Published in final edited form as:

J Behav Med. 2008 April ; 31(2): 115–125. doi:10.1007/s10865-007-9140-5.

Posttraumatic stress disorder, alcohol use, and physical health concerns

Debra Kaysen,

Center for Trauma Recovery, University of Missouri-St. Louis, St. Louis, MO, USA, Department of Psychiatry & Behavioral Sciences, University of Washington School of Medicine, Box 356560, Seattle, WA 98195-0650, USA

David W. Pantalone,

Center for HIV/AIDS Educational Studies and Training (CHEST), Department of Psychology, Hunter College City, University of New York, New York, NY, USA

Neharika Chawla,

Department of Psychology, University of Washington, Seattle, WA, USA

Kristen P. Lindgren,

Department of Psychiatry & Behavioral Sciences, University of Washington School of Medicine, Box 356560, Seattle, WA 98195-0650, USA

Gretchen A. Clum,

Department of Community Health Sciences, School of Public Health and Tropical Medicine, Tulane University, New Orleans, LA, USA

Christine Lee, and

Department of Psychiatry & Behavioral Sciences, University of Washington School of Medicine, Box 356560, Seattle, WA 98195-0650, USA

Patricia A. Resick

Center for Trauma Recovery, University of Missouri-St. Louis, St. Louis, MO, USA, Women's Health Sciences Division, National Center for PTSD, VA Boston Healthcare System, Boston, MA, USA, Departments of Psychology and Psychiatry, Boston University, Boston, MA, USA

Debra Kaysen: dkaysen@u.washington.edu

Abstract

PTSD is a risk factor for alcohol problems and both in turn have been independently associated with increased health problems. However, it is unclear whether alcohol use moderates the relationship between PTSD and health. Participants were battered women ($N = 336$) recruited from local domestic violence shelters and non-shelter victim-assistance agencies. A 2 (PTSD diagnosis) $\times$ 3 (abstainer, infrequent/light, regular/heavy drinking) ANCOVA was conducted, with injuries and length of abuse as covariates and health concerns as the dependent variable. Main effects for PTSD and alcohol use were significant but not the interaction. Women with PTSD reported the greatest number of health concerns. Women who abstained from drinking and those who drank regularly/heavily reported more health concerns than the infrequent/light drinkers. Health concerns associated with PTSD do not appear to be due to problem drinking. In addition, infrequent/light drinking, even for women with PTSD, may be associated with fewer health concerns.

Keywords

Posttraumatic stress disorder; Alcohol use; Victimization; Family violence; Physical health

Introduction

Recognition of the high rates of interpersonal violence (IPV) experienced by women has led to increased concern about negative mental and physical health consequences of such experiences (Buka et al. 2001; Jones et al. 2001). Relationship violence has been associated with posttraumatic stress disorder (PTSD) (Bennice et al. 2003), alcohol problems (Miller and Downs 1993; Testa and Leonard 2001), increased medical comorbidity (Campbell et al. 1997; Plichta 2004), and increased health care utilization (Marshall et al. 1998; Plichta 1992; Walker et al. 2003; Wisner et al. 1999). However, the relation between PTSD, alcohol use, and physical health in general as well as specific to IPV, has only begun to be addressed in the literature (El-Bassel et al. 2003; Savarese et al. 2001; Wingood et al. 2000; Zlotnick et al. 2003a, b. In particular, it is unclear whether PTSD and alcohol use have independent or interdependent effects on physical health. This study examines alcohol use as a moderator of the relation between PTSD and health concerns among battered women from a community sample and tests whether alcohol use and PTSD have independent or interdependent effects.

Posttraumatic stress disorder and physical health

Both IPV and PTSD have been associated with negative health consequences (Ciechanowski et al. 2004; Kimerling et al. 2000; Walker et al. 2003; Weinbaum et al. 2001; Zoellner et al. 2000), and researchers have begun to investigate the pathways through which trauma exposure (e.g., IPV) and reactions to trauma (e.g., PTSD) influence negative health consequences (Cromer and Sachs-Ericsson 2006; Lang et al. 2006; Ouimette et al. 2004; Roy-Byrne et al. 2006). With regard to the former, there appear to be multiple pathways from IPV to negative health consequences including acute injury, chronic health problems as a result of untreated injury, increases in negative health behaviors (Coker et al. 2002), as well as the allostatic load associated with trauma (Beckham et al. 2002; Glover et al. 2006; Resnick et al. 1997; Schnurr and Green 2004; Shalev et al. 1990). Regarding the latter, an important consideration in the relation between violence experienced and changes in health status is the victim's posttraumatic response. In particular, psychological distress after a trauma, such as PTSD or depression, has been found to be an important mediator of poorer self-reported physical health, immune function, and higher rates of physician-diagnosed medical conditions (Ciechanowski et al. 2004; Frayne et al. 2004; Lang et al. 2006; Leserman et al. 2005; Norris et al. 2006; Schnurr and Green 2004; Schnurr and Spiro 1999; Woods et al. 2005). Thus, it appears that there are both direct pathways between IPV and negative health consequences, via injuries and allostatic load and indirect pathways via PTSD (Schurr and Green 2004).

There is a similar pattern of direct and indirect pathways between PTSD and negative health consequences. First, there is a robust literature indicating that individuals who meet criteria for PTSD both display and report decrements in health, including more pain overall, pregnancy neurological problems, respiratory problems, cardiovascular problems, and gastrointestinal problems (Litz et al. 1992; McFarlane et al. 1994; Lauterbach et al. 2005; Shalev et al. 1990; Zoellner et al. 2000). These relations appear even after controlling for physical injuries (Kimerling and Calhoun 1994; Wagner et al. 2000) or comorbid medical conditions (Zatzick et al. 2002; Zatzick et al. 2003; Zatzick et al. 1997). In addition, PTSD severity is associated with increased physical health complaints (Kimerling et al. 2000; Litz et al. 1992; Zoellner et al. 2000). Second, it has been hypothesized that PTSD may indirectly affect health through changes in health behaviors. In particular, there is some evidence that negative changes in

health behaviors, like increased alcohol use, smoking, decreases in exercise, and avoidance of medical care may be associated with PTSD (Dobie et al. 2004; Lang et al. 2003; Lawler et al. 2005; Morland et al. 2007; Ullman and Brecklin 2003; Ullman et al. 2005).

Both trauma exposure and PTSD have also been associated with increased alcohol-related problems (Breslau et al. 1997; Kessler, Crum et al. 1997; Kilpatrick et al. 2000; Ouimette et al. 1996; Stewart et al. 2004; Stewart et al. 1998). Specifically, IPV has been associated with a greater likelihood of alcohol-related consequences (Rice et al. 2001) and with heavy episodic drinking (Testa and Leonard 2001; Testa et al. 2003). Similarly, PTSD is associated with increased alcohol problems and consumption (Breslau et al. 2000; Darves-Bornoz et al. 1998; Kessler et al. 1995; Marx and Sloan 2003; Ullman and Brecklin 2003; Najavits et al. 1997).

Alcohol use and physical health

Independent of the literature on trauma exposure, PTSD, and physical health, alcohol use itself is associated with increased risk for both acute and chronic health consequences, including injuries, cancer, stroke and coronary heart disease (Rehm et al. 2003; Rehm and Monteiro 2005; Room et al. 2005). However, the impact of alcohol use on health outcomes is complex. For many chronic diseases, changes in risk are related to the specific pattern of alcohol use. For example, chronic excessive alcohol consumption is associated with an increased risk for a variety of negative health consequences, but low-to-moderate consumption on average is associated with a lower risk than abstinence. This J-shaped relation is an especially robust finding in the literature on alcohol and coronary heart disease (Corrao et al. 2004; Di Castelnuovo et al. 2006; Room et al. 2005). There is a broad discussion regarding findings that when compared with abstinence, low-to-moderate average consumption (i.e., 20 g per day) is associated with lower coronary heart disease incidence and mortality. This relation reverses at higher levels of alcohol consumption. For example, average consumption of more than 70 grams of alcohol per day has been associated with greater health risks when compared with abstainers (Corrao et al. 2000). However, research findings regarding the protective effects of low-to-moderate alcohol use in women are less conclusive than those for men (Corrao et al. 2000; Green et al. 2004; White et al. 2002).

The aforementioned studies have generally focused on objective health outcomes. Studies that focus on perceived health or health concerns have also found relationships between alcohol use and health concerns (Green et al. 2004; Stranges et al. 2006). Similar to what has been found in looking at more objective measures of health outcomes when drinking quantity has been examined in relation to subjective health, non-drinkers have the lowest subjective physical health and current drinkers who consume 2–3 drinks per day appear to have the best subjective health (Stranges et al. 2006). Similarly, when drinking frequency and quantity are combined, a U-shaped distribution has been found between drinking and physical health concerns in women (Green et al. 2004).

The present study

The association between alcohol and trauma exposure and PTSD is well established empirically. The separate associations between alcohol and health outcomes and between PTSD and health outcomes also appear well established. What is less clear is how alcohol use that co-occurs with trauma exposure and PTSD influences health. Although it has been hypothesized that trauma exposure may lead to both problem drinking and to PTSD, and that these outcomes of trauma exposure lead to problems with physical health, few studies have specifically investigated PTSD, alcohol use, and health outcomes. Instead, studies have tended to (a) investigate only the relationship between trauma exposure, PTSD and alcohol but not consider physical health consequences (Breslau et al. 1997; Breslau et al. 2000; Kessler, Crum

et al. 1997; Kessler et al. 1995; Kilpatrick et al. 2000; Marx and Sloan 2003; Ouimette et al. 1996; Stewart et al. 2004) or (b) examine changes in health behaviors, as a group (e.g., examine alcohol use, smoking, and decreases in exercise as a single, combined variable), as a consequence of trauma exposure and PTSD rather than focusing more specifically on independent contributions to health outcomes (Dobie et al. 2004; Lang et al. 2003; Lawler et al. 2005; Morland et al. 2007; Ullman and Brecklin 2003; Ullman et al. 2005). For example, in a study of women with substance use disorder diagnosis, PTSD was associated with significantly poorer functional health and well-being (Ouimette et al. 2006). In this study, however, the role of alcohol use on health, either independently or in relation to PTSD was not examined. In another study, women in primary care with comorbid PTSD and substance use disorders were compared with women without substance use disorders on several domains of health problems (Zlotnick et al. 2003a, b; no differences were found in self-reported health functioning or number of lifetime medical illnesses. However, this study was limited by a small sample size and the lack of a trauma-exposed, PTSD negative comparison group.

Given that relatively few studies include an exploration of the effects of PTSD and alcohol use on health concerns, our interests were in testing whether PTSD and alcohol use are independently related to self-report of health concerns in a sample of recent IPV victims, and whether the relation between PTSD and health concerns was moderated by alcohol use. We expected a significant interaction wherein the protective effects of light, less frequent alcohol use would be present, but only for those women without PTSD. In those women with PTSD, we expected to find increased health concerns, even with lower amounts of alcohol use.

Methods

Participants

This sample consisted of participants recruited through local domestic violence shelters (49%) and non-shelter victim-assistance agencies (51%). Exclusion criteria included apparent psychosis, illiteracy, intoxication at the time of the assessment, or potential danger to the participant ($n = 12$). There were no other exclusion criteria, thus women with other psychiatric symptomatology could be included in the sample. Women must have experienced battering within an intimate relationship that lasted three months or more ($M = 7$ years, $SD = 7$ years). During telephone screenings, both duration of the relationship and abuse severity were assessed. The screening criteria for battering severity was based on the modified Conflict Tactics Scale (Straus et al. 1996) and was defined as two or more severe behaviors or any combination of four or more severe and minor behaviors. Each must have occurred during a separate battering incident. The most recent incident had to be between two and 24 weeks prior to assessment ($M = 43$ days, $SD = 35$ days). Sixty-seven women were excluded based on these eligibility criteria during telephone screenings. The majority of women included had experienced chronic IPV ($M = 5$ years, $SD = 6$ years).

Of the 369 women assessed, 21 did not complete the assessments and 12 had data that were deemed invalid, yielding a final sample size of 336. Participants ranged in age from 18 to 62 ($M = 34.51$, $SD = 8.03$ years). Sixty seven percent of the sample was African American ($n = 225$), 27% Caucasian ($n = 92$), and 6% were from other ethnic groups ($n = 19$). Fifty-five percent of the participants reported personal incomes below \$10,000 annually ($n = 186$). Participants had approximately a high school education ($M = 12.59$ years, $SD = 2$ years). Sixty-seven percent had children ($n = 225$).

Measures

Revised Conflict Tactics Scale (CTS2: Straus et al. 1996)—The Conflict Tactics Scale and CTS2 (Straus 1979; Straus et al. 1996) are the most widely used scales for measuring

interpersonal relationship conflict. The CTS2 is a 78-item scale measuring five categories of behaviors aimed at resolving conflict: negotiation, psychological aggression, physical assault, sexual coercion, and injury (Straus et al. 1996). Items from the physical assault scale were used as screening criteria for inclusion into the study and the physical injury subscale was used as a covariate.

Timeline Followback Method Alcohol (TLFB; Sobell et al. 1996; Sobell and Sobell 1992) was used for assessment of alcohol consumption patterns. The TLFB is a widely used retrospective measure that obtains daily estimates of drinking, was used for assessment of alcohol consumption patterns. For the TLFB, participants are presented with a calendar to write important events as memory prompts for daily estimates of alcohol consumption over the past month. The TLFB has been found to have good psychometric properties and to provide valid data in situations where data collection is within a research setting, voluntary, confidential, and participants are alcohol-free at time of assessment. For the present study, drinking pattern was conceptualized as a categorical variable resulting from the combination of drinking frequency (days per week) and quantity (drinks per drinking day), including nondrinkers. We formed three unique groups: abstainers (nondrinkers); infrequent/light drinkers (one or two drinks per occasion, no more than once per week); and regular/heavier drinkers (three or more drinks per occasion or drinking two or more times a week). The combination of drinking frequency and peak drinking (drinking pattern) has been found to predict general health and physical functioning in women (Green et al. 2004).

Posttraumatic Stress Diagnostic Scale (PDS: Foa et al. 1997)—The PDS is a 49-item self-report measure designed to assist with the diagnosis of PTSD. The instrument assesses all DSM-IV diagnostic criteria including: a traumatic stressor; experiencing fear, helplessness, or horror; intrusive, avoidance, and hyperarousal symptoms; and duration and course of symptoms. A PTSD diagnosis is made only if the six DSM-IV criteria are endorsed. The scale has been found to have high internal consistency and to demonstrate acceptable convergent validity when compared with other measures of PTSD diagnosis and symptom severity (Coffey et al. 1998; Griffin et al. 2004). For the purposes of this study the PDS was used as a diagnostic indicator of PTSD.

Pennebaker Inventory of Limbic Languidness (PILL: Pennebaker and Brittingham 1982)—The PILL is a 54-item, 5-point scale assessing frequency of common physical symptoms and sensations. Symptoms were coded as present or absent and then summed to create a continuous variable indicating health concerns. The reported internal consistency for the measure is high (.88) and was .96 for our sample (Pennebaker and Brittingham 1982). High PILL scorers are aware of more symptoms across a number of settings relative to low PILL scorers. The scale has been found to have reasonable convergent validity, correlating both with other physical health indicators and with measures of health concerns. For example, PILL scores are positively correlated with self-reported physician visits ($r = .22$, $N = 505$), number of days that the person's activities were restricted ($r = .19$, $N = 505$), and aspirin use ($r = .30$, $N = 231$). The PILL correlates moderately with the Hopkins Symptom Checklist ($r = .48$, $N = 213$), the Autonomic Perception Questionnaire ($r = .50$, $N = 75$), and the Cornell Medical Index composite score ($r = .57$, $N = 100$).

Procedures

Assessments were conducted at the Center for Trauma Recovery at the University of Missouri-St. Louis from 1999–2002. Assessments were conducted in two sessions held up to one week apart, with each visit lasting from one to three hours. The PDS and PILL were self-administered via computer. The TLFB was completed using paper and pencil, and trained female interviewers were present and available to answer participants' questions about converting

their daily alcohol consumption into standard drinks. All data were collected as part of a larger study. Participants were paid for participation.

Results

Preliminary analyses

Means and standard deviations for primary measures are listed in Table 1. Participants reported a wide range of health concerns. The most commonly endorsed were watery or itching eyes, gastrointestinal symptoms (upset stomach, indigestion, abdominal pain), shortness of breath, racing heart, back pain, and headaches. The women reported experiencing an average of over 20 health concerns. We also examined demographic and abuse characteristics and health concerns. There were no significant differences between African-American participants and Caucasian participants in health concerns, nor were there significant differences based on income or education. An increased number of health concerns was associated with more physical injuries sustained during the abuse, $r^2 = .26$, $p < .001$, and more chronic domestic violence, $r^2 = .13$, $p < .05$.

Participants reported high rates of PTSD; 85% of this sample met criteria for PTSD ($n = 286$). Caucasian participants were significantly more likely to meet criteria for PTSD, $\chi^2(1, 362) = 7.95$, than African American participants. There were no significant differences in PTSD diagnoses based on income or education. In this sample, 51% of participants ($n = 172$) reported that they did not drink alcohol at all over a typical month, 13% endorsed light/infrequent use of alcohol ($n = 44$), and 36% reported regular/heavy use of alcohol ($n = 120$). There were no significant associations between drinking patterns and ethnicity, income, education, length of abuse, or injuries sustained.

Data screening

All measures of interest for this paper were completed by 336 participants. For 65 participants (16%), data from one or more responses were missing. However, no differences were found on any of the primary variables of interest between those with complete versus incomplete data. Thus, it appears that the subset of participants who provided complete data were representative of the larger sample and comprise the sample analyzed below. Data were examined for compliance with the assumptions of analysis of variance (Tabachnik and Fidell 2001). There were no univariate outliers on the PILL, and, although the variable distribution was skewed, it was insufficient to violate the assumptions of ANCOVA.

Alcohol use and PTSD

Analysis of covariance (ANCOVA) was used to examine the number of self-reported physical health concerns. The independent variables were PTSD and drinking pattern. The degree of injuries sustained during the domestic abuse and length of abuse were used as covariates. Analyses were performed using SPSS GLM. The covariate, injuries, remained significant in the model whereas length of abuse was not significant. After adjustment by covariates, health concerns differed significantly by PTSD, $F(1, 335) = 10.28$, $p < .001$, wherein the presence of a PTSD was associated with a greater number of health concerns (Cohen's $d = .73$). Health concerns also differed significantly with drinking pattern, $F(2, 335) = 3.26$, $p < .05$, but the PTSD and drinking pattern interaction was not significant, $F(2, 335) = .91$ (see Fig. 1).

Simple contrasts were used to examine whether significant differences in the number of health concerns existed between the three drinking patterns, using abstainers as the reference group. There was a significant difference across the 3 groups, $F(2, 329) = 3.16$, $p < .05$. There was no significant difference in health concerns between abstainers and regular/heavy drinkers

(Cohen's $d = .11$) but both abstainers (Cohen's $d = .56$) and regular/heavy drinkers (Cohen's $d = .70$) had significantly more health concerns than light/infrequent drinkers, $p < .05$.

Post-hoc analyses

Given our findings of a main effect for drinking and health concerns, we conducted two sets of post-hoc analyses. The first analysis disaggregated drinking pattern to examine both frequency and peak alcohol use in relation to health concerns. Analysis of covariance (ANCOVA) was used, with degree of injuries and duration of abuse as covariates. The independent variables were frequency of drinking (abstainer = 0 drinking days over month, infrequent = once/week or less, frequent = more than once/week) and peak use (abstainer = 0 drinks, light = less than 4 drinks/peak drinking occasion, and heavy drinker = 4 + drinks/peak drinking occasion). Both covariates were significant. After adjustment by covariates, health concerns differed. Specifically, there was a main effect for frequency of drinking, $F(1, 343) = 12.03$, $p < .001$. Drinking more than once per week was associated with significantly more health concerns than less frequent alcohol consumption, $p < .05$. There was not a significant main effect for peak use, $F(1, 343)$, but the interaction between frequency and peak alcohol use was significant, $F(1, 343) = 5.99$, $p < .05$. Based on post-hoc planned comparisons, those who consumed alcohol infrequently and kept their alcohol use below 4 standard drinks per drinking occasion had the fewest number of health concerns. Those who consumed alcohol frequently, even if they kept their alcohol use below 4 standard drinks per drinking occasion, had the greatest number of health concerns, $p < .05$. There were no differences between abstainers and those who consumed 4 or more drinks in health concerns.

Discussion

The present study is one of the few to examine the impact of both PTSD and substance abuse on health outcomes and is the first to our knowledge that focuses specifically on whether health concerns associated with PTSD varies as a function of alcohol use (Ouimette et al. 2006; Zlotnick et al. 2003a, b). Results indicated both PTSD and drinking patterns contributed to health concerns. Women with PTSD reported more concerns about their physical health than women without PTSD. Conversely, light and infrequent alcohol consumption was associated with fewer reported health concerns than abstinence or heavy/regular alcohol consumption. Considering the contributions of both PTSD and alcohol use, PTSD appeared to have the larger impact on women's health concerns.

PTSD and physical health

Our study adds to the growing research literature documenting relationships between PTSD and health outcomes (Schnurr and Green 2004; Trief et al. 2006). Our research suggests that PTSD has a unique impact on health concerns in recently battered women, even after controlling for acute injury and length of the use and taking into consideration the potential moderating role of alcohol use. In other studies, PTSD has been hypothesized to be the "key mechanism" between trauma exposure and health outcomes, even after considering the high comorbidity between PTSD and disorders such as depression and substance use, perhaps because of the toll of allostatic load (Schnurr and Green 2004; Schnurr and Spiro 1999; Wolfe et al. 1994). Our study lends support to the literature documenting an independent effect of PTSD when comorbid conditions are examined (Boscarino and Chang 1999; Schnurr et al. 2000). However, it should be noted that the comorbid conditions investigated in this study did not extend to other mental health concerns.

Alcohol use and physical health

Our findings also support the behavioral view that poor health behaviors such as alcohol use, that can be associated with PTSD, may independently lead to increased health concerns. The

J-shaped distribution between alcohol use and health concerns, are consistent with extant literature on alcohol and physical health (Corrao et al. 2000; Room et al. 2005) or subjective physical health (Green et al. 2004). Light and infrequent alcohol use was associated with fewer reported health concerns and the association reversed at higher and more frequent levels of drinking. Moreover, the present study provided a replication of this finding in women, a population in which the relations between drinking patterns and health outcomes has been less consistent (Corrao et al. 2000; Gmel et al. 2003; Rehm et al. 2001). Heavy alcohol consumption has been associated with multiple health problems including coronary heart disease, injuries, various cancers, hypertension, and liver disease (Rehm et al. 2003; Rehm and Monteiro 2005; Room et al. 2005; Standridge et al. 2004). Given these associations, it is not surprising that general health concerns were elevated in this group, even once we controlled for injuries due to the relationship violence and controlled for the duration of time over which the abuse occurred.

The robust finding that alcohol abstinence is associated with somewhat poorer health than light alcohol use has perplexed many. Physiological explanations have been posited to explain the U or J-shaped distribution, at least for the relation between alcohol consumption and coronary heart disease, as light or moderate use is associated with reductions in plaque deposits (Rehm et al. 2003). However, this study extends these associations between light or moderate alcohol use and more general health concerns. One difficulty with the present study, and much of the other literature examining this issue, is that the reason for alcohol abstinence was not assessed (Shaper 1995; Shaper and Wannamethee 1998; Wannamethee and Shaper 1997). Thus, it is possible that some of the women who abstain from drinking have past histories of problem drinking and may have health problems as a consequence of that period, or that women may currently abstain from drinking because of significant physical or mental health concerns or medication interactions. Future research should examine the context for drinking. It is possible that light, regular drinking occurs predominantly in social contexts, for socially motivated reasons (Mohr et al. 2005; Stewart and Chambers 2000). Thus the association between lower drinking and lower health concerns may be explained by a tertiary factor, such as social support, which is associated with better health (Penley et al. 2002; Uchino et al. 1999). Conversely, heavy drinking may be associated with higher coping motives and with drinking alone (Bonin et al. 2000; Cooper et al. 1995; Mohr et al. 2005). Higher coping motives have been associated with more negative consequences for drinking (Cooper et al. 1995). Alcohol use may have direct effects on health concerns but also may serve as a proxy variable for other aspects of abused women's lives, which may also have direct effects on health outcomes. More complex, multivariate and longitudinal studies are needed to allow us to better understand the relationship between alcohol use and health concerns in battered women.

Another issue with the present study was the use of a combined measure of frequency and quantity as a measure of alcohol use. The present study included post-hoc analysis as a preliminary and exploratory step toward disaggregating the main effect of alcohol use on health concerns – i.e., does this effect stem from how often and/or how much individual drink. Those exploratory analyses indicated an interaction of peak alcohol use and frequency, with those who drank frequently but who drank less on those occasions and those who abstained from alcohol having the least amount of self-reported physical health concerns and those who drank frequently but more on those occasions having the most number of self-reported health concerns. It should be emphasized that these findings are exploratory in nature, and should be interpreted in that light. This study was not designed to address more nuanced questions regarding the impact of varying types of drinking behavior on health outcomes. In addition to the limitations of this study, there are also important definitional questions within the emerging literature on the possible non-harmful patterns of alcohol use related to (a) what constitutes light use on a given occasion and (b) what constitutes “frequent” versus “infrequent” drinking. Various factors also may affect the impact of the quantity of alcohol consumed on health

outcomes, including differences in the number of hours over which alcohol was consumed and the weight of the drinker. Future research should attempt to assess more detailed information regarding drinking behavior to better address what types of drinking patterns are most associated with negative health outcomes in women.

Contrary to our predictions, there was no interaction effect between PTSD and drinking pattern. Thus, based on these findings, the health problems associated with PTSD do not appear to be related to or exacerbated by drinking behavior. The association between PTSD and poorer health may be caused by other factors such as allostatic load, chronic sleep disturbance, the effects of persistently high cortisol levels, or changes in other health related behaviors due to avoidance or isolation (Clum et al. 2001; Krakow et al. 2001; Morgan and Grillon 1999). Similarly, health concerns associated with drinking behaviors occurred independent of PTSD (Zlotnick et al. 2003a, b). These results suggest that, even for those women with PTSD, drinking moderately may be associated with health benefits, as long as the alcohol use remains relatively infrequent and is not used to self-medicate PTSD symptoms.

Our findings of associations between both PTSD and alcohol use with elevated health concerns in battered women suggest that many of these women may be highly likely to present with somatic complaints in primary health care settings. This emphasizes the need for collaboration between physicians and mental health providers. One option is to integrate mental health providers more regularly into primary care settings, rather than in specialty mental health clinics. These may be more accessible for many women who present predominantly with somatic concerns. It also may be more difficult for lower income women to access specialty care and to access mental health services (Kimerling and Baumrind 2005; Lipsky and Caetano 2007). Another option to increase access to appropriate assessment and services is to train physicians in assessing interpersonal violence exposure, PTSD symptoms, and alcohol use. Implementing such training and having appropriate referrals that are available and accessible would be essential. Physicians can also be trained in conducting brief interventions. These have been developed to reduce high risk drinking, and there are promising early prevention strategies for PTSD as well. Such brief interventions might facilitate women accessing prevention programs that have been developed to reduce high risk drinking and reduce risk of PTSD following trauma exposure. Regardless, there is a tremendous need to better identify health concerns that are secondary to or exacerbated by interpersonal violence to decrease associated health care costs. Also, because studies have found reciprocal relationships between violence, alcohol use, and revictimization, prevention strategies have the opportunity to reduce what may become an escalating pattern of risk behaviors.

It is important to acknowledge the limitations of the present study, most notably, the cross-sectional design and reliance on self-report measures for the primary constructs of interest. Given this design, there is no way to examine the temporal sequencing of these relations. Thus, we cannot determine whether PTSD or alcohol use caused elevated health concerns. Future work in this area would benefit from longitudinal studies to better model the development of and changes in these symptoms over time. This paper did not include other measures of health problems including review of medical records or examination of treatment utilization, which would have extended the findings beyond self-report of health concerns. We cannot know whether actual health status differed or whether health concerns reflected perceptions of somatic experiences. In addition, the present study did not assess other possible psychiatric comorbidities. It is possible that the present findings may be explained by other psychiatric symptoms that can co-occur with either PTSD or alcohol misuse such as depression, other anxiety disorders, dependence upon other drugs, or nicotine dependence (Clum et al. 2000; Kimerling et al. 2007). These diagnoses can also be associated with health concerns (Clum et al. 2000). Further examination of these important issues would be useful to the literature, but beyond the scope of the current paper.

The study has several limitations that may affect the generalizability of the findings. Research was conducted with female participants only, a group that is at greater risk for PTSD but at reduced risk for alcohol problems (Breslau 2002; Kessler et al. 1997). It is possible these results may not generalize to men; comparisons based on gender were not possible. In addition, the study did not assess other potential comorbid psychiatric conditions. It is possible that our findings may be a reflection of other underlying conditions such as depression. Also, given the overrepresentation of low income participants and ethnic minorities, it is unclear whether the composition of the sample may reflect a sampling bias. Unfortunately, data were not available for comparison with the host programs. Shelters and victim service agencies were contacted following the end of data collection, and staff indicated that the sample that participated in this research study was generally consistent in terms of income and ethnocultural diversity with the women who they serve. However, it cannot be ruled out that women who were lower income or who were unemployed may have been more able or willing to participate in the research study. Although we did not find that income, education, or ethnicity affected health concerns in our sample, it is possible that our results may not generalize to other samples. In addition, this study had high rates of PTSD and, therefore, it is possible that this may have made it more difficult to detect an interaction between PTSD and drinking patterns.

Despite limitations, the present study has a number of strengths, including a large sample, recent trauma among the participants, and inclusion of measures of both PTSD and drinking that appear useful in extending our understanding of the relations between trauma exposure and health concerns in battered women. Overall, PTSD and alcohol use both contributed to women's perceptions of their physical health. These results highlight the importance of assessing health concerns of women who have experienced domestic violence and the likelihood that these women will present in medical settings. In addition, the results highlight the importance of prevention of IPV as a means of prevention of other complex negative medical and behavioral problems (Coker 2004, 2006). Future research should utilize more objective measures of health status to better understand the nature of health concerns associated with both PTSD and alcohol use.

Acknowledgments

We would like to thank the women who participated in this research study, as well as the community agencies that assisted with participant recruitment. This research was supported in part by NIMH Grant R01MH55542 (P.I., Patricia A. Resick, Ph.D.), by NIAAA Fellowship F32AA014728 (P.I., Debra Kaysen, Ph.D.), by NIMH Fellowship F31MH071179 (P.I., David Pantalone, M.S.), and by a grant awarded by the Alcohol Beverage Medical Research Foundation (P.I., Tracy Simpson, Ph.D.). Portions of this manuscript were presented as part of a symposium at the 20th Annual Meeting of the International Society for Traumatic Stress Studies (November 2004).

References

- Beckham JC, Calhoun PS, Glenn DM, Barefoot JC. Posttraumatic stress disorder, hostility, and health in women: A review of current research. *Annals of Behavioral Medicine* 2002;24(3):219–228. [PubMed: 12173679]
- Bennice JA, Resick PA, Mechanic M, Astin M. The relative effects of intimate partner physical and sexual violence on posttraumatic stress disorder symptomatology. *Violence and Victims* 2003;18(1): 87–94. [PubMed: 12733621]
- Bonin MF, McCreary DR, Sadava SW. Problem drinking behavior in two community-based samples of adults: Influence of gender, coping, loneliness, and depression. *Psychology of Addictive Behaviors* 2000;14:151–161. [PubMed: 10860114]
- Boscarino JA, Chang J. Higher abnormal leukocyte and lymphocyte counts 20 years after exposure to severe stress: Research and clinical implications. *Psychosomatic Medicine* 1999;61(3):378–386. [PubMed: 10367620]

- Breslau N. Epidemiologic studies of trauma, posttraumatic stress disorder, and other psychiatric disorders. *Canadian Journal of Psychiatry—Revue Canadienne de Psychiatrie* 2002;47(10):923–929. [PubMed: 12553127]
- Breslau N, Davis GC, Peterson EL, Schultz L. Psychiatric sequelae of posttraumatic stress disorder in women. *Archives of General Psychiatry* 1997;54(1):81–87. [PubMed: 9006404]
- Breslau N, Davis GC, Peterson EL, Schultz LR. A second look at comorbidity in victims of trauma: The posttraumatic stress disorder-major depression connection. *Biological Psychiatry* 2000;48(9):902–909. [PubMed: 11074228]
- Buka SL, Stichick TL, Birdthistle I, Earls FJ. Youth exposure to violence: Prevalence, risks and consequences. *American Journal of Orthopsychiatry* 2001;71(3):298–310. [PubMed: 11495332]
- Campbell JC, Lewandowski LA. Mental and physical health effects of intimate partner violence on women and children. *The Psychiatric Clinics of North America* 1997;20(2):353–374. [PubMed: 9196919]
- Ciechanowski PS, Walker EA, Russo JE, Newman E, Katon WJ. Adult health status of women HMO members with posttraumatic stress disorder symptoms. *General Hospital Psychiatry* 2004;26(4):261–268. [PubMed: 15234820]
- Clum GA, Calhoun KS, Kimerling R. Associations among symptoms of depression and posttraumatic stress disorder and self-reported health in sexually assaulted women. *Journal of Nervous & Mental Disease* 2000;188:671–678. [PubMed: 11048816]
- Clum GA, Nishith P, Resick PA. Trauma-related sleep disturbance and self-reported physical health symptoms in treatment-seeking female rape victims. *Journal of Nervous & Mental Disease* 2001;189(9):618–622. [PubMed: 11580006]
- Coffey SF, Dansky BS, Falsetti SA, Saladin ME, Brady KT. Screening for PTSD in a substance abuse sample: Psychometric properties of a modified version of the PTSD symptom scale self-report. *Journal of Traumatic Stress* 1998;11(2):393–399. [PubMed: 9565924]
- Coker AL. Primary prevention of intimate partner violence for women's health: A response to plichta. *Journal of Interpersonal Violence* 2004;19(11):1324–1334. [PubMed: 15534334]
- Coker AL. Preventing intimate partner violence: How we will rise to this challenge. *American Journal of Preventive Medicine* 2006;30(6):528–529. [PubMed: 16704948]
- Coker AL, Davis KE, Arias I, Desai S, Sanderson M, Brandt HM, et al. Physical and mental health effects of intimate partner violence for men and women. *American Journal of Preventive Medicine* 2002;23(4):260–268. [PubMed: 12406480]
- Cooper M, Frone MR, Russell M, Mudar P. Drinking to regulate positive and negative emotions: A motivational model of alcohol use. *Journal of Personality & Social Psychology* 1995;69:990–1005. [PubMed: 7473043]
- Corrao G, Bagnardi V, Zambon A, La Vecchia C. A meta-analysis of alcohol consumption and the risk of 15 diseases. *Preventive Medicine* 2004;38(5):613–619. [PubMed: 15066364]
- Corrao G, Rubbiati L, Bagnardi V, Zambon A, Poikolainen K. Alcohol and coronary heart disease: A meta-analysis. *Addiction* 2000;95(10):1505–1523. [PubMed: 11070527]
- Darves-Bornoz J, Lepine J, Choquet M, Berger C, Degiovanni A, Gaillard P. Predictive factors of chronic post-traumatic stress disorder in rape victims. *European Psychiatry* 1998;13(6):281–287. [PubMed: 19698642]
- Di Castelnuovo A, Costanzo S, Bagnardi V, Donati MB, Iacoviello L, de Gaetano G. Alcohol dosing and total mortality in men and meta-analysis of 34 prospective studies. *Archives of Internal Medicine* 2006;166(22):2437–2445. [PubMed: 17159008]
- Dobie DJ, Kivlahan DR, Maynard C, Bush KR, Davis TM, Bradley KA. Posttraumatic stress disorder in female veterans: Association with self-reported health problems and functional impairment. *Archives of Internal Medicine* 2004;164(4):394–400. [PubMed: 14980990]
- El-Bassel N, Gilbert L, Witte S, Wu E, Gaeta T, Schilling R, et al. Intimate partner violence and substance abuse among minority women receiving care from an inner-city emergency department. *Women's Health Issues* 2003;13(1):16–22.
- Foa EB, Cashman L, Jaycox L, Perry KJ. The validation of a self-report measure of posttraumatic stress disorder: The Posttraumatic Diagnostic Scale. *Psychological Assessment* 1997;9:445–451.

- Frayne SM, Seaver MR, Loveland S, Christiansen CL, Spiro A 3rd, Parker VA, et al. Burden of medical illness in women with depression and posttraumatic stress disorder. *Archives of Internal Medicine* 2004;164(12):1306–1312. [PubMed: 15226164]
- Glover DA, Stuber M, Poland RE. Allostatic load in women with and without PTSD symptoms. *Psychiatry* 2006;69(3):191–203. [PubMed: 17040172]
- Gmel G, Gutjahr E, Rehm J. How stable is the risk curve between alcohol and all-cause mortality and what factors influence the shape? A precision-weighted hierarchical meta-analysis. *European Journal of Epidemiology* 2003;18(7):631–642. [PubMed: 12952136]
- Green CA, Perrin NA, Polen MR. Gender differences in the relationships between multiple alcohol consumption and physical and mental health. *Alcoholism: Clinical and Experimental Research* 2004;28(5):754–764.
- Griffin MG, Uhlmansiek MH, Resick PA, Mechanic MB. Comparison of the posttraumatic stress disorder scale versus the clinician-administered posttraumatic stress disorder scale in domestic violence survivors. *Journal of Traumatic Stress* 2004;17(6):497–503. [PubMed: 15730068]
- Jones L, Hughes M, Unterstaller U. Post-traumatic stress disorder (PTSD) in victims of domestic violence: A review of the research. *Trauma Violence & Abuse* 2001;2(2):99–119.
- Kessler RC, Crum RM, Warner LA, Nelson CB, Schulenberg J, Anthony JC. Lifetime co-occurrence of DSM-III-R alcohol abuse and dependence with other psychiatric disorders in the National Comorbidity Survey. *Archives of General Psychiatry* 1997;54(4):313–321. [PubMed: 9107147]
- Kessler RC, Sonnega A, Bromet E, Hughes M, Nelson CB. Posttraumatic stress disorder in the National Comorbidity Survey. *Archives of General Psychiatry* 1995;52(12):1048–1060. [PubMed: 7492257]
- Kilpatrick DG, Acierno R, Saunders B, Resnick HS, Best CL, Schnurr PP. Risk factors for adolescent substance abuse and dependence: Data from a national sample. *Journal of Consulting & Clinical Psychology* 2000;68(1):19–30. [PubMed: 10710837]
- Kimerling R, Baumrind N. Access to Specialty Mental Health Services Among Women in California. *Psychiatric Services* 2005;56:729–734. [PubMed: 15939951]
- Kimerling R, Calhoun KS. Somatic symptoms, social support, and treatment seeking among sexual assault victims. *Journal of Consulting & Clinical Psychology* 1994;62(2):333–340. [PubMed: 8201071]
- Kimerling R, Clum G, Wolfe J. Relationships among trauma exposure, chronic posttraumatic stress disorder symptoms, and self-reported health in women: replication and extension. *Journal of Traumatic Stress* 2000;13:115–128. [PubMed: 10761178]
- Krakow B, Melendrez D, Pedersen B, Johnston L, Hollifield M, Germain A, et al. Complex insomnia: Insomnia and sleep-disordered breathing in a consecutive series of crime victims with nightmares and PTSD. *Biological Psychiatry* 2001;49(11):948–953. [PubMed: 11377413]
- Lang AJ, Laffaye C, Satza LE, McQuaid JR, Malcarne VL, Dresselhaus TR, Stein MB. Relationships among childhood maltreatment, PTSD, and health in female veterans in primary care. *Child Abuse & Neglect* 2006;30(11):1281–1292. [PubMed: 17116330]
- Lang AJ, Rodgers CS, Laffaye C, Satz LE, Dresselhaus TR, Stein MB. Sexual trauma, posttraumatic stress disorder, and health behavior. *Behavioral Medicine* 2003;28(4):150–158. [PubMed: 14663922]
- Lauterbach D, Vora R, Rakow M. The relationship between posttraumatic stress disorder and self-reported health problems. *Psychosomatic Medicine* 2005;67:939–947. [PubMed: 16314599]
- Lawler C, Ouimette P, Dahlstedt D. Posttraumatic stress symptoms, coping, and physical health status among university students seeking health care. *Journal of Traumatic Stress* 2005;18(6):741–750. [PubMed: 16382439]
- Leserman J, Whetten K, Lowe K, Stangl D, Swartz MS, Thielman NM. How trauma, recent stressful events, and PTSD affect functional health status and health utilization in HIV-infected patients in the south. *Psychosomatic Medicine* 2005;67(3):500–507. [PubMed: 15911916]
- Lipsky S, Caetano R. Impact of intimate partner violence on unmet need for mental health care: results from the NSDUH. *Psychiatric Services* 2007;58(6):822–829. [PubMed: 17535943]
- Litz BT, Keane TM, Fisher L, Marx B, Monaco V. Physical health complaints in combat-related post-traumatic disorder: A preliminary report. *Journal of Traumatic Stress* 1992;5(1):131–141.

- Marshall RP, Jorm AF, Grayson DA, O'Toole BI. Posttraumatic stress disorder and other predictors of health care consumption by Vietnam veterans. *Psychiatric Services* (Washington, D.C 1998;49(12): 1609–1611.
- McFarlane A, Atchison M, Rafalowicz E, Papay P. Physical symptoms in post-traumatic stress disorder. *Journal of Psychosomatic Research* 1994;38(7):715–716. [PubMed: 7877126]
- Miller BA, Downs WR. The impact of family violence on the use of alcohol by women. *Alcohol Health & Research World* 1993;17(2):137–143.
- Mohr CD, Armeli S, Tennen H, Temple M, Todd M, Clark J, Carney MA. Moving beyond the keg party: A daily process study of college student drinking motivations. *Psychology of Addictive Behaviors* 2005;19:392–403.
- Morgan CA, Grillon C. Abnormal mismatch negativity in women with sexual assault-related posttraumatic stress disorder. *Biological Psychiatry* 1999;45(7):827–832. [PubMed: 10202569]
- Morland L, Goebert D, Onoye J, Frattarelli L, Derauf C, Herbst M, Matsu C, Friedman M. Posttraumatic stress disorder and pregnancy health: Preliminary update and implications. *Psychosomatics* 2007;48(4):304–308. [PubMed: 17600166]
- Najavits LM, Weiss RD, Shaw SR. The link between substance abuse and posttraumatic stress disorder in women: A research review. *American Journal on Addictions* 1997;6:273–283. [PubMed: 9398925]
- Norris F, Slone L, Baker C, Murphy A. Early physical health consequences of disaster exposure and acute disaster-related PTSD. *Anxiety, Stress and Coping* 2006;19:95–110.
- Ouimette P, Cronkite R, Prins A, Moos R. Posttraumatic stress disorder, anger and hostility, and physical health status. *The Journal of Nervous and Mental Disease* 2004;192(8):563–566. [PubMed: 15387159]
- Ouimette P, Goodwin E, Brown PJ. Health and well being of substance use disorder patients with posttraumatic stress disorder. *Addictive Behaviors* 2006;31(8):1415–1423. [PubMed: 16380217]
- Ouimette PC, Wolfe J, Chrestman KR. Characteristics of posttraumatic stress disorder-alcohol abuse comorbidity in women. *Journal of Substance Abuse* 1996;8(3):335–346. [PubMed: 8934438]
- Penley JA, Tomaka J, Wiebe JS. The association of coping to physical and psychological health outcomes: A meta-analytic review. *Journal of Behavioral Medicine* 2002;25:551–603. [PubMed: 12462958]
- Pennebaker, JW.; Brittingham, GL. Environmental and sensory cues affecting the perception of physical symptoms. In: Baum, A.; Singer, J., editors. *Advances in environmental psychology*. Vol. 4. Hillsdale, NJ: Erlbaum; 1982. p. 115-136.
- Plichta S. The effects of woman abuse on health care utilization and health status: A literature review. *Women's Health Issues* 1992;2(3):154–163.
- Plichta SB. Intimate partner violence and physical health consequences: Policy and practice implications. *Journal of Interpersonal Violence* 2004;19(11):1296–1323. [PubMed: 15534333]
- Rehm J, Gmel G, Semplos CT, Trevisan M. Alcohol-related morbidity and mortality. *Alcohol Research Health* 2003;27(1):39–51. [PubMed: 15301399]
- Rehm J, Greenfield TK, Rogers JD. Average volume of alcohol consumption, patterns of drinking, and all-cause mortality: Results from the US National Alcohol Survey. *American Journal of Epidemiology* 2001;153(1):64–71. [PubMed: 11159148]
- Rehm J, Monteiro M. Alcohol consumption and burden of disease in the Americas: Implications for alcohol policy. *Pan American Journal of Public Health* 2005;18(4–5):241–248. [PubMed: 16354420]
- Resnick HS, Acierno R, Kilpatrick DG. Health impact of interpersonal violence: II. Medical and mental health outcomes. *Behavioral Medicine* 1997;23(2):65–78. [PubMed: 9309346]
- Rice C, Mohr CD, Del Boca FK, Mattson ME, Young L, Brady K, et al. Self-reports of physical, sexual and emotional abuse in an alcoholism treatment sample. *Journal of Studies on Alcohol* 2001;62(1): 114–123. [PubMed: 11271959]
- Room R, Babor T, Rehm J. Alcohol and public health. *Lancet* 2005;365(9458):519–530. [PubMed: 15705462]
- Roy-Byrne PP, Noonan C, Afari N, Buchwald D, Goldberg J. Is the association between posttraumatic stress disorder symptoms and poor health due to a common familial or genetic factor? *General Hospital Psychiatry* 2006;28(5):408–413. [PubMed: 16950376]

- Savarese VW, Suvak MK, King LA, King DW. Relationships among alcohol use, hyperarousal, and marital abuse and violence in Vietnam veterans. *Journal of Traumatic Stress* 2001;14(4):717–732. [PubMed: 11776419]
- Schnurr PP, Friedman MJ, Sengupta A, Jankowski MK, Holmes T. PTSD and utilization of medical treatment services among male Vietnam veterans. *The Journal of Nervous and Mental Disease* 2000;188(8):496–504. [PubMed: 10972568]
- Schnurr PP, Green BL. Understanding relationships among trauma, post-traumatic stress disorder, and health outcomes. *Advances in Mind-Body Medicine* 2004;20(1):18–29. [PubMed: 15068106]
- Schnurr PP, Spiro A 3rd. Combat exposure, posttraumatic stress disorder symptoms, and health behaviors as predictors of self-reported physical health in older veterans. *Journal of Nervous & Mental Disease* 1999;187(6):353–359. [PubMed: 10379722]
- Shalev A, Bleich A, Ursano RJ. Posttraumatic stress disorder: Somatic comorbidity and effort tolerance. *Psychosomatics* 1990;31(2):197–203. [PubMed: 2330402]
- Shaper AG. The “unhealthy abstainers” question is still important. *Addiction* (Abingdon, England) 1995;90(4):488–490. discussion 493–488.
- Shaper AG, Wannamethee SG. The J-shaped curve and changes in drinking habit. Novartis Foundation symposium 1998;216:173–188. discussion 188–192. [PubMed: 9949793]
- Sobell LC, Brown J, Leo GI, Sobell MB. The reliability of the Alcohol Timeline Followback when administered by telephone and by computer. *Drug & Alcohol Dependence* 1996;42(1):49–54. [PubMed: 8889403]
- Sobell, LC.; Sobell, MB. Timeline follow-back: A technique for assessing self-reported alcohol consumption. Litten, Raye Z., editor. Allen; 1992. p. 228pp
- Standridge JB, Zylstra RG, Adams SM. Alcohol consumption: An overview of benefits and risks. *Southern Medical Journal* 2004;97(7):664–672. [PubMed: 15301124]
- Stewart SH, Chambers L. Relationships between drinking motives and drinking restraint. *Addictive Behavior* 2000;25:269–274.
- Stewart SH, Mitchell TL, Wright KD, Loba P. The relations of PTSD symptoms to alcohol use and coping drinking in volunteers who responded to the Swissair Flight 111 airline disaster. *Journal of Anxiety Disorders* 2004;18(1):51–68. [PubMed: 14725868]
- Stewart SH, Pihl RO, Conrod PJ, Dongier M. Functional associations among trauma, PTSD and substance-related disorders. *Addictive Behaviors* 1998;23(6):797–812. [PubMed: 9801717]
- Straus MA. Measuring intrafamily conflict and violence: The conflict tactics (CT) scales. *Journal of Marriage & the Family* 1979;41(1):75–88.
- 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(3):283–316.
- Stranges S, Notaro J, Freudenheim JL, Calogero RM, Muti P, Farinaro E, Russell M, Nochajski TH, Trevisan M. Alcohol drinking pattern and subjective health in a population-based study. *Addiction* 2006;101(9):1265–1276. [PubMed: 16911725]
- Tabachnik, BG.; Fidell, LS. Using multivariate statistics. Needham Heights, MA: Allyn & Bacon; 2001.
- Testa M, Leonard KE. The impact of marital aggression on women’s psychological and marital functioning in a newlywed sample. *Journal of Family Violence* 2001;16(2):115–130.
- Testa M, Livingston JA, Leonard KE. Women’s substance use and experiences of intimate partner violence: A longitudinal investigation among a community sample. *Addictive Behaviors* 2003;28:1649–1664. [PubMed: 14656551]
- Trief PM, Ouimette P, Wade M, Shanahan P, Weinstock RS. Post-traumatic stress disorder and diabetes: Co-morbidity and outcomes in a male veteran sample. *Journal of Behavioral Medicine* 2006;29(5):411–418. [PubMed: 16865552]
- Uchino BN, Uno D, Holt-Lunstad J. Social support, physiological processes, and health. *Current Directions in Psychological Science* 1999;8:145–148.
- Ullman SE, Brecklin LR. Sexual assault history and health-related outcomes in a national sample of women. *Psychology of Women Quarterly* 2003;27(1):46–57.

- Ullman SE, Filipas HH, Townsend SM, Starzynski LL. Trauma exposure, posttraumatic stress disorder and problem drinking in sexual assault survivors. *Journal of Studies on Alcohol* 2005;66(5):610–619. [PubMed: 16331846]
- Wagner AW, Wolfe J, Rotnitsky A, Proctor SP, Erickson DJ. An investigation of the impact of posttraumatic stress disorder on physical health. *Journal of Traumatic Stress* 2000;13(1):41–55. [PubMed: 10761173]
- Walker EA, Katon W, Russo J, Ciechanowski P, Newman E, Wagner AW. Health care costs associated with posttraumatic stress disorder symptoms in women. *Archives of General Psychiatry* 2003;60(4):369–374. [PubMed: 12695314]
- Wannamethee SG, Shaper AG. Lifelong teetotallers, ex-drinkers and drinkers: Mortality and the incidence of major coronary heart disease events in middle-aged British men. *International Journal of Epidemiology* 1997;26(3):523–531. [PubMed: 9222777]
- Weinbaum Z, Stratton TL, Chavez G, Motylewski-Link C, Barrera N, Courtney JG. Female victims of intimate partner physical domestic violence (IPP-DV), California 1998. *American Journal of Preventive Medicine* 2001;21(4):313–319. [PubMed: 11701303]
- White IR, Altmann DR, Nanchahal K. Alcohol consumption and mortality: Modelling risks for men and different ages. *BMJ* 2002;325(7357):191. [PubMed: 12142306]
- Wingood GM, DiClemente RJ, Raj A. Adverse consequences of intimate partner abuse among women in non-urban domestic violence shelters. *American Journal of Preventive Medicine* 2000;19(4):270–275. [PubMed: 11064231]
- Wisner CL, Gilmer TP, Saltzman LE, Zink TM. Intimate partner violence against women: Do victims cost health plans more? *The Journal of Family Practice* 1999;48(6):439–443. [PubMed: 10386487]
- Wolfe J, Schnurr PP, Brown PJ, Furey J. Posttraumatic stress disorder and war-zone exposure as correlates of perceived health in female Vietnam War veterans. *Journal of Consulting & Clinical Psychology* 1994;62(6):1235–1240. [PubMed: 7860822]
- Woods AB, Page GG, O'Campo P, Pugh LC, Ford D, Campbell JC. The mediation effect of posttraumatic stress disorder symptoms on the relationship of intimate partner violence and IFN-gamma levels. *American Journal of Community Psychology* 2005;36(1–2):159–175. [PubMed: 16134052]
- Zatzick DF, Jurkovich GJ, Gentilello L, Wisner D, Rivara FP. Posttraumatic stress, problem drinking, and functional outcomes after injury. *Archives of Surgery (Chicago, Ill)* 2002;137(2):200–205.
- Zatzick DF, Russo JE, Katon W. Somatic, posttraumatic stress, and depressive symptoms among injured patients treated in trauma surgery. *Psychosomatics* 2003;44(6):479–484. [PubMed: 14597682]
- Zatzick DF, Weiss DS, Marmar CR, Metzler TJ, Wells K, Golding JM, et al. Post-traumatic stress disorder and functioning and quality of life outcomes in female Vietnam veterans. *Military Medicine* 1997;162(10):661–665. [PubMed: 9339077]
- Zlotnick C, Bruce SE, Weisberg RB, Shea TM, Machan JT, Keller MB. Social and health functioning in female primary care patients with post-traumatic stress disorder with and without comorbid substance abuse. *Comprehensive Psychiatry* 2003a;44(3):177–183. [PubMed: 12764704]
- Zlotnick C, Najavits LM, Rohsenow DJ, Johnson DM. A cognitive-behavioral treatment for incarcerated women with substance abuse disorder and posttraumatic stress disorder: Findings from a pilot study. *Journal of Substance Abuse Treatment* 2003b;25(2):99–105. [PubMed: 14629992]
- Zoellner LA, Goodwin ML, Foa EB. PTSD severity and health perceptions in female victims of sexual assault. *Journal of Traumatic Stress* 2000;13(4):635–649. [PubMed: 11109236]

Fig. 1. Posttraumatic Stress Disorder, Drinking Pattern, and Health Concerns. *Note.* PTSD = Posttraumatic stress disorder. PILL = Pennebaker Inventory of Limbic Languidness. PTSD > No PTSD, $P < .001$. Abstainer = Regular/Heavier drinker > Infrequent/light drinker, $P < .05$

Table 1
Means and standard deviations of injuries and physical health concerns by PTSD diagnosis and drinking pattern

	<u>Abstainer</u>		<u>Infrequent/light drinker</u>		<u>Frequent/heavy drinker</u>	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
<i>Modified conflict tactics scale—injuries</i>						
PTSD positive	25.33	26.40	25.91	22.77	27.00	24.85
PTSD negative	18.38	17.32	12.72	19.76	23.53	20.82
<i>Pennebaker inventory limbic languidness</i>						
PTSD positive	27.03	15.07	11.73	10.72	27.15	14.79
PTSD negative	15.20	12.95	18.03	21.34	19.18	15.07