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ORIGINAL ARTICLE

Posttraumatic Stress Disorder Symptoms, Relationship Adjustment, and Relationship Aggression in a Sample of Female Flood Victims

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Abstract This study tested a model examining the interrelationships among posttraumatic stress disorder (PTSD) symptoms, intimate relationship adjustment, and intimate relationship aggression in a sample of 205 adult female flood victims. At the bivariate level, higher PTSD symptoms were associated with higher physical and psychological aggression victimization, poorer relationship adjustment, and higher physical and psychological aggression perpetration. Results from structural equation modeling (SEM) analyses indicated that relationship aggression victimization influenced aggression perpetration directly, and in the case of physical aggression, indirectly through its relationship with PTSD symptoms and relationship adjustment. The influence of PTSD symptoms on physical aggression perpetration was fully explained by poorer relationship adjustment. These findings extend prior work from other traumatized populations documenting associations between variables reflecting PTSD symptomatology and indices of relationship functioning, and indicate a need for further investigation in this area of inquiry.

Keywords Posttraumatic stress disorder · Relationship adjustment · Relationship aggression · Flood · Natural disaster

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Natural disasters can have devastating effects on the psychological functioning of trauma survivors (Norris et al. 2002a; Norris et al. 2002b). Several studies show that posttraumatic stress disorder (PTSD) is the most prevalent mental health problem among those exposed to such trauma (e.g., Sharan et al. 1996). Symptoms of PTSD, particularly those reflecting difficulties in experiencing and expressing emotions and in regulating anger, may significantly impair an individual's ability to establish and maintain healthy intimate relationships. Previous research among male veterans indicates that those with PTSD evidence more relationship problems and distress, problems with intimacy, and less constructive communication behaviors than those without the disorder, and are more likely to take steps towards separation and divorce (see Monson and Taft 2005). Much less work has been done examining the association between women's PTSD and intimate relationship problems. However, using data from the nationally representative National Comorbidity Study (Kessler et al. 1994), Whisman (1999) found that for women, PTSD was significantly associated with lower marital adjustment, even

when controlling for other psychiatric disorders. PTSD was not associated with marital adjustment for men in this study. These data suggest that PTSD symptomatology may exert a particularly detrimental impact on women's marital adjustment.

PTSD is also related to intimate relationship aggression. Studies of male veterans have consistently shown higher levels of partner aggression in those with PTSD compared to those without the disorder (Jordan et al. 1992), and large associations have been found between PTSD severity and physical and psychological aggression severity (Byrne and Riggs 1996). Relationship aggression perpetration has been under-examined among female victims of trauma, though one study of female veterans from the National Vietnam Veterans Readjustment Study (NVVRS; Kulka et al. 1990) indicates that PTSD symptoms were significantly associated with psychological aggression (Gold et al. 2007). A nonsignificant association was found between PTSD symptoms and physical aggression in this study. It is important to better understand women's perpetration of relationship aggression because although women's aggression may be less severe and produce fewer physical injuries, this aggression may be associated with a range of negative consequences for both partners (Hines and Malley-Morrison 2001; Lawrence and Bradbury 2007).

Theoretical models propose that relationship adjustment problems play a causal role in relationship aggression. For example, according to their model of courtship aggression, Riggs and O'Leary (1989) posited that poor relationship adjustment represents a situational factor that leads to relationship aggression primarily because it is associated with higher severity and frequency of conflict. Given such models and the aforementioned association between PTSD symptoms and poor relationship adjustment, it is plausible that PTSD symptoms lead to aggressive relationship behavior in part through their deleterious impact on broader relationship functioning. Consistent with this expectation, one previous study of male Vietnam veterans has found relationship problems to mediate the association between veteran's PTSD symptoms and overall (physical and psychological) relationship aggression (Byrne and Riggs 1996).

Little to no previous research has examined the potential mediating effects of relationship adjustment with respect to the PTSD-relationship aggression association among women, and we are aware of no previous study that has examined the associations of interest among a sample exposed to natural disaster. Prior work has documented the presence of marital maladjustment and abuse among this population. Norris and Uhl (1993) found elevated levels of marital stress among a large sample of women and men exposed to Hurricane Hugo, and trauma exposure was associated with this form of stress. Further, marital stress was related to individual psychological distress. Adams and Adams (1984) tracked changes in the social and psychological functioning of a small community (women and men) affected by the Mount Saint Helen's ashfall. Macro-level behavioral indicators of adjustment were obtained from records and reports made by local mental health, medical, police, and social agencies for a pre-disaster baseline period and a seven-month post-disaster period. In this study, police reports of physical relationship aggression increased by approximately 46% in the post-disaster period.

In order to evaluate the applicability of current models of the PTSD-relationship aggression association in women, we examined the role of relationship adjustment in mediating the association between PTSD symptoms and reports of perpetration. It is also important to consider the role of victimization experience in examining women's reports of aggression perpetration, given that PTSD and distress is associated with victimization (Koss et al. 2003), some women may aggress out of self-defense (White et al. 2000), and much intimate aggression is bidirectional in community-based samples (Johnson and Ferraro 2000). Thus, this cross-sectional study used SEM to test the following hypotheses: (a) physical aggression victimization would evidence direct and indirect associations with physical aggression perpetration through its relationships with higher PTSD symptoms and poorer relationship adjustment; and (b) poorer relationship adjustment would partially mediate the effects of PTSD symptoms on the relationship aggression outcomes. Partial (not full) mediation was proposed due to the likelihood that several other unmeasured variables likely help account for the association between PTSD symptoms and relationship aggression.

Method

Participants

During the summer of 1993, the Mississippi River and its tributaries experienced the greatest flooding in U.S. history, affecting millions of acres of land in eight states. Participants for this study were 205 female adult flood victims who were representative of the flood population in Monroe County, Illinois and St. Louis, Missouri. Data were drawn from a larger investigation into the impact of the flood on marital conflict and violence among women. Although some data were collected from the male partners of the participants, data were not collected from them on any of the primary study variables in the current investigation, and only a subset of men completed assessments, at the discretion of their female partners.

In order to find prospective participants, first, maps of the flooded areas were obtained from the Agricultural, Stabilization, and Conservation Department of Monroe County and the Army Corp of Engineers for the city. Then, in the county, the Tax Assessor's office was used to obtain names and matched addresses of people with property that resided in the flood areas from plat books from the Farmer's Bureau. In the city, detailed maps of the areas with addresses were obtained from the Metropolitan Sewer District. The final step in matching names and addresses was by obtaining the information from the Tax Assessor's Offices. Once the people who were affected by the flood were identified, everyone was assigned a number and a random draw was conducted. Prospective participants were sent an introductory letter describing the study and its importance. They were asked to call project staff to obtain more information regarding the study, and were supplied a prepaid postcard to indicate their interest. A total of 564 letters were sent in waves of approximately 150 letters each. The letters were followed by phone calls in order to schedule participants who were eligible. Most subjects classified as missing, because of returned letters or unlisted telephone numbers, were tracked through local government offices and through networking.

To be included, participants had to be either married or cohabiting at the time of the flood and for at least six months prior to the flood. Participants were considered ineligible if the flood damage was solely to commercial property, or if they owned a flooded lot that no one lived on. Of the 564 randomly-drawn, invited participants, 298 did not meet study inclusion criteria. Of the remaining 266 potential participants, 29 were not able to participate because they had moved out of the area or could not be located. A total of 30 women refused to participate, including fourteen women who refused because of a male partner forbidding their participation. Two women indicated that they were too distraught, could not participate because of work schedules, or suffered from severe illness or disability which prevented their participation. The final response rate was 36.3%. Participants were assessed over a four-month period beginning approximately six months after the end of the flood.

Ninety-six percent of the participants were Caucasian, 2% were African American, and 1% were Hispanic. At the time of the study, participants averaged 46.7 years of age (SD=16.3 years). Regarding employment, 42% of participants worked full time, 14% were employed part time, 10% were unemployed or disabled, 11% were retired, 1% were students, and 22% described themselves as homemakers. At the time of the study, 92% of the participants were married or living with their partner, 5% were divorced or separated, and 3% were widowed.

Measures

PTSD symptoms were assessed with a modified version of the National Women's Study PTSD module (Kilpatrick et al. 1989). This module is a descendant of the Diagnostic Interview Schedule used in the National Vietnam Veterans Readjustment Study (Kulka et al. 1990) and has been used in several prior epidemiological studies (e.g., Resnick et al. 1993). The modification for the current study consisted of participants reporting the presence or absence of 21 symptoms for a period of one month or more within the past six months, but since the flood. PTSD symptoms were not anchored to specific flood exposure variables because we were interested not only in PTSD related to the flood, but also in how the flood could exacerbate preexisting symptoms. The internal consistency reliability estimate for this measure was .91.

Relationship adjustment was evaluated with the Dyadic Adjustment Scale (DAS; Spanier 1976). The DAS is a widely used and well validated measure of marital adjustment (e.g., Carey et al. 1993). The internal consistency reliability estimate for the DAS was .94.

Intimate partner physical and psychological aggression perpetration and victimization were measured with the eight-item Violence and six-item Verbal Aggression subscales of the Conflict Tactics Scale (CTS; Straus 1979). Participants rated the frequency of items for herself and her male partner since the flood on a scale from 0 (*no*) to 6 (*more than 20 times*). Positively endorsed items were summed, in order to reflect "variety scores." Variety scores increase reliability by giving equal weight to each aggressive behavior, reducing skewness, and taking memory limitations regarding behavior frequencies into account.

Procedure

All study sessions were carried out by a Masters-level assessor. Assessment sessions were conducted at the home of the participant, or wherever the participant found convenient (because many of the participants lost their homes due to the flood). Male partners were not present during the study session. Participants completed the self-report questionnaires on a laptop computer. Next, a semi-structured interview, which included the PTSD module, was conducted. Debriefings were conducted with participants after completion of all instruments. All participants were provided safety planning information and referrals for supportive services for their area. In addition, each woman had the opportunity to discuss the impact of her study participation. Participants were compensated $25 for their participation.

Analyses

SEM was employed to test the hypothesized interrelationships among study variables. To conserve statistical power, separate models were computed for physical and psychological aggression perpetration. Measurement models were computed to test the adequacy of the hypothesized models in explaining the observed data. Structural models were then specified and evaluated to examine the direct and indirect effects of PTSD symptoms on aggression.

For all SEM analyses, raw data were submitted to the Mplus program version 4.1 (Muthén and Muthén 2006). The full information maximum likelihood (FIML) estimator was used to compute all SEM solutions to accommodate missing data. Total variety scores for physical and psychological aggression were submitted to Mplus as categorical data, given that these variables had four and six ordered category totals, respectively. To account for the categorical nature of these data, Mplus bases model solutions upon polychoric correlations. SEM model estimators were based upon the weighted least-squares with mean and variance adjustment (WLSMV), as this estimator is shown to be ideal for models involving categorical data (Muthén et al. 1997).

Results

Descriptive Statistics and Bivariate Associations

Table 1 presents descriptive statistics for all study variables. Participants reported experiencing an average of almost seven PTSD symptoms. The average score on the DAS was comparable to scores obtained from married couples in normative studies (Carey et al. 1993; Spanier 1976). Participants reported experiencing an average of 0.52 physically aggressive acts and 1.96 psychologically aggressive acts after the flood. In addition, prevalence rates for any physical and psychological aggression victimization were 8% and 74%, respectively. Participants reported perpetrating an average of 0.16 acts of physical aggression and 1.23 psychologically aggressive acts. Prevalence rates for any physical and psychological aggression perpetration were 9% and 55%, respectively.

Tables 2 and 3 present the estimated correlation matrix among latent study variables based upon the model solutions involving physical and psychological aggression, respectively. As noted, all latent variables were significantly intercorrelated in the expected direction. Both physical and psychological aggression victimization evidenced small-to-medium sized associations with PTSD symptoms, and medium-to-large sized association with relationship adjustment (Cohen 1988). The relationship aggression victimization variables were generally highly associated with the perpetration variables. The association between PTSD symptoms and relationship adjustment was in the medium-to-large range of magnitude, and associations between PTSD symptoms and the relationship aggression variables were in the small-to-medium range. Relationship adjustment evidenced a large association with physical aggression, and a medium-sized association with psychological aggression.

Physical Aggression Model

Measurement and structural models were calculated to examine the hypothesized associations of model variables with physical aggression perpetration. PTSD symptoms were indicated by total PTSD reexperiencing symptoms, avoidance/numbing symptoms, and hyperarousal symptoms. Relationship adjustment was indicated by the DAS Consensus, Affection, Satisfaction, and Cohesion subscales. Physical aggression victimization and perpetration were observed variables. First, a measurement model was employed to determine whether or not the hypothesized latent structure of PTSD symptoms and relationship adjustment was supported by the observed data. PTSD symptoms, relationship adjustment, physical aggression victimization, and physical aggression perpetration were permitted to intercorrelate, given the hypothesized relation-

Table 1 Descriptive statistics for study variables (N=205)

Variable	M	SD	Range
PTSD symptoms	6.79	5.65	0–20
Relationship adjustment	106.70	20.74	14–149
Physical aggression victimization	0.52	1.40	0–7
Psychological aggression victimization	1.96	1.73	0–7
Physical aggression perpetration	0.16	0.58	0–4
Psychological aggression perpetration	1.23	1.50	0–7

PTSD=Posttraumatic Stress Disorder

Table 2 Intercorrelations among study variables for model involving physical aggression (N=205)

Variable	1	2	3	4
1. Physical aggression victimization	—			
2. PTSD symptoms	.23	—		
3. Relationship adjustment	−.41	−.39	—	
4. Physical aggression perpetration	.45	.24	−.52	—

PTSD = Posttraumatic stress disorder

p<.05 for all values

Table 3 Intercorrelations among study variables for model involving psychological aggression (N=205)

PTSD = Posttraumatic stress disorder

p<.05 for all values

Variable	1	2	3	4
1. Psychological aggression victimization	—			
2. PTSD symptoms	.22	—		
3. Relationship adjustment	−.37	−.39	—	
4. Psychological aggression perpetration	.57	.29	−.36	—

ships among these variables. Although the chi-square test was significant, χ^2 (12, N =199)=22.69, p<.05, the CFI (.93, Bentler 1990) and RMSEA (.06, Steiger 1990) suggested a reasonable model fit to the data. In addition, all observed indicators significantly loaded onto their corresponding hypothesized latent variable constructs, indicating the latent variables significantly predicted the observed variable indicators.

A structural model was then computed to test the hypotheses of interest with respect to physical aggression perpetration. The chi-square model fit test was significant, χ^2 (13, N=194)=27.11, p<.05. However, the CFI = .94 and RMSEA = .07 indicated an acceptable model fit to the data. Regarding specific model pathways, physical aggression victimization was associated with higher PTSD symptoms, lower relationship adjustment, and higher physical aggression perpetration (see Fig. 1). PTSD was not related to physical aggression perpetration. However, higher PTSD symptoms were significantly associated with lower relationship adjustment, which, in turn, was associated with physical aggression perpetration.

Next, Mplus (Muthén and Muthén 2006) was programmed to test the direct and indirect effects of model variables. The relationship between physical aggression victimization and perpetration was shown to be both direct (standardized direct effects = .34, p<.01) and indirect (standardized indirect effects = .12, p<.001). Tests of the specific indirect effects of physical aggression victimization revealed that its relationship to physical aggression perpetration was partially explained by the negative relationship between physical aggression victimization and relationship adjustment (standardized indirect effects = .10, p<.01). In addition, a significant indirect pathway was found from physical aggression victimization to PTSD symptoms to relationship adjustment to physical aggression perpetration (standardized indirect effects = .02, p<.05). Finally, the relationship between PTSD symptoms and physical aggression perpetration was shown to be entirely indirect in that PTSD symptoms were positively related to lower relationship adjustment, which, in turn, was negatively related to physical aggression perpetration (standardized indirect effects = .09, p<.01).

Psychological Aggression Model

Observed indicators for PTSD symptoms and relationship adjustment were identical to those used in the models involving physical aggression. Psychological aggression victimization and perpetration were observed model

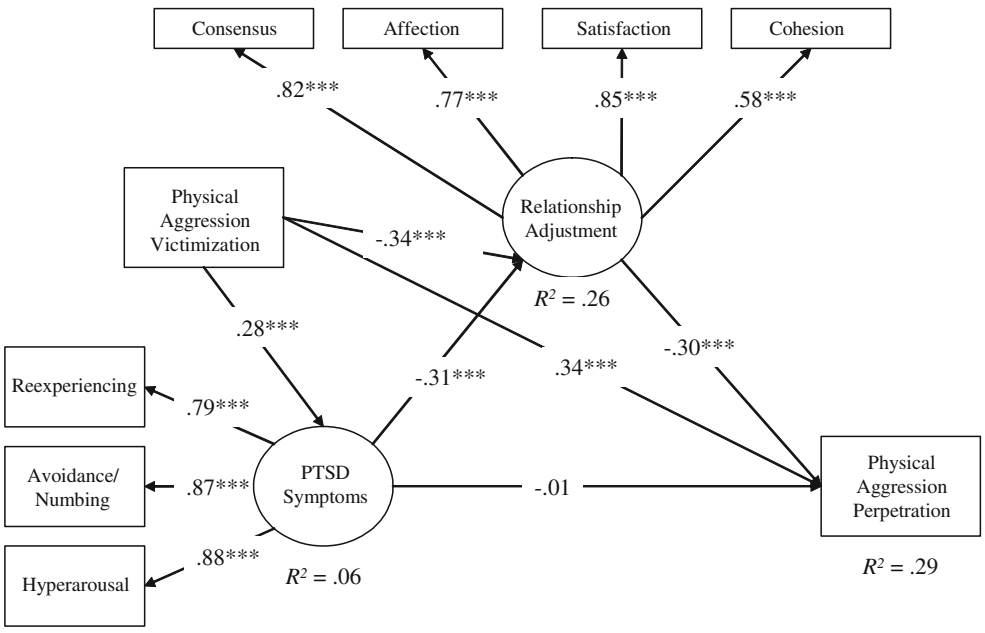

Fig. 1 Standardized structural model for physical aggression perpetration outcome. ***p<.001

variables. To test the adequacy of the latent variable models, a measurement model was computed. Measurement model fit indices suggested that the hypothesized model fit the underlying data structure, χ^2 (12, N =205)= 19.17, p=.07, CFI=.95, and RMSEA=.06. Further supporting the latent model structure, all observed indicators were significantly associated with their hypothesized latent variable factors.

The overall structural model fit was acceptable, χ^2 (13, N =205)=22.23, p=.05, CFI=.96, and RMSEA=.06. Turning to the model pathways, psychological aggression victimization was strongly related to psychological aggression perpetration (see Fig. 2). In addition, higher victimization was associated with higher PTSD symptoms and lower relationship adjustment. Relationship adjustment was not associated with psychological aggression perpetration. The positive direct relationship between PTSD symptoms and psychological perpetration approached statistical significance (p=.07).

Tests of the indirect and direct effects model pathways were then examined. Psychological aggression victimization had a direct effect on psychological aggression perpetration (standardized direct effects=.51, p<.001). The overall indirect effects of psychological aggression victimization on psychological aggression perpetration was also significant (standardized indirect effects=.06, p<.05). However, none of the specific indirect effects of psychological aggression victimization reached statistical significance. Finally, neither the direct nor indirect effects of PTSD symptoms on psychological aggression perpetration were significant (standardized direct effects=.13, p=.07; standardized indirect effects=.03, p=.26).

Discussion

The current study extends findings obtained primarily from samples of veterans indicating possible trauma-related effects on intimate relationships and suggests that these associations are also relevant for women. Expectations regarding the role of relationship aggression victimization were partially supported. Although both physical and psychological aggression victimization were associated with higher PTSD symptoms, poorer relationship adjustment, and higher relationship aggression perpetration, the effects of victimization on perpetration were primarily direct. These findings support the notion that the women in this sample may have engaged in aggression in part due to self-defense or as a function of milder forms of bidirectional aggression that are likely to characterize community-based samples (Johnson and Ferraro 2000; White et al. 2000).

The association between PTSD symptoms and physical aggression perpetration was fully mediated by relationship adjustment. These findings are consistent with models that emphasize relationship maladjustment in the etiology of aggressive relationship behavior (Riggs and O'Leary 1989), as well as findings from one study of male Vietnam veterans in which relationship problems mediated the association between PTSD symptoms and relationship aggression (Byrne and Riggs 1996). Interestingly, relationship adjustment did not mediate the effects of PTSD symptoms on psychological aggression. These findings suggest that the association between PTSD symptoms and psychological aggression is not through the negative effect of PTSD symptoms on intimate relationships. Some

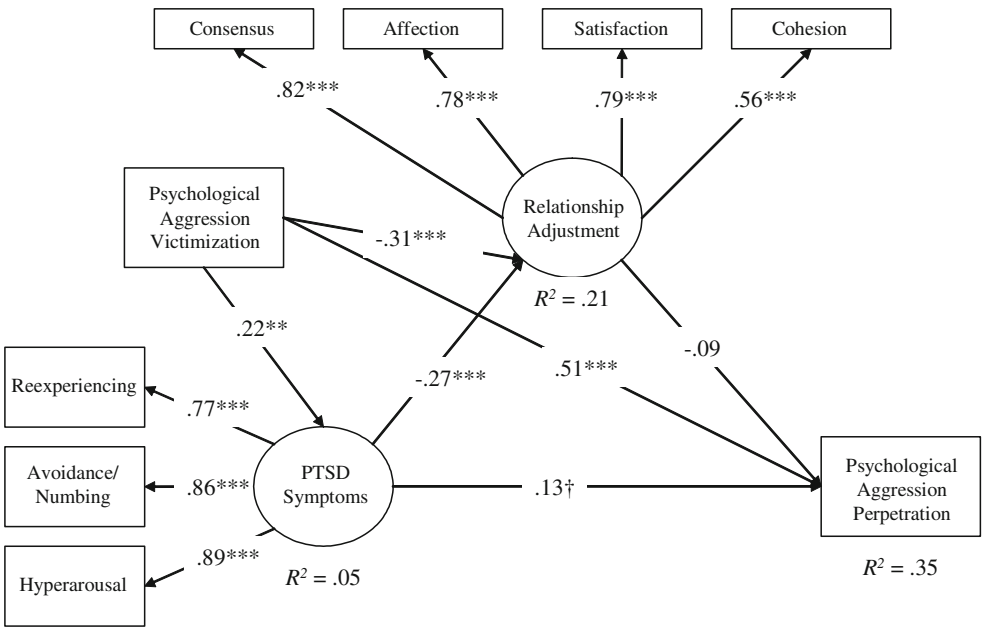

Fig. 2 Standardized structural model for psychological aggression perpetration outcome. †p=.07, **p<.01, ***p<.001

symptoms of PTSD, such as anger and irritability, may be more directly predictive of psychologically aggressive behaviors (e.g., verbal insults) that occur in everyday life among those in both distressed and nondistressed relationships, relative to acts of physical aggression that more likely occur in the context of a poor relationship.

Future investigations should incorporate a more inclusive set of potential explanatory variables to further explicate the etiology of relationship aggression among natural disaster victims. Research among samples of men is beginning to suggest several other potential mechanisms for the relationship between PTSD symptoms and aggression, including negative affect variables (Taft et al. 2007b; Taft et al. 2007c), physiological reactivity and substance abuse (Taft et al. 2007a), and social problem solving deficits (Taft et al. in press).

An important study limitation was our reliance on cross-sectional data, which limits the ability to draw conclusions regarding directionality. For example, it is possible and perhaps likely that there is a reciprocal association between relationship adjustment and aggression that was not captured in study analyses. It is also plausible that intimate relationship problems increased the vulnerability of participants for the development of PTSD symptomatology post-flood exposure. Future research should prospectively examine the associations of interest, with such work ideally also including pre-trauma assessments of intimate relationship functioning.

It is important that in future research, both relationship aggression perpetration and victimization data be collected from both members of the dyad to more adequately assess relationship aggression. Relatedly, a reliance on data from the female partners in this study precluded the ability to examine the contribution of men's psychological and relationship adjustment on the outcomes of interest. There are also generalizability issues to consider. Study participants consisted of a largely Caucasian sample of flood victims, although there were both urban and rural victims represented. Current study findings should be replicated among other, more diverse samples of flood victims and those exposed to other forms of natural disaster. Further, some potential participants refused to participate in this study due to their elevated levels of distress or because their partners forbade their participation. This exclusion may have led to an overall deflation of relationship aggression reports and an inflation of relationship adjustment scores, further indicating a need for the replication of current study results and determination of the nature and scope of intimate relationship adjustment difficulties experienced by this population.

Despite these limitations, the current findings have important prevention and treatment implications. The data suggest inter-relationships between victimization experiences, PTSD symptomatology, poorer relationship functioning, and higher aggression perpetration. Thus, in addition to a focus on individual functioning post-disaster, prevention and treatment programs for this population should also place a focus on relationship and family functioning. Meta-analyses reveal that social support is one of the most robust and consistent factors associated with PTSD (Brewin et al. 2000; Ozer et al. 2003). Yet, we are not aware of any prevention efforts aimed at individuals to bolster and facilitate the maintenance of social support. There is some evidence from the treatment literature that PTSD-focused conjoint therapy is efficacious in improving PTSD symptoms, with the added benefit of enhancing relationship satisfaction (e.g., Monson et al. 2004).

The effects of natural disasters reverberate beyond individuals to affect couples, families, and communities. As elaborated elsewhere (Monson et al. in press), it is imperative that we more fully understand and appreciate the interpersonal nature and consequences of trauma and PTSD. We hope that findings from this study will help focus increased attention on the impact of natural disasters on intimate relationships, and will stimulate additional work in this area of inquiry.

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