Intimate Relationships Among Returning Soldiers: The Mediating and Moderating Roles of Negative Emotionality, PTSD Symptoms, and Alcohol Problems

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Research examining relationship quality among combat veterans largely focuses on the role of posttraumatic stress disorder (PTSD), with less attention devoted to other correlates of PTSD and relationship quality, such as personality and problematic drinking. In a sample of combat-exposed National Guard soldiers recently returned from Iraq ($N = 308$), we examined (a) a meditational pathway from negative emotionality, to elevated postdeployment PTSD symptoms, to poorer relationship quality; and (b) the moderating role of problematic drinking. Moderated mediation regression strategies supported the mediating role of postdeployment PTSD symptoms, but not the moderating role of problematic drinking on soldiers’ relationship quality. Findings suggest negative emotionality creates a vulnerability to more severe early postdeployment PTSD symptoms and poorer early postdeployment relationship quality.

Operation Enduring Freedom (OEF) and Operation Iraqi Freedom (OIF) veterans, especially those with mental health concerns, are expressing growing difficulties with intimate relationships. Between initial postdeployment mental health screenings, Milliken, Auchterlonie, and Hoge (2007) found concerns about interpersonal relationships for OIF veterans increased at rates greater than any other concern assessed. Additionally, over 75% of partnered OEF and OIF veterans referred for Veterans Affairs (VA) behavioral health evaluations endorsed problems with romantic relationships or their children, and over 50% reported mild to moderate intimate partner violence (IPV; Sayers, Farrow, Ross, & Oslin, 2009). Consistent with previous generations of veterans (see Galovski & Lyons, 2004), posttraumatic stress disorder (PTSD) symptoms among OEF and OIF veterans are associated with poorer relationship satisfaction as reported by both male veterans and their female partners (Nelson Goff, Crow, Reisbig, & Hamilton, 2007; Renshaw, Rodrigues, & Jones, 2008). Efforts to understand how PTSD symptoms impact intimate relationships highlight specific PTSD symptoms, including emotional numbing, hyperarousal, and anger (see Galovski & Lyons, 2004 for review). Posttraumatic stress disorder-related emotional numbing may promote emotional...
withdrawal from intimate relationships and with it, decreased positive engagement, intimacy, and opportunity for effective and validating communication. Additionally, angry outbursts can reduce the frequency and effectiveness of communication, problem solving, and social support (Sherman, Zanotti, & Jones, 2005).

Research examining PTSD and intimate relationship functioning suffers a number of limitations. Posttraumatic stress disorder symptoms and relationship distress are often studied in isolation and cross-sectionally, rather than investigating how individual and couple difficulties develop over time, who is likely to experience such difficulties, or how known correlates of both PTSD symptoms and couple distress impact their co-occurrence. An overly restricted focus on PTSD symptoms and relationship functioning fails to address how additional frequent comorbid or preexisting conditions (e.g., substance use, depression, borderline traits, antisociality, and neuroticism) may affect relationship quality, so causal chains of difficulties and predisposing factors remain unknown. Additionally, research extending findings to OEF and OIF veterans is scarce. The present study examines the contribution of the preexisting negative emotionality (neuroticism) and comorbid problem drinking to the association between postdeployment PTSD symptoms and relationship distress among OIF soldiers.

NEGATIVE EMOTIONALITY

Negative emotionality represents the tendency to experience negative emotional states such as anxiety or irritability, react poorly to stress, and respond out of proportion to circumstances (Clark, Watson, & Mineka, 1994; McCrae & Costa, 2003). Unlike symptoms of PTSD, negative emotionality refers to general negative affectivity, is not specifically tied to traumatic events, presents early in life, and demonstrates longitudinal stability across the lifespan (e.g., Bowman, 1999). Research demonstrates that PTSD and negative emotionality are clearly related (Rubin, Bernsten, & Bohm, 2008) but distinct, in both cross-sectional and prospective, longitudinal studies (Englehard, van den Hout, & Kindt, 2003; Rubin et al., 2008). A recent meta-analysis found a weighted average association between negative emotionality and PTSD symptoms of .43 and .25 among prospective studies (Rubin et al., 2008). Negative emotionality appears to magnify the impact of trauma on PTSD symptoms and predispose individuals to PTSD (Bowman, 1999; Lauterbach & Vrana, 2001; Miller, 2003).

Negative emotionality also has negative implications for relationship functioning. Of the five broad personality factors consistently demonstrated in the literature (i.e., neuroticism, extraversion, conscientiousness, agreeableness, and openness to experience; McCrae & Costa, 1987), negative emotionality scores demonstrate the most dependable and strongest associations with relationship functioning (Karney & Bradbury, 1995; Robins, Caspi, & Moffitt, 2000). Negative emotionality is linked both cross-sectionally and in longitudinal research to dissatisfaction in romantic relationships (e.g., Eysenck & Wakefield, 1981; Karney & Bradbury, 1995; Thomsen & Gilbert, 1998) and relationship instability (e.g., Karney & Bradbury, 1995), with associations found up to 40 years later (Kelly & Conley, 1987). Further, negative emotionality has been linked to destructive interpersonal behaviors associated with relationship quality, including yelling, criticism (Caughlin, Huston, & Houts, 2000), hostility, and lack of warmth (Donnellan, Conger, & Bryant, 2004).

Research examining negative emotionality and relationship functioning has drawn primarily on community rather than veteran samples. The extent to which the severity of combat-related PTSD influences associations between negative emotionality and relationship quality is unknown. For soldiers recently returned from combat deployments, severity of PTSD-related distress may provide a vehicle through which negative emotionality harms intimate relationships. That is, a mediating relationship may exist where negative emotionality predisposes individuals to more severe symptoms of PTSD following combat exposure, and these symptoms then translate into poorer quality of romantic relationships.

PROBLEMATIC ALCOHOL USE

Among men with PTSD, alcohol abuse or dependence is the most common comorbid disorder (Kessler, Sonnaga, Bromet, Hughes, & Nelson, 1995; Kulka et al., 1990), with lifetime rates as high as 75% among Vietnam veterans with PTSD (Kulka et al., 1990). Although the mechanism for this relationship remains unclear and likely varies between individuals, a substantial body of longitudinal evidence suggests that alcohol use often follows trauma exposure, implying that alcohol use may function as “self-medication” to reduce the distress of PTSD symptoms (Jacobson, Southwick, & Kosten, 2001). Additionally, in a systematic review, Marshal (2003) concluded that problematic and heavy drinking has a clear and consistent association with marital dissatisfaction, negative couple interaction patterns, and IPV, and poses a chronic stressor to marriages, decreasing relationship functioning and increasing negative family interactions (Halford, Bouma, Kelly, & Young, 1999; O’Farrell & Rotunda, 1997).

The nature of the impact of alcohol problems on relations between PTSD and relationship quality remains poorly understood. The causes of alcohol use among OIF soldiers are likely diverse and may include celebrating reunification with family and friends, stress associated with reintegration, and self-medicating depressive and PTSD symptoms. Regardless of its impetus, alcohol use may increase destructive communication, anger, and emotional withdrawal, especially among those at risk for such behavior (e.g., those with PTSD), amplifying associations between PTSD symptoms and relationship discord. As a result, problematic alcohol may exacerbate (i.e., moderate) associations between PTSD symptoms and relationship quality; a hypothesis supported in at least one study examining IPV perpetration (Savarese, Suvak, King, & King, 2001).
Meis et al.

METHOD

Participants and Procedure

Participants were drawn from the Readiness and Resilience in National Guard Soldiers project, a prospective longitudinal study of 522 Army National Guard soldiers deployed to Iraq (Polusny et al., 2009). Participants were surveyed 1 month prior to a 16-month deployment and again 2–3 months following their return using postcard reminders, repeated mailings, and $50 incentive (postdeployment response rate = 81%). Postdeployment responders were similar to nonresponders in gender, rank, or preddeployment vulnerability features, protective factors, or PTSD symptoms. Noncompleters were significantly younger, less educated, and more likely non-White and unmarried than completers (Polusny et al., 2009). The present study included those in romantic relationships at postdeployment (N = 310), endorsing at least one item consistent with combat exposure on the Combat Experiences Scale (King, King, & Vogt, 2003; n = 308). The average respondent (277 male; 31 female) was 31 years old (SD = 9; range = 18 to 57), primarily White (95.8%), and had 14.6 years of education (SD = 2.1). Thirteen (13.4%) percent had a high school diploma/general equivalency diploma, 40.3% attended some college, 39.0% had a college degree, and 6.9% had advanced degrees. Most were currently employed (61.6%) and married or living with a partner (64.8%) and half (50.6%) had at least one child.

Measures

The Abbreviated Dyadic Adjustment Scale (Sharpley & Rogers, 1984), a 7-item version of the widely used Dyadic Adjustment Scale (Spanier, 1976), was used to measure post-deployment relationship adjustment (α = .86). Two additional indices of postdeployment relationship quality were extracted from the Navy

Figure 1. Postdeployment posttraumatic stress disorder (PTSD) symptoms mediating associations between negative emotionality and relationship quality.

Figure 2. Moderated mediation.
Quality of Life Survey (Wilcove, 2005), including respondents’ ratings on a single 7-point Likert scale item assessing overall relationship satisfaction (i.e., “How satisfied are you OVERALL in each of these areas: Marriage/Intimate Relationship?”) and the total score on the Marriage/Intimate Relationship Satisfaction Scale (Navy Quality of Life Relationship Satisfaction Scale; eight items) assessing satisfaction across multiple areas of couple functioning ($\alpha = .92$).

The PTSD Checklist (Weathers, Litz, Herman, uska, & Keane, 1993) assessed PTSD symptomatology before (civilian version) and following deployment (military version) across 17 symptoms mapping onto diagnostic criteria ($\alpha = .94$). Posttraumatic stress disorder symptom severity was used as a continuous variable in primary analyses. Associations with screening status for PTSD (i.e., score of 50 or higher and at least moderate ratings on one Criterion B, three Criterion C, and two Criterion D symptoms; Weathers et al., 1993; Hoge, Castro, Messer, McGurk, Cotting, & Koffman, 2004) are also presented. The Alcohol Use Disorder Test (AUDIT; Babor, Higgins-Biddle, Saunders, & Monteiro, 2001) measured self-reported problems with postdeployment alcohol use, including quantity/frequency of alcohol use and degree of hazardous drinking ($\alpha = .84$; scores of 8 or higher indicate probable hazardous drinking).

Prior to deployment, negative emotionality was assessed using an abbreviated version of the Negative Emotionality/Neuroticism scale of the Minnesota Multiphasic Personality Inventory-2 (MMPI-2) Psychopathy Five scales (Harkness, McNulty, & Ben-Porath, 1995). The abbreviated scale consisted of 23 of the original 33 MMPI-2 items ($\alpha = .83$). Finally, prior to deployment, participants were administered the Deployment Risk and Resilience Inventory, Prior Stressors Scale (King et al., 2003), which assesses exposure to potentially traumatic events (e.g., domestic violence, physical assault, sexual abuse, combat duty; $\alpha = .76$).

**Data Analysis**

To avoid inflating the number of comparisons made using multiple outcome measures of similar constructs, we created a composite index of relationship quality and satisfaction by averaging participants’ standardized scores on the three highly intercorrelated relationship quality indices: Abbreviated Dyadic Adjustment Scale, Navy Quality of Life Relationship Satisfaction Scale, and the single item assessing relationship satisfaction from the Navy Quality of Life Scale. Hypotheses 1 and 2 were examined through estimating simple indirect effects (Figure 1). Hypothesis 3 integrated AUDIT scores into the meditational model (i.e., moderated mediation; Figure 2). To isolate combat-related PTSD symptoms from PTSD secondary to prior trauma, we controlled for predeployment exposure to potential traumatic events and predeployment PTSD symptoms. Given recommendations for caution in selecting covariates (Meehl, 1971; Miller & Chapman, 2001), secondary analyses were performed omitting covariates.

Simple indirect effects were tested through an application for SPSS (Preacher & Hayes, 2008), which includes a formal test of the indirect effect (i.e., negative emotionality on relationship quality through postdeployment PTSD symptoms, path $ab$; Figure 1), traditional steps required by Baron and Kenny (1986), and covariates. This macro bootstraps the sampling distribution for $ab$, avoiding the often-violated assumption underlying Sobel’s (1982) method that the sampling distribution of $ab$ be normal (Bollen & Stine, 1990). This approach was chosen over Baron and Kenny’s (1986) causal steps approach because it (a) provides a direct test of indirect (or mediating) effects, (b) is a more sensitive test of mediation, and (c) reduces the opportunity for incorrect conclusions amplified by the multiple significance tests required by the causal steps approach (Hayes, 2009). However, because the causal steps approach remains in wide use, we present results from Baron and Kenny’s approach as well.

Moderated mediation (Hypothesis 3) in the present context is demonstrated when the association between the interaction term ($mb$; Figure 2) and relationship quality is significant and the indirect effect varies with the moderator. This hypothesis was tested through an SPSS macro (Preacher, Rucker, & Hayes, 2007) probing moderated effects through testing conditional indirect effect at different levels of the moderator and providing recommended bootstrapped confidence intervals. Due to limited amounts of missing data (four cases), missing cases were dropped from tests of the primary hypotheses.

**RESULTS**

See Table 1 for descriptive statistics and correlations. Results showed 15.8% screened positive for PTSD, 22.1% for relationship distress (Abbreviated Dyadic Adjustment Scale score lower than 21.5; Rogge & Funk, 2007), and 30.5% for hazardous drinking/possible alcohol dependence (Babor et al., 2001). Soldiers with positive PTSD screens were more likely to screen positive for relationship distress than those with negative PTSD screens, 33.3% vs. 19.6%, $\chi^2 (1, N = 295) = 4.23$, $p < .05$. Soldiers with positive hazardous drinking screens were more likely to screen positive for PTSD than those with negative hazardous drinking screens, 36.6% versus 29.2%, $\chi^2 (1, N = 304) = 43.47$, $p < .001$, but those screening positive for hazardous drinking were no more likely to screen positive for relationship distress than those with negative drinking screens, 24.4% versus 21.1%, $\chi^2 < (1, N = 299, n.s.)$.

**Simple Mediation**

Using bootstrapping, the simple indirect effect was significant (Table 2), as indicated by 95% confidence intervals around the indirect effect that did not contain values of zero. As discussed
### Table 1. Descriptive Statistics and Correlations Among Study Variables

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<td>.37**</td>
<td>.18*</td>
<td>.26**</td>
<td>.20**</td>
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<td>-.14*</td>
<td>-.16*</td>
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<td>.16*</td>
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<td></td>
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<td>.61**</td>
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<td>Prior stressors</td>
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<td>.21**</td>
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<td>-.18*</td>
<td>.13*</td>
<td>-.20**</td>
<td>.23**</td>
<td>.07</td>
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*Note. Missing correlations are presented as chi-square tests in text. + = Positive screen; NEM = negative emotionality; PTSD = posttraumatic stress disorder. AUDIT = Alcohol Use Disorder Test; ADAS = Abbreviated Dyadic Adjustment Scale; NQOLS-MIRS = Navy Quality of Life Scale: Marriage/Intimate Relationship Satisfaction scale; NQOLS-SAT = Single item assessing relationship satisfaction from NQOLS; Relationship quality = aggregate of z-scores from ADAS, NQOL-SAT, and NQOL-MIRS; Pre-depl = assessed prior to deployment; Prior stressors = exposure to potentially traumatic events prior to deployment. *p < .05. **p < .001.

### Table 2. Hypothesis 1 and 2: Simple Mediation

<table>
<thead>
<tr>
<th>Indirect effects</th>
<th>M</th>
<th>SE</th>
<th>LL 95% CI</th>
<th>UL 95% CI</th>
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<td>-.03</td>
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<table>
<thead>
<tr>
<th>Causal steps approach (Baron &amp; Kenny, 1986)</th>
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<th>SE</th>
<th>t</th>
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<td>Step 1: Path a</td>
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<td>0.22</td>
<td>3.12**</td>
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<td>Step 2: NEM and relationship quality</td>
<td>−0.01</td>
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<td>Step 3: Path b</td>
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<td>0.00</td>
<td>−5.10***</td>
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<tr>
<td>Step 4: Path c'</td>
<td>−0.00</td>
<td>0.02</td>
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<table>
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<tr>
<th>Partial effect of control variables on relationship quality</th>
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<tr>
<td>Predeployment potentially traumatic events</td>
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<td>0.02</td>
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<tr>
<td>Predeployment PTSD severity</td>
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*Note. N = 304; Bootstrap sample size = 5000; b = unstandardized regression coefficient; LL = lower limit; UL = upper limit; CI = Confidence Interval. Model summary for DV model: $R^2 = .13$, Adj $R^2 = .12$, $F(4, 299) = 11.28$, $p < .001$. NEM = negative emotionality; PTSD = posttraumatic stress disorder symptoms. *p < .05. **p < .001. ***p < .001.

above, we also evaluated the indirect effect using the causal steps approach (Baron & Kenny, 1986). Negative emotionality was significantly associated with postdeployment PTSD symptoms (Step 1). Negative emotionality and relationship quality were not significantly associated after controlling for predeployment potential trauma exposure and PTSD symptoms (Step 2). However, recent theory and methodological research recommends against requiring this step to assume mediation as it seriously reduces power for mediation tests, particularly when independent and dependent variables are distal and is not necessary for mediated effects to be...
Table 3. Hypothesis 3: Moderated mediation

<table>
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<td></td>
<td>$b$</td>
<td>$SE$</td>
<td>$t$</td>
<td>$p$</td>
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<td>Path $mb$</td>
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Indirect effects at varying levels of problematic alcohol use with bootstrapping

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<tr>
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<tr>
<td>$M (.00)$</td>
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<td>−2.59*</td>
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<td>−2.00*</td>
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Covariates

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<tr>
<th>Predeployment IV</th>
<th>Postdeployment DV</th>
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<th>$SE$</th>
<th>$t$</th>
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<tr>
<td>Traumatic events</td>
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</table>

Note. $N = 304$. Bootstrap sample size $= 5000$. $b =$ unstandardized regression coefficients; Traumatic events = potentially traumatic events from the Prior Stressors scale of the Deployment Risk and Resilience Inventory; PTSD = posttraumatic stress disorder symptoms; IV = independent variable; DV = dependent variable.

$^*$ $p < .05$. $^{**}p < .001$. $^{***}p < .001$.

Moderated Mediation

Contrary to hypotheses, after controlling for predeployment PTSD symptoms and potential trauma exposure, the interaction term (AUDIT $\times$ Postdeployment PTSD Symptoms; path $mb$) was not significantly associated with relationship quality (see Table 3), indicating associations between PTSD symptoms and relationship quality were not significantly exacerbated by greater problematic alcohol use. $^1$ No differences were found when examining the same model without covariates.

Discussion

Our results are consistent with a causal meditational chain where negative emotionality predisposes combat-exposed soldiers to more severe PTSD symptoms which, in turn, contribute to poorer intimate relationship quality. The formal test of this indirect effect was significant. The traditional causal steps approach (e.g., Baron & Kenny, 1986) was also consistent with mediation, after relaxing the requirement for a significant initial path from negative emotionality to relationship functioning through PTSD symptom severity. Analyses omitting covariates were consistent with conclusions, with one exception: Without covariates included, the initial association between negative emotionality and relationship quality was significant, $b = −.03$, $SE = .01$, $p < .05$.

$^1$ To examine the potential role of multicollinearity due to the simultaneous entry of main effects and interaction terms, we also conducted hierarchical regression analyses, entering the main effects prior to the interaction term. Results were consistent with those presented here.
emotionality to relationship quality, consistent with recommendations (Hayes, 2009; MacKinnon et al., 2000; Shrout & Bolger, 2002).

Examination of specific paths within the simple indirect effect indicated that higher levels of preexisting negative emotionality predicted higher levels of postdeployment PTSD symptoms. This is consistent with existing literature suggesting negative emotionality creates vulnerability for more severe symptoms of PTSD (Rubin et al., 2008). However, the effect size was modest ($r = -0.14$) considering the robust associations in the larger literature, perhaps due to the approximately 1.5 years between assessment points or the broad nature of the relationship quality index. Larger effects may be found for specific relationship functioning indices (e.g., IPV, conflict).

Postdeployment PTSD symptoms were then significantly associated with lower relationship quality, even after accounting for prior trauma exposure and preexisting PTSD symptoms. Acute postdeployment PTSD symptoms present a new relationship stressor for these couples who may struggle with unanticipated changes in relationship quality caused by PTSD, including increased irritability and anger, difficulties expressing feelings, problems connecting to their partners, and decreased focus and concentration. The novelty of these new difficulties may be particularly distressing and partially explain why postdeployment PTSD symptoms remain consistently and robustly associated with relationship quality above and beyond preexisting negative emotionality, preexisting PTSD, prior exposure to potentially traumatic events, and postdeployment problem drinking. Overall, 16% screened positive for probable PTSD, 22% for relationship distress, and 31% for hazardous drinking. Those with probable PTSD were more likely to experience relationship distress than those without probable PTSD (33% vs. 20%). The prevalence of positive screens for postdeployment PTSD is consistent with rates documented in the literature (Tanielian & Jaycox, 2008).

Results of this study did not support the hypothesis that, within the above meditational analysis, problematic alcohol use moderates the impact of postdeployment PTSD symptoms on relationship quality. Although problem drinking was significantly correlated with relationship quality and postdeployment PTSD symptoms, the absence of an interaction between postdeployment PTSD symptoms and problem drinking was surprising, given the high rates of comorbidity between problematic alcohol use and both PTSD symptoms (Kessler et al., 1995; Kulkä et al., 1990) and marital dissatisfaction (Marshall, 2003). As soldiers in this sample recently returned from OIF, perhaps their problem drinking had yet to translate into poorer relationship quality above or beyond the impact PTSD symptom severity. Consistent with what has been described as a “honeymoon” period during the initial months of reintegration (Logan, 1987), positive feelings associated with reunion may buffer associations between hazardous drinking and intimate relationship quality. However, with time, problem drink-

ing may interfere with soldiers’ functioning, leading to greater conflict over drinking and relationship distress.

Our design aids in speaking to causality through a longitudinal design and control for the trauma exposure and PTSD symptoms prior to deployment. However, both postdeployment PTSD symptoms and relationship quality were assessed simultaneously. Design limitations prevent discounting that relationship functioning causes or exacerbates PTSD symptoms. A feedback loop may exist between postdeployment PTSD symptoms and relationship quality, such that PTSD symptoms increase problems in intimate relationships, and relationship dissatisfaction exacerbates PTSD. Associations between these concurrently measured variables may be artificially inflated compared to longitudinal associations with negative emotionality. Additional assessment waves can aid in examining PTSD symptoms and relationship quality longitudinally. Future research is needed to replicate these findings using alternative measures of negative emotionality, structured diagnostic interviews, and additional relationship constructs including conflict, IPV, and intimacy.

Although we controlled for predeployment exposure to potentially traumatic events and PTSD symptoms, predeployment relationship functioning was not assessed. Future studies should assess soldiers’ relationship functioning prior to deployment to examine changes postdeployment. Second, small numbers of women in this cohort ($n = 31$), precluded the investigation of gender differences. Additional research is needed to examine the impact of gender on these associations and intimate partners’ reports and perspectives. Finally, though our sample is drawn from an important and understudied population, it consisted of mostly White National Guard soldiers from the Midwest. Findings may not generalize to other groups (e.g., enlisted Army soldiers, veterans seeking treatment for PTSD, or ethnically diverse samples from other regions). Additionally, we examined PTSD symptom severity, rather than the presence or absence of diagnosis. Findings may not generalize to samples entirely of those with a PTSD diagnosis. However, research considering PTSD as a continuous and dimensional construct is more applicable to the larger population of OIF soldiers, and subthreshold PTSD symptoms are associated with clinically significant impairment, distress (Kulka et al., 1990; Stein, Walker, Hazen, & Forde, 1997; Weiss et al., 1992), and similar help-seeking behavior as those meeting full criteria for PTSD (Stein et al., 1997).

To prevent returning soldiers from developing chronic relationship problems found among previous generations of veterans with symptoms of PTSD (Galovski & Lyons, 2004), we must better understand how PTSD symptoms and relationship distress co-occur, including developing sophisticated understandings of their interplay over time and the role of additional problems. Work is needed to continue to identify which soldiers are at risk for problems in their intimate relationships, how these problems develop, and factors that strengthen or weaken associations to inform
research and intervention. Only through expanding models to include broader, longitudinal conceptualizations and related problems, such as those presented here, can we fully understand how PTSD symptoms and relationship quality interact.

REFERENCES


