, specific events of interest (e.g., substance use). Participants were provided with stamped envelopes, pre-addressed to the research team, and were instructed to mail the brief surveys to the team daily. To minimize risk to participants' safety, envelopes were pre-printed with a return address specifying "Breast Cancer Study." Each day, a

research assistant collected mail, recorded the stamped postmark, and logged-in the surveys received. Three days of missed diaries resulted in a follow-up phone call from a research assistant to the participant to assess her safety and barriers to participation. Data from the surveys were not manually entered into a database but rather, were computer-scanned (i.e., teleforms). Participants reported data only about events that occurred the prior day to minimize retrospection, and only surveys postmarked within two days of completion were considered compliant and included in analyses to ensure that recall bias was minimized. Participants were remunerated \$45 for each baseline and follow-up interview and \$2 per daily diary.

Measures

A day was classified as a drug use only day, alcohol use only day, or a drug and alcohol use co-occurrence day if participants reported any use of a drug (e.g., marijuana, opiates, cocaine) and/or alcohol on that day. Participants also reported whether they saw their partner or were in a controlled environment (e.g., inpatient facility) on the day about which they reported.

The *Posttraumatic Diagnostic Scale* (PDS; Foa, 1995) was used to screen for current PTSD at baseline with victimization by the current male partner as the referent traumatic event. Participants reported whether any instances of intimate partner violence were consistent with diagnostic Criterion A, namely that they believed there was imminent risk to themselves or someone else and that they felt helpless or terrified during an incident of intimate partner violence. The frequency of re-experiencing (Criterion B), avoidance and numbing (Criterion C), and hyperarousal (Criterion D) symptoms experienced in the past 3 months were rated on a 4-point scale (0 = *not at all or only one time*) to (3 = *five or more times a week/almost always*). Criterion E assessed the duration of symptoms. Criterion F assessed whether participants' PTSD symptoms impaired their ability to function in various life domains. Participants were categorized as meeting criteria for current PTSD (1) or not meeting criteria (0). Consistent with DSM-IV (American Psychiatric Association, 1994), a diagnosis of current PTSD was based on the presence of a Criterion A traumatic event; endorsement of at least one re-experiencing symptom, three avoidance/numbing symptoms, and two hyperarousal symptoms; duration of at least 1 month; and impairment in at least two areas of functioning. In addition, a total symptom severity score was created by summing the 17 symptom severity items.

Data analysis

Compliance rates were calculated to reflect the proportion of days women completed the daily survey out of 21 days. At the day level of analysis, we created a 4-level categorical variable for substance use, i.e., no use, drug use only, alcohol use only, and both drug and alcohol use (co-occurring use). We assessed the association between current PTSD and daily substance use using hierarchical generalized linear modeling (HGLM; Raudenbush & Bryk, 2002). We specified a multilevel multinomial logistic regression model. Current PTSD was specified as a person-level variable (i.e., level 2). We also included two control variables in the level 1 (daily) portion of the model: whether or not participants saw their partner (0 = no,

1 = yes) and whether they were in a controlled environment (0 = no, 1 = yes) for a given day. Both level 1 predictors were grand-mean centered.

We report the coefficients from the unit-specific models with robust standard errors. All 41 participants were retained for analysis (see Singer & Willett, 2003, pp. 146–148). For a day to be retained for analyses it needed to have complete data for drug and alcohol use, face-to-face partner contact, and whether or not they were in a controlled environment. The power of multilevel models is a function of both the number of level 1 and level 2 units. Kreft and DeLeeuw's (1998) review of multilevel power simulation studies indicate that designs having at least 30 level 2 units with 30 observations each will provide adequate power (e.g., .80) for small and moderate effect sizes. Our sample approaches this requirement and should provide adequate power to detect moderate sized effects.

Results

The 41 women who took part in this study were about 45 years old ($M = 45.1$, $SD = 8.5$), mostly African American ($n = 32$, 78%), educated at a high school level ($M = 12.0$, $SD = 1.3$), and generally unemployed ($n = 29$, 71%). Just over half were living with the partner who was abusive ($n = 24$, 59%) (see Table 1).

Participants completed, on average, 15.8 diary days ($SD = 5.9$) out of 21 for a completion rate of 75.2%, and provided 647 observations to be examined. Completion rate was not related to proportion of days with drug use ($r = .06$, $p = .71$), alcohol use ($r = .19$, $p = .23$), or with current PTSD ($r = .08$, $p = .64$). As shown in Table 2, participants reported some type of substance use on 44.5% of days; drug use only was reported on 13.4% of days, alcohol use only on 12.1% of days, and co-occurring drug and alcohol use on 19.0% of days. Of note, participants saw their partner on 83.0% of days. They were in controlled environments on 1.2% of days; this variable was not used in the models due to the low base-rate which resulted in problems with model convergence.

Fifteen percent of women met current PTSD criteria. The mean symptom severity rating across all 41 women was 15.90 ($SD = 10.94$, range 0 – 47). Current PTSD was a significant predictor of drug and alcohol use co-occurrence days and drug use only days (see Table 3). Interpretation of the odds ratios shows that the strongest effect was for prediction of drug and alcohol use co-occurrence days. For participants with (vs. without) current PTSD, the odds of engaging in both drug and alcohol use on a given day, versus not engaging in any substance use, were 14.69 times greater and the odds of engaging in drug use only were 6.94 times greater. Face-to-face contact with partners was predictive of drug-use-only days ($OR = 4.88$).

We re-estimated the models using the PTSD symptom severity variable instead of the binary diagnosis variable. In this model, PTSD severity was in the anticipated direction in predicting drug and alcohol use co-occurrence days, but it was not significant ($B = .065$, $SE = .055$, $p = .25$, $OR = 1.07$, 95% $CI[0.95, 1.19]$). PTSD symptom severity was a marginally significant predictor of drug use only days ($B = .062$, $SE = .032$, $p = .065$, $OR = 1.06$, 95% $CI[0.97, 1.14]$) and a significant predictor of alcohol use only days ($B = .097$, $SE = .031$, p

= .003, OR = 1.10, 95% CI[1.036, 1.17]). It should be noted that for these models the OR represents the change in the odds of the outcome for a unit change in PTSD severity, which ranges from 0 to 47. These results demonstrate differences in outcomes between the diagnostic and symptom severity scores and therefore, suggest that future research is warranted to elucidate the potentially unique relationships.

Discussion

This study contributes uniquely to the literature by examining the influence of current PTSD on the daily co-occurrence of drug and alcohol use among women experiencing intimate partner violence, a high-risk group in need of targeted and integrated interventions for both PTSD and substance use (Cohen et al., 2013). Findings of this micro-longitudinal study emphasize the role of current PTSD in co-occurring daily drug and alcohol use among victims of intimate partner violence. Most notably, the odds of engaging in both drug and alcohol use on a given day, versus not engaging in any substance use, were nearly 15 times greater for women with (vs. without) current PTSD. Regarding drug use (without alcohol use), the odds were nearly 7 times greater for those with PTSD.

Co-occurring drug and alcohol use is concerning as it is associated with poorer substance use treatment outcomes and greater health and behavior problems relative to the use of one type of substance alone (Cohen & Hien, 2014; Hien, Nunes, Levin, & Fraser, 2000; López-Castro et al., 2015). Theory and empirical evidence suggest that women experiencing intimate partner violence may use substances to alleviate the negative sequelae of this violence, including PTSD symptoms (Stewart, Conrod, Samoluk, Pihl, & Dongier, 2000; Sullivan & Holt, 2008). A growing body of literature speculates that individuals choose to use certain substances because of their differential effects on specific PTSD symptoms (Back, Sonne, Killeen, Dansky, & Brady, 2003). We believe that women with current PTSD in the present study may have been more motivated to use drugs (with or without alcohol) to manage the frequency and or severity of their PTSD symptoms, than women without current PTSD.

Though not a central focus of this study, the finding regarding women's face-to-face contact with their partners as it relates to their substance use is noteworthy. Drug use only days were more likely when women had face-to-face contact with their partners compared to days when there was no face-to-face contact. This finding is among the first to corroborate anecdotal evidence reported by some women that they are more likely to use substances when with their abusive partners than when alone. Perhaps women more often use drugs with their partners because their partners are strong cues for trauma reminders, which is a trigger to use drugs (Fonzo et al., 2010; Johnson & Zlotnick, 2009; Simmons et al., 2008), because substance use is more common in social versus solitary contexts (Cashin, Presley, & Meilman, 1998; Wechsler, Dowdall, Davenport, & Castillo, 1995), or because they are coerced or forced to use drugs by their partners (Brookoff, O'Brien, Cook, Thompson, & Williams, 1997; Sorenson & Wiebe, 2004). This substance use may serve as a risk factor for proximal intimate partner violence victimization as has been suggested by extant literature (El-Bassel, Gilbert, Rajah, Folen, & Frye, 2000; El-Bassel, Gilbert, Wu, Go, & Hill, 2005; Testa et al., 2012). Future research is needed to explore the influence of partners' behaviors

and dyadic patterns on women's substance use and subsequent victimization, as these findings could have strong implications for prevention and intervention programs for victims as well as offenders.

Findings from the current study should be considered in light of the following limitations. Substance use was characterized at the day-level and PTSD was assessed at the person-level. This limits our understanding of the relations among these variables. Research is underway to better understand the proximal relations among drug and alcohol use and PTSD symptoms in this population. Motivations and expectancies of drug and alcohol use were not assessed, which limits our understanding about what contributes to co-occurring use of substances. Further, the sample size of the PTSD group is small. Although we found a significant effect (which was not driven by a few individuals but rather reflected the PTSD group as a whole), the sample might not be representative of women experiencing intimate partner violence with PTSD more generally. Finally, despite some controversy regarding the internal and external validity of paper diaries (Bolger, ShROUT, Green, Rafaeli, & Reis, 2006; Tennen, Affleck, Coyne, Larsen, & DeLongis, 2006), data from paper diaries are virtually indistinguishable from those retrieved from electronic sources (Weiler, Christ, Woodworth, Weiler, & Weiler, 2004), particularly for examining same-day relations among discrete or dichotomous variables (Stone & Shiffman, 2002; Tennen, Affleck, & Armeli, 2005).

This study is among the first to examine the co-occurrence of drug and alcohol use at the day level among women experiencing intimate partner violence. Our results highlight the importance of developing and more effectively implementing interventions treating PTSD and substance misuse concurrently in this population. Specifically, results revealed the strong influence of current PTSD on daily co-occurring drug and alcohol use. If future research is consistent with and builds on our findings, interventions may need to be modified to target the relationship between current PTSD and both drug and alcohol use so that women have the best chance of positive treatment outcomes and sustained abstinence and recovery (López-Castro et al., 2015). Specifically, given evidence of heightened co-occurring daily drug and alcohol use, which may function to alleviate different PTSD symptoms (Stewart et al., 1999; Tull et al., 2010), substance use treatment for women with PTSD experiencing intimate partner violence may benefit from assessing and treating various motives (e.g., anxiolytic, numbing, and enhancement) for using specific substances.

Acknowledgments

FUNDING

The research described here was supported, in part, by grants from the National Institutes of Health and Office of Research on Women's Health (K23 DA019561; T32DA019426; T32MH020031; K12HD055885) and the University of Connecticut General Clinical Research Center (M01 RR06192).

References

- American Psychiatric Association. Diagnostic and statistical manual of mental disorders. 4. Washington, DC: American Psychiatric Publishing, Inc; 1994.
- Back SE, Sonne SC, Killeen T, Dansky BS, Brady KT. Comparative profiles of women with PTSD and comorbid cocaine or alcohol dependence. *American Journal of Drug & Alcohol Abuse*. 2003; 29(1): 169–189. [PubMed: 12731687]

- Beckham, Jean C.; Wiley, Matthew T.; Miller, Susannah C.; Dennis, Michelle F.; Wilson, Sarah M.; McClernon, F Joseph; Calhoun, Patrick S. Ad lib smoking in post-traumatic stress disorder: An electronic diary study. *Nicotine & Tobacco Research*. 2008; 10(7):1149–1157. Retrieved from <http://www.informaworld.com/10.1080/14622200802123302>. [PubMed: 18629724]
- Bolger, Niall, Shrout, Patrick E, Green, Amie S, Rafaeli, Eshkol, & Reis, Harry T. (2006). Paper or plastic revisited: Let's keep them both--Reply to Broderick and Stone (2006); Tennen, Affleck, Coyne, Larsen, and DeLongis (2006); and Takarangi, Garry, and Loftus (2006).
- Brady KT, Back SE, Coffey SF. Substance abuse and posttraumatic stress disorder. *Current Directions in Psychological Science*. 2004; 13:206–209.10.1111/j.0963-7214.2004.00309.x
- Brookoff, Daniel; O'Brien, Kimberly; Cook, Charles S.; Thompson, Terry D.; Williams, Charles. Characteristics of participants in domestic violence. *JAMA: Journal of the American Medical Association*. 1997; 277(17):1369–1373. [PubMed: 9134942]
- Cashin, Jeffrey R.; Presley, Cheryl A.; Meilman, Philip W. Alcohol use in the Greek system: Follow the leader? *Journal of Studies on Alcohol and Drugs*. 1998; 59(1):63.
- Chilcoat, Howard D.; Breslau, Naomi. Investigations of causal pathways between PTSD and drug use disorders. *Addictive Behaviors*. 1998; 23(6):827–840. [PubMed: 9801719]
- Cohen, Lisa R.; Field, Craig; Campbell, Aimee NC.; Hien, Denise A. Intimate partner violence outcomes in women with PTSD and substance use: A secondary analysis of NIDA Clinical Trials Network "Women and Trauma" Multi-site Study. *Addictive Behaviors*. 2013; 38(7):2325–2332. doi:<http://dx.doi.org/10.1016/j.addbeh.2013.03.006>. [PubMed: 23584194]
- Cohen, Lisa R.; Hien, Denise A. Treatment outcomes for women with substance abuse and PTSD who have experienced complex trauma. *Psychiatric Services*. 2014
- El-Bassel, Nabila; Gilbert, Louisa; Rajah, Valli; Foleno, Anthony; Frye, Victoria. Fear and violence: Raising the HIV stakes. *AIDS Education and Prevention*. 2000; 12(2):154–170. [PubMed: 10833040]
- El-Bassel, Nabila; Gilbert, Louisa; Wu, Elwin; Go, Hyun; Hill, Jennifer. Relationship Between Drug Abuse and Intimate Partner Violence: A Longitudinal Study Among Women Receiving Methadone. *American Journal of Public Health*. 2005; 95(3):465–470. Retrieved from <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC1449203/pdf/0950465.pdf>. [PubMed: 15727978]
- Foa, EB. Posttraumatic stress diagnostic scale manual. Minneapolis, MN: National Computer Systems Pearson, Inc; 1995.
- Fonzo, Gregory A.; Simmons, Alan N.; Thorp, Steven R.; Norman, Sonya B.; Paulus, Martin P.; Stein, Murray B. Exaggerated and Disconnected Insular-Amygdalar Blood Oxygenation Level-Dependent Response to Threat-Related Emotional Faces in Women with Intimate-Partner Violence Posttraumatic Stress Disorder. *Biological Psychiatry*. 2010; 68(5):433–441. doi:<http://dx.doi.org/10.1016/j.biopsych.2010.04.028>. [PubMed: 20573339]
- Golding, Jacqueline M. Intimate partner violence as a risk factor for mental disorders: A meta-analysis. *Journal of Family Violence*. 1999; 14(2):99–132.
- Hien, Denise A.; Nunes, Edward; Levin, Frances Rudnick; Fraser, Deborah. Posttraumatic stress disorder and short-term outcome in early methadone treatment. *Journal of Substance Abuse Treatment*. 2000; 19(1):31–37. doi:[http://dx.doi.org/10.1016/S0740-5472\(99\)00088-4](http://dx.doi.org/10.1016/S0740-5472(99)00088-4). [PubMed: 10867298]
- Johnson, Dawn M.; Zlotnick, Caron. HOPE for battered women with PTSD in domestic violence shelters. *Professional Psychology: Research and Practice*. 2009; 40(3):234–241.10.1037/a0012519
- Karno, Mitchell P.; Grella, Christine E.; Niv, Noosha; Warda, Umme; Moore, Alison A. Do substance type and diagnosis make a difference? A study of remission from alcohol-versus drug-use disorders using the National Epidemiologic Survey on Alcohol and Related Conditions. *Journal of Studies on Alcohol and Drugs*. 2008; 69(4):491–495. [PubMed: 18612563]
- Kaysen, Debra; Atkins, David C.; Simpson, Tracy L.; Stappenbeck, Cynthia A.; Blayney, Jessica A.; Lee, Christine M.; Larimer, Mary E. Proximal relationships between PTSD symptoms and drinking among female college students: Results from a daily monitoring study. *Psychology of Addictive Behaviors*. 2014; 28(1):62–73.10.1037/a0033588 [PubMed: 23915369]

- Kaysen, Debra; Dillworth, Tiara M.; Simpson, Tracy; Waldrop, Angela; Larimer, Mary E.; Resick, Patricia A. Domestic violence and alcohol use: Trauma-related symptoms and motives for drinking. *Addictive Behaviors*. 2007; 32(6):1272–1283. Retrieved from http://ac.els-cdn.com/S0306460306002954/1-s2.0-S0306460306002954-main.pdf?_tid=ae634518-a637-11e3-b27f-00000aacb362&acdnat=1394224563_7d0055bc4f702b1cbee07a3c796a78ae. [PubMed: 17098370]
- Kreft, I.; de Leeuw, J. *Introducing Multilevel Modeling*. New York: Sage; 1998.
- López-Castro, Teresa; Hu, Mei-Chen; Papini, Santiago; Ruglass, Lesia M.; Hien, Denise A. Pathways to change: Use trajectories following trauma-informed treatment of women with co-occurring post-traumatic stress disorder and substance use disorders. *Drug and Alcohol Review*. 2015; 34(3): 242–251.10.1111/dar.12230 [PubMed: 25735200]
- Midanik, Lorraine T.; Tam, Tammy W.; Weisner, Constance. Concurrent and simultaneous drug and alcohol use: Results of the 2000 National Alcohol Survey. *Drug and Alcohol Dependence*. 2007; 90(1):72–80. doi:<http://dx.doi.org/10.1016/j.drugalcdep.2007.02.024>. [PubMed: 17446013]
- Searles, John S.; Perrine, MW.; Mundt, James C.; Helzer, John E. Self-report of drinking using touch-tone telephone: Extending the limits of reliable daily contact. *Journal of Studies on Alcohol*. 1995; 56(4):375–382. [PubMed: 7674671]
- Simmons, Alan N.; Paulus, Martin P.; Thorp, Steven R.; Matthews, Scott C.; Norman, Sonya B.; Stein, Murray B. Functional Activation and Neural Networks in Women with Posttraumatic Stress Disorder Related to Intimate Partner Violence. *Biological Psychiatry*. 2008; 64(8):681–690. doi:<http://dx.doi.org/10.1016/j.biopsych.2008.05.027>. [PubMed: 18639236]
- Simpson TL, Galloway C, Rosenthal CF, Bush KR, McBride B, Kivlahan DR. Daily telephone monitoring compared with retrospective recall of alcohol use among patients in early recovery. *American Journal on Addictions*. 2011; 20(1):63–68.10.1111/j.1521-0391.2010.00094.x [PubMed: 21175922]
- Singer, JD.; Willett, JB. *Applied longitudinal data analysis: Modeling change and event occurrence*. New York: Oxford University Press; 2003.
- Sorenson, Susan B.; Wiebe, Douglas J. Weapons in the Lives of Battered Women. *American Journal of Public Health*. 2004; 94(8):1412–1417. doi:<http://dx.doi.org/10.2105/AJPH.94.8.1412>. [PubMed: 15284052]
- Stewart, Sherry H.; Conrod, Patricia J.; Samoluk, Sarah Barton; Pihl, Robert O.; Dongier, Maurice. Posttraumatic stress disorder symptoms and situation-specific drinking in women substance abusers. *Alcoholism Treatment Quarterly*. 2000; 18(3):31–47.
- Sullivan, Tami P.; Ashare, Rebecca L.; Jaquier, Veronique; Tennen, Howard. Risk factors for alcohol-related problems among victims of partner violence. *Substance Use & Misuse*. 2012; 47(6):673–685.10.3109/10826084.2012.658132 [PubMed: 22360665]
- Sullivan, Tami P.; Holt, Laura J. PTSD symptom clusters are differentially related to substance use among community women exposed to intimate partner violence. *Journal of Traumatic Stress*. 2008; 21(2):173–180. [PubMed: 18404637]
- Sullivan, Tami P.; Khondkaryan, Enna; Dos Santos, Nancy P.; Peters, Erica N. Applying Experience Sampling Methods to Partner Violence Research: Safety and Feasibility in a 90-Day Study of Community Women. *Violence Against Women*. 2011; 17(2):251–266.10.1177/1077801210397756 [PubMed: 21307033]
- Tennen, Howard; Affleck, Glenn; Coyne, James C.; Larsen, Randy J.; DeLongis, Anita. Paper and plastic in daily diary research: Comment on Green, Rafaeli, Bolger, Shrout, and Reis. 2006
- Testa, Maria; Kubiak, Audrey; Quigley, Brian M.; Houston, Rebecca J.; Derrick, Jaye L.; Levitt, Ash; ... Leonard, Kenneth E. Husband and Wife Alcohol Use as Independent or Interactive Predictors of Intimate Partner Violence. *Journal of Studies on Alcohol and Drugs*. 2012; 73(2):268–276. Retrieved from <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3281984/http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3281984/pdf/jsad268.pdf>. [PubMed: 22333334]
- Wechsler, Henry; Dowdall, George W.; Davenport, Andrea; Castillo, Sonia. Correlates of college student binge drinking. *American Journal of Public Health*. 1995; 85(7):921–926. [PubMed: 7604914]

Zhao, Jinhui; Macdonald, Scott; Borges, Guilherme; Joordens, Chantele; Stockwell, Tim; Ye, Yu. The rate ratio of injury and aggressive incident for alcohol alone, cocaine alone and simultaneous use before the event: A case–crossover study. *Accident Analysis & Prevention*. 2015; 75(0):137–143. <http://dx.doi.org/10.1016/j.aap.2014.11.020>. [PubMed: 25481538]

Author Manuscript

Author Manuscript

Author Manuscript

Author Manuscript

Table 1Demographic characteristics ($N = 41$)

	<i>n</i> (%)	<i>M</i> (<i>SD</i>)
Age (years)		45.1 (8.5)
Race/ethnicity		
African American	32 (78.0%)	
White	4 (9.8%)	
Latina	3 (7.3%)	
Native American/Alaskan	2 (4.9%)	
Unemployed	29 (70.7%)	
Education (years)		12.0 (1.3)
Annual household income (dollars)		\$15,306 (\$13,127)
Living with partner	24 (59.0%)	
Face-to-face contact with partner (days per week)		6.5 (1.0)
Have children	10 (24.4%)	

Table 2

Proportion of days characterized by drug and/or alcohol use

Substance Type and Occurrence	% of days
Type	
No Drug or Alcohol Use	55.5%
Drug Use	32.5%
Marijuana	19.3%
Cocaine	8.4%
Sedatives/Tranquilizers/Hypnotics	4.5%
Other	<1%
Alcohol Use	31.1%
Occurrence/co-occurrence	
Drug Use Only	13.4%
Alcohol Use Only	12.1%
Co-occurring Drug and Alcohol Use	19.0%

Note. Days of complete data = 647.

Table 3

Multilevel multinomial logistic regression predicting occurrence/co-occurrence of daily substance use

<i>Outcome</i>	<i>Predictor</i>	<i>B</i>	<i>SE</i>	<i>p</i>	<i>OR</i>	<i>95% CI</i>
<i>Drug and alcohol use</i>	PTSD ^a	2.69	1.24	.037	14.69	[1.19, 181.99]
	See Partner ^b	0.79	0.58	.176	2.21	[0.70, 6.95]
<i>Drug use only</i>	PTSD ^a	1.93	0.93	.044	6.94	[1.06, 45.50]
	See Partner ^b	1.58	0.43	.001	4.88	[2.08, 11.43]
<i>Alcohol use only</i>	PTSD ^a	1.76	0.99	.081	5.86	[0.79, 43.20]
	See Partner ^b	0.13	0.38	.638	1.14	[0.54, 2.41]

Note. Values are HLM fixed effects with robust standard errors. Non-substance use day is the reference category for each outcome. OR = odds ratio; CI = confidence interval; PTSD = posttraumatic stress disorder; See Partner = had face-to-face contact with partner.

^a0 = no, 1 = yes

^b0 = no, 1 = yes.