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Between- and Within-subject Associations of PTSD Symptom Clusters and Marital Functioning in Military Couples

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Abstract

Using data from 570 male service members and their wives, the current study investigated over-time associations between male service members' self-report of PTSD symptoms and marital functioning (marital satisfaction, positive bonding, conflict behavior) as perceived by both spouses. Analyses spanned five time points over a two year period and fully disentangled between- and within-subject effects. Higher levels of all four PTSD symptom clusters (numbing, hyperarousal, effortful avoidance, and reexperiencing) showed significant between-subjects associations with lower levels of marital satisfaction and positive bonding, and higher levels of conflict for both men and women, whereas there were markedly fewer significant within-subject associations. When running models with all four PTSD symptom clusters entered at once, the primary between-subjects finding was that men with higher numbing symptoms overall reported poorer marital functioning in all domains; there were no significant between-subjects links between numbing and marital functioning for women. In contrast, within-subject effects for numbing were found for both men and women, linking increased numbing with decreased positive bonding and increased conflict behavior over time; women also had lower marital satisfaction when their husbands reported relatively higher numbing. Between-subject analyses also revealed that for men with higher average levels of effortful avoidance, wives reported lower levels of satisfaction and positive bonding, whereas men themselves reported less frequent conflict behavior. Finally, within-subject effects showed that at times when men reported increased hyperarousal, they also perceived increased marital conflict, whereas women surprisingly reported increased marital satisfaction. Implications of divergent between- and within-subject results are discussed.

Keywords

PTSD; military; couples; communication; marital satisfaction

There are well-established links between PTSD and poor marital relationship functioning, particularly in military samples (Campbell & Renshaw, 2016; Taft et al., 2011). At the same time, key questions remain regarding how specific PTSD symptoms relate to specific aspects marital functioning over time. This study examined associations between four clusters of

PTSD symptoms (numbing, hyperarousal, effortful avoidance, and reexperiencing) and three aspects of marital functioning (marital satisfaction, positive bonding, conflict behavior) using analytic methods that disentangle between-subjects from within-subject effects. Specifically, we examined how couples with different husband levels of each symptom cluster differ from one another, as well as how changes in these symptom clusters over time relate to changes in marital functioning over time.

Empirically, it appears that the PTSD symptoms of avoidance or emotional numbing are most strongly related to relationship difficulties, with evidence that this occurs via mechanisms such as reduced disclosure and intimacy (Campbell & Renshaw, 2013, 2016; Taft et al., 2008). Hyperarousal symptoms of PTSD are less consistently linked to poor relationship functioning, but may be most associated with relationship problems such as aggression and anger (Campbell & Renshaw, 2016; Taft et al., 2007), perhaps via increased cognitive bias toward signs of threat (Chemtob et al., 1997). In a comprehensive review of the associations between PTSD symptom clusters and different relationship problems, Campbell and Renshaw (2017) have conceptualized a deficit (of positives) versus an excess (of negatives) model. In this model, symptom clusters such as numbing involve a deficit of positives such as emotional engagement, often corresponding to deficits of positive relationship factors, such as disclosure and intimacy. In contrast, symptom clusters such as hyperarousal involve an excess of negatives such as reactivity and impulsivity, often corresponding to excesses of negatives in the relationship, such as overt conflict.

Associations between PTSD symptoms and relationship issues have often been explored with cross sectional data, yet theoretically there is interdependence over time (e.g., Nelson Goff & Smith, 2005). That is, symptoms of PTSD may lead to relationship problems such as increased conflict or decreased intimacy, but these same relationship problems also increase stress and decrease support, perhaps exacerbating PTSD. Findings vary from study to study, but there is mixed evidence from longitudinal studies that aspects of PTSD predict later family problems, and that family problems predict higher levels of later PTSD symptoms (e.g., Benotsch et al., 2000; Campbell & Renshaw, 2013; Erbes, Meis, Polusny, & Compton, 2011; Evans, Cowlshaw, & Hopwood, 2009; Evans, Cowlshaw, Forbes, Parslow, & Lewis, 2010; Koenen, Stellman, Sommer, & Stellman, 2008; Tarrier, Sommerfield, & Pilgrim, 1999). However, existing longitudinal analyses of the association between PTSD and relationship functioning do not separate two sources of variance: (a) relatively stable between-subjects sources of variance reflecting differences in PTSD between groups of individuals or couples versus (b) within-subject sources of variance isolating the degree to which changes in PTSD over time are connected to changes in marital quality. Between-subjects effects would indicate that individuals with higher PTSD or couples where one partner is higher in PTSD show worse relationship adjustment compared to those with generally lower PTSD, whereas within-subject effects would suggest that when an individual shows a relative increase in PTSD symptoms over time, there is also a relative decrease in relationship adjustment over time for the individual or their partner. Hoffman and Stawski (2009) explain that between-subjects effects often reflect more stable aspects of personality, lifestyle, or other relatively chronic factors, whereas within-subject effects often reflect relatively acute factors such as time specific deviations in symptom or stress levels. Unless these two types of effects are statistically separated, results from analyses show both effects

pooled together, which undermines interpretation of the source of the association and can lead to mistaken interpretation about how PTSD and marital functioning are likely to change within couples over time (see Curran & Bauer, 2011 and Hoffman & Stawski, 2009 for detailed explanations and examples of this analytic approach).

Present Study

The current study builds on the deficits versus excesses conceptual model proposed by Campbell and Renshaw (2017), and uses advanced analytic techniques to isolate between- and within-subject effects. Specifically, this study focuses on associations between distinct PTSD symptom clusters and positive and negative aspects of marital functioning among married Army couples using analytical methods that fully disentangle change within couples over time from differences between different couples. We used five waves of data collection spaced approximately six months apart. These waves of data allowed us to measure the within-subject associations of changes in different PTSD symptom clusters and both positive and negative aspects of couple functioning over time. For this study, positive aspects of couple functioning are represented by positive bonding, a construct which includes friendship, intimacy, fun, felt support, and sensual/sexual connection, whereas negative aspects of the relationship are represented by conflictual interaction patterns such as escalation, invalidation, and insults. To increase correspondence with prior literature, we also included overall marital satisfaction, which can be affected by both positive and negative aspects of couple functioning. All of these aspects of couple functioning are measured from the perspective of both service members and their spouses. Four symptom clusters of self-reported male service member PTSD will be isolated (King, Leskin, King, & Weathers, 1998): reexperiencing, effortful avoidance, emotional numbing, and hyperarousal.

Consistent with the conceptual framework and empirical review offered by Campbell and Renshaw (2017), we hypothesize that (1) the service members' emotional numbing will show both between- and within-subject associations with lower positive bonding and that (2) the service members' hyperarousal will show both between- and within-subject associations with greater conflictual interaction. Given prior literature finding unique associations between numbing and relationship satisfaction (e.g., Campbell & Renshaw, 2013; Renshaw & Caska, 2012), we also hypothesize that (3) numbing will show both between- and within-subject associations with marital satisfaction. With regard to the other two PTSD symptom clusters evaluated, both reexperiencing and effortful avoidance explicitly reference trauma (e.g., dreams about the traumatic stress or avoidance of situations that remind one of the traumatic stress); such symptoms tend to have lower covariance with relationship functioning, and, therefore, we do not make specific hypotheses about these symptom clusters.

These hypotheses will be examined in a sample of married Army couples (husband service members, civilian wives) who participated in a larger study on the effects of marriage education. These couples were not selected for PTSD or relationship distress. Using a non-clinical sample may allow a greater range of mean level and change over time on target variables than seen in some prior studies which focused only on treatment seeking participants with clinical levels of PTSD and poor family functioning. In fact, spouses of

service members with PTSD symptoms are more likely to experience relationship distress even when PTSD symptoms are subclinical and measured outside of a treatment context (Lambert, Engh, Hasbun, & Holzer, 2012). In baseline analyses with a subsample of these couples, overall levels of PTSD symptoms for the male service member corresponded significantly with separate husband and wife reports of greater negative communication and lower positive bonding and marital satisfaction (Allen, Rhoades, Stanley, & Markman, 2010).

Method

Participants

The current sample consists of 570 married couples comprised of an Active Duty U.S. Army husband and a non-active duty (civilian) wife. At the first assessment point used in the current study, couples were married an average of 5.9 years ($SD = 4.7$). Men averaged 30.0 years of age ($SD = 6.1$) and women averaged 29.1 years of age ($SD = 6.0$). In terms of education, 69.3% of men and 52.6% of women reported that the highest level obtained was a high school diploma or GED. Of the husbands, 66.0% were White non-Hispanic, 11.4% were Hispanic, 9.3% were African American, 0.7% were American Indian/Alaska Native, 0.9% were Asian, 0.7% were Hawaiian or Pacific Islander, and 4.2% described themselves as multi-racial (6.8% did not report a race). Of the wives, 69.8% were White non-Hispanic, 10.0% were Hispanic, 8.9% were African American, 1.2% were American Indian/Alaska Native, 0.9% were Asian, 1.1% were Hawaiian or Pacific Islander, and 4.0% described themselves as multi-racial (4.0% did not report a race). Overall, 62.5% of the couples included spouses who were both White non-Hispanic, while the remainder reported at least one minority spouse. The majority (59.4%) of husbands identified as Non-Commissioned Officers, with smaller numbers (26.8%) identifying as Junior Enlisted, up to Company Grade and Field Grade Officers (13.8%). Almost all men (90.1%) reported a history of deployment, with 39.8% having deployed within the past year. Of men who endorsed combat exposure or similar situations of risk in the prior year, the level of combat exposure averaged light to moderate based on the Combat Exposure Scale (Keane et al., 1989). Men reported being separated from their wives (in the current marriage) due to deployment an average of 19.05 months ($SD = 12$ months).

Procedures

Participants were selected from a sample of 662 couples who enrolled in a larger study of the effectiveness of a marriage education program conducted by Army chaplains. The program consisted of 14.4 hours of content delivered in a workshop/retreat format to groups of couples, and was designed to address a range of skills and principles associated with relationship health (additional details regarding the program available in Markman, Stanley, & Blumberg, 2010). Study procedures were approved by the University of Denver Institutional Review Board (Protocol #471733, Title "Marriage Education and Risk Reduction for Army Families"). Recruitment took place on two separate Army installations via direct chaplain contacts and various announcements on post. To enroll in the study, all couples were required to be married, have at least one active duty partner, speak and read English fluently, not have participated in a similar marriage program already, and be willing

to be randomly assigned to the marriage education or control condition. The data for the current study were drawn from five sequential follow-up assessments; the first one was approximately 6 months after the intervention phase, with the five assessments spaced approximately 6 months apart. Thus, the five assessment points span approximately 2 years. Assessments were primarily administered by sending each participant a unique link for an online survey, which they could complete anywhere in the world and even when on deployment (when computing access was adequate). Hard copy questionnaires were available to participants upon request. Because couples could complete the assessments during deployment, and this could affect the degree to which PTSD and couples' processes are associated, we included deployment as a control variable in analyses.

For the current study, only couples consisting of an active duty Army husband and a civilian wife were chosen (91% of the larger sample). Other couple configurations (e.g., both spouses active duty, civilian husband married to active duty wife) were not included due to low numbers or inability to differentiate partners consistently. Moreover, couples who had divorced by the first follow-up (and thus did not provide data on marital functioning) or did not complete assessments for other reasons during this timeframe were not included. We did not restrict the sample based on scores on the PTSD or relationship measures.

Measures

Means and standard deviations of variables over time are available in the online supplement.

Husbands' PTSD symptoms—The PTSD Checklist (PCL-C; Weathers, Litz, Herman, Huska, & Keane, 1993) is a 17-item self-report measure of DSM-IV symptoms of PTSD (APA, 1994). We used the husband self-report. For each item, husbands rate how much they were “bothered by that problem in the past month.” Items are rated on a 5-point scale ranging from 1 (“not at all”) to 5 (“extremely”). This version of the PCL did not specify the nature of the stressful event and thus could include non-military experiences. Internal consistency was excellent ($\alpha = .95$). The summed scores can range from 17 – 85. In this sample, at the first time point, the average was 32.6 ($SD = 15.5$); 34.5% met or exceeded a liberal screening cut-off score (i.e., 34) used to identify soldiers with PTSD symptoms (Bliese et al., 2008). Moreover, PTSD symptoms decreased over the waves in this study to a small but significant degree, reaching an average of 31.2 by the end of the timeframe of the current study. Thus, the majority of participants did not indicate potentially clinical levels of PTSD at any time point.

There have been several different analyses of the underlying factor structure of PTSD symptoms. For the current paper, we adopt the King et al. (1998) four factor model, where items are broken down into reexperiencing (e.g., “Repeated, disturbing memories, thoughts, or images of a stressful experience from the past”), effortful avoidance (e.g., “Avoid activities or situations because they remind you of a stressful experience from the past”), emotional numbing (“Feeling emotionally numb or being unable to have loving feelings for those close to you”), and hyperarousal (e.g., “Feeling irritable or having angry outbursts”). Thus, this model isolates the deficits of emotional numbing and the excesses of hyperarousal thought to be related to different types of relationship functioning (Campbell & Renshaw,

2017). In our analyses, scores for each cluster are a mean of relevant items, with higher scores representing more PTSD symptomatology. Each subscale also had good internal consistency, with subscales' α ranging from .84 to .93.

Husbands' and wives' marital satisfaction—The Kansas Marital Satisfaction Scale (KMS; Schumm et al., 1986) was used to assess marital satisfaction from the perspective of each spouse. This is a brief (3-item) scale assessing satisfaction with the marriage, the partner as a spouse, and the relationship with spouse on a scale from 1 (extremely dissatisfied) to 7 (extremely satisfied). This scale has strong reliability and validity (Schumm et al.) and provides a pure global satisfaction rating without including other aspects of relationship functioning. In the current study, scores are a mean of the three items, with higher scores representing a greater degree of marital satisfaction. Husband ($M = 5.88$, $SD = 1.24$, $\alpha = .96$) and wife ($M = 5.76$, $SD = 1.36$, $\alpha = .96$) reports both showed excellent internal consistency and fairly high levels of satisfaction overall. Crane, Middleton, and Bean (2000) suggest that an average score of 5.67 is an optimal cutoff score for the KMS wherein couples higher than this would be considered satisfied and couples lower than this would be considered dissatisfied. Thus, at the first time point, couples averaged just above this cutoff. However, satisfaction did significantly decrease over the course of the study for both spouses; by the final wave, husbands' mean satisfaction was 5.67 (averaging right at this cut off) and wives' was 5.49 (below this cut off).

Husbands' and wives' positive bonding—The Positive Bonding Scale was adapted from the Couple Activities Scale (Markman, 2000). This scale consists of 9 questions assessing the friendship, intimacy, fun, felt support, and sensual/sexual relationship of the couple. Each spouse responded to questions such as, “We regularly have conversations where we just talk as good friends,” “We have a satisfying sensual or sexual relationship,” “I feel emotionally supported by my partner,” and “We regularly make time for fun activities together as a couple,” on a scale of 1 (strongly disagree) to 7 (strongly agree). Stanley, Whitton, Kline, and Markman (2006) report logical convergence of the parent scale with other indices of individual and marital functioning. Scores are the mean of the nine items, with higher scores representing more positive bonding. As with marital satisfaction, husband ($M = 5.57$, $SD = 1.16$, $\alpha = .91$) and wife ($M = 5.55$, $SD = 1.26$, $\alpha = .92$) reports both showed excellent internal consistency and fairly high levels of positive bonding overall. Positive bonding also showed a small, significant decrease over the study timeframe, reaching an average of 5.46 for men and 5.40 for women.

Husbands' and wives' conflictual interaction—The current study included several items related to overt conflict between partners, collected from each spouse. We divided items based on the identified actor: the self or the partner. This was important as we may expect stronger associations, for example, between husband hyperarousal and his own overt conflict behavior than between husband hyperarousal and his partner's overt conflict behavior.

Conflict-self: Ten conflict items from the Marital Coping Inventory (Bowman, 1990) were included. The Marital Coping Inventory is a 66-item measure asking about behaviors that the

respondent engages in when dealing with marital problems. There are five factors: Conflict, Self-Blame, Positive Approach, Self-interest, and Avoidance. The factor adopted here was the Conflict factor. Example items include “Pick fights with my spouse over small issues,” “Yell or shout at my spouse,” and “Tell my spouse that the problem is all his or her fault.” This scale showed good reliability and validity in the Bowman study, and was also supported by Cohan and Bradbury (1994). The original subscale has a total of 15 items, but for the purpose of this study, wherein we wished to isolate overt marital conflict, conflict items were not used if they were covert in nature (e.g., “decide to get even with my spouse”), not focused on the marital partner (“argue more than usual with people”), or appeared tautological with the PCL (e.g., the MCI Conflict item “Am irritable around my spouse” was very similar to “Feeling irritable or having angry outbursts” and thus was not used). Each spouse rated their own behaviors on a scale of 1 (never) to 5 (usually). Scores for the scale are the mean of the ten chosen conflict-self items, with higher scores representing more frequent conflict behaviors on the part of the respondent. Husband ($M = 1.81$, $SD = .62$, $\alpha = .88$) and wife ($M = 1.98$, $SD = .62$, $\alpha = .86$) reports both showed good internal consistency and low levels of enacting conflict behavior towards the partner. Only wives reported a small, yet significant increase in their own conflict behaviors over time. Wives mean at the final time point was 1.97 ($SD = .65$). Because the scale of the conflict-self items was different than the scale of the conflict-partner items, for analyses items were z-transformed to obtain a standardized score for conflict-self.

Conflict-partner: Three items comprised this composite of the overt conflict behavior that the respondent reported about their partner’s behavior. Two items from the Communication Danger Signs Scale (Stanley & Markman, 1997) indicating escalation (“My spouse criticizes or belittles my opinions, feelings, or desires”) and negative interpretation (“My spouse seems to view my words or actions more negatively than I mean them to be”) were selected. Forms of this measure have demonstrated convergence with other theoretically related constructs and predicted changes subsequent to communication skill interventions (e.g., Stanley et al., 2005). The third item was from the Verbal Abuse and Coercion factor of the Control Tactics Scale from Leone, Johnson, Cohan, and Lloyd (2004): “In the past 12 months, when you’ve had an argument, how often did your spouse: Insult you, swear at you, or call you mean or nasty names?” Each participant responded to these items on a scale of 1 (never or almost never) to 3 (frequently). Husband ($M = 1.65$, $SD = .54$, $\alpha = .74$) and wife ($M = 1.58$, $SD = .52$, $\alpha = .71$) reports both showed adequate internal consistency and moderate levels of perceived negative conflict behavior from the partner. Again, wives reported a small but significant increase in conflict-partner over the study timeframe. Wives mean at the final time point reached 1.60 ($SD = .56$). Because the scale of the conflict-self items was different than the scale of the conflict-partner items, for analyses items were z-transformed to obtain a standardized score for conflict-partner.

Deployment—At each assessment, each spouse responded to the item, “Are you or your spouse currently deployed?” A response of yes was coded as a 1, and no as a 0. Because our sample included only active-duty husbands and civilian wives, this variable coded whether the husband was deployed at the time of each spouse’s survey response.

Data Analytic Plan

Data analyses were conducted using HLM 7.01 software (Raudenbush, Bryk, & Congdon, 2013). To test separate within- and between-subjects associations of PTSD symptom clusters with aspects of marital quality, three-level random-intercept multilevel models were used, with time nested within individuals and individuals nested within study cohort. PTSD symptoms were always based on husbands' reports of their own symptoms, whereas marital functioning was reported individually by each spouse. Thus, the link between marital functioning and PTSD represents a different concept for men (i.e., his self-report of symptoms linked to his self-report of marital functioning) than for women (i.e., her spouse's self-report of his symptoms linked to her own self-report of marital functioning). Given this, we ran separate models for men and women in our sample. Specifically, models for men represented the association between their self-reports of PTSD symptoms and their perceptions of marital functioning, and models for women represented the association between their own perceptions of their marital functioning and their husbands' concurrent self-reports of PTSD symptoms. Each model includes one spouse's report of one measure of marital functioning at each time point and does not account for the partner's report of that aspect of marital functioning at that time point. Time was measured as months since the first follow-up assessment. For each of the four PTSD clusters, we tested between-subjects and within-subject associations with each of the four marital functioning domains (marital satisfaction, positive bonding, conflict-self, and conflict-partner) in separate models. To further test the specificity of effects, follow-up models including all four PTSD clusters simultaneously were also tested. This allowed us to test the degree to which each PTSD cluster uniquely predicted each aspect of marital functioning after accounting for the effects of the other PTSD clusters.

To separate within-subject effects from between-subjects effects, we modeled within-subject changes in time-varying PTSD cluster variables at level 1 and between-subjects differences in mean PTSD cluster scores at level 2 (Raudenbush & Bryk, 2002). We detrended the level-1 PTSD variable to account for linear drift over time, as suggested by Curran and Bauer (2011). We also controlled for deployment status at level 1 in all models. See Knopp et al. (2017) for further description of the use of these kinds of models with longitudinal couple data.

Our analytic models were defined as follows:

$$\text{Level 1: } (MARITAL)_{tij} = \pi_{0ij} + \pi_{1ij}(TIME)_{tij} + \pi_{2ij}(PTSDw)_{tij} + \pi_{3ij}(DEPLOY)_{tij} + e_{tij}$$

$$\text{Level 2: } \pi_{0ij} = \beta_{00j} + \beta_{01j}(PTSDb) + r_{0ij}$$

$$\pi_{1ij} = \beta_{10j}$$

$$\pi_{2ij} = \beta_{20j}$$

$$\pi_{3ij} = \beta_{30j}$$

$$\text{Level 3: } \beta_{00j} = \gamma_{000} + u_{00j}$$

$$\beta_{01j} = \gamma_{010}$$

$$\beta_{10j} = \gamma_{100}$$

$$\beta_{20j} = \gamma_{200}$$

$$\beta_{30j} = \gamma_{300}$$

In these models, $(MARITAL)_{tij}$ is one spouse's report of one measure of marital functioning at each time point; $(TIME)_{tij}$ is time of the survey response measured in months since the baseline assessment, grand-mean centered; $(PTSDw)_{tij}$ is the within-subject component of husbands' reports of one cluster of PTSD symptoms at each time point, detrended; $(PTSDb)_{ij}$ is the between-subjects component of one cluster of husbands' PTSD symptoms; and $(DEPLOY)_{tij}$ is a binary indicator of husbands' deployment status at each wave, where 0 equals not deployed and 1 equals deployed. The within-subject effect of PTSD on marital functioning is estimated by the fixed effect γ_{200} , and the between-subject PTSD effect is estimated by γ_{010} .

We had very few missing data points within this sample, with both husbands and wives completing an average of 4.5 out of 5 surveys, and all but 7 couples (1% of the sample) represented in the data by both spouses. This resulted in model sample sizes (i.e., number of units) for women and men, respectively, of 2591 and 2543 person-waves at level 1, 565 and 569 individuals at level 2, and 53 cohorts (for both) at level 3. Missing data at specific waves were handled analytically using full maximum likelihood (FIML) estimation in HLM 7.01.

The focus of the current paper was not potential intervention effects, nor did we have a theoretical reason to expect that the relationship education intervention that took place prior to the time points analyzed in this study would affect the tested associations. We checked this assumption and found that assignment to intervention versus control group moderated only two of the sixty-four effects tested (3.1%, within expected Type I error rate; additional details available in online supplement). Given this very low rate, we did not include intervention condition in the final analytic models.

Results

Between- and within-subject associations of PTSD clusters with aspects of marital functioning (γ_{010} and γ_{200} , respectively) are shown in Table 1. All coefficients reported in Table 1 are unstandardized. However, we provide standardized coefficients in the text for significant effects of interests as a rough index of relative effect size. These coefficients were calculated as: $b_{std} = b_{raw} * (sd(x)/sd(y))$. Because there are varying issues in computing these coefficients related to statistical differences within each level of analysis, we reiterate that these are only a rough index of effect size and recommend comparing within analytic levels only (i.e., do not compare standardized between-subjects coefficients to standardized within-subject coefficients).

Between-Subjects Effects (Each Cluster Tested Separately)

Unstandardized results are shown in the top line in each cell in the top panel of Table 1. For example, the between-subjects unstandardized association of numbing and marital satisfaction for husbands, without controlling for other symptom clusters, is -0.479 . Recall that these analyses disentangle between- and within-subject effects. Thus, these between-subjects effects control for the within-subject effects and represent only average differences between different respondents. Consistent with prior literature, all four clusters of PTSD showed significant, negative between-subjects associations with marital satisfaction and positive bonding, and significant, positive between-subjects association with conflict-self and conflict-partner for both men and women. Thus, higher average levels of all types of husband PTSD symptoms were associated with both husbands' and wives' reports of worse marital functioning in multiple domains. The absolute value of standardized coefficients ranged from 0.14 to 0.31, with men generally showing somewhat larger effects (~ 0.30) than women (~ 0.19). For men, numbing showed the strongest effects, whereas for women, both numbing and effortful avoidance showed stronger effects than the other clusters.

Between-Subjects Effects (Clusters Tested Simultaneously)

These models predict marital functioning from all four PTSD clusters simultaneously to isolate unique associations. Unstandardized results are shown in the bottom line in each cell in the top panel of Table 1. For example, the between-subjects unstandardized association of numbing and marital satisfaction for men, controlling for other symptom clusters, is -0.768 . Calculated standardized coefficients are provided in text. When controlling for other symptom clusters, only numbing and effortful avoidance continued to show significant effects. For men, greater numbing was uniquely associated with lower marital satisfaction ($b_{std} = -0.48$) and positive bonding ($b_{std} = -0.56$) as well as higher levels of conflict-self ($b_{std} = 0.34$) and conflict-partner ($b_{std} = 0.39$). Also for men, greater effortful avoidance was uniquely associated with lower own conflict behavior ($b_{std} = -0.18$). For women, contrary to hypotheses, the only effects to remain significant in these simultaneous analyses were that husbands' effortful avoidance scores were negatively associated with wives' marital satisfaction ($b_{std} = -0.18$) and perceived positive bonding ($b_{std} = -0.18$).

Within-Subjects Effects (Each Cluster Tested Separately)

These results are shown in the top line in each cell in the bottom panel of Table 1. For example, the within-subjects unstandardized association of numbing and marital satisfaction for men, without controlling for other symptom clusters, is -0.094 . Within-subject effects told a somewhat different story than between-subject effects. Although multiple significant within-subject associations emerged and showed the same general positive or negative direction as corresponding between-subjects associations in the analyses run separately by PTSD cluster, there were markedly fewer significant within-subject associations. Recall that within-subject effects should be understood as the association of changes in husband PTSD over time with concomitant changes in husband or wife marital functioning, controlling for differences in mean PTSD levels between different individuals. For women, husband numbing was negatively associated with marital satisfaction ($b_{std} = -0.06$) and positive bonding ($b_{std} = -0.05$) over time, and was positively associated with conflict-self over time

($b_{std} = 0.04$). Further, husband reexperiencing was negatively associated with marital satisfaction ($b_{std} = -0.04$). For men, we found that, over time, (a) numbing was negatively related to positive bonding ($b_{std} = -0.05$) and positively associated with conflict (self $b_{std} = 0.08$ and partner $b_{std} = 0.07$), (b) hyperarousal was negatively associated with marital satisfaction ($b_{std} = -0.04$) and positive bonding ($b_{std} = -0.07$), and positively associated with conflict (self $b_{std} = 0.08$ and partner $b_{std} = 0.07$), and (c) both effortful avoidance and reexperiencing were positively associated with conflict (for both self $b_{std} = 0.06$ and partner $b_{std} = 0.05$ and 0.04 , respectively).

Within-Subjects Effects (Clusters Tested Simultaneously)

These results are shown in the bottom line in each cell in the bottom panel of Table 1. For example, the within-subjects unstandardized association of numbing and marital satisfaction for men, controlling for other symptom clusters, is -0.080 . The simultaneous within-subject analyses indicated that only changes in numbing and hyperarousal showed unique effects over time. For men, numbing had a negative association with positive bonding ($b_{std} = -0.12$) and a positive association with conflict-self ($b_{std} = 0.05$); further, hyperarousal was positively associated with conflict from self ($b_{std} = 0.05$) and partner ($b_{std} = 0.05$). For women, husband numbing was negatively related to satisfaction ($b_{std} = -0.08$) and positive bonding ($b_{std} = -0.08$), and was positively associated with conflict-self ($b_{std} = 0.07$). An additional surprising finding emerged for women, wherein husband hyperarousal symptoms were positively related to marital satisfaction ($b_{std} = 0.06$).

Discussion

There were two goals of the current investigation: (1) to analyze the association between service member PTSD symptoms and husband and wife marital functioning using models that disentangle between- versus within-couple effects, and (2) to use these models to examine how different PTSD symptom clusters are associated with different aspects of marital adjustment (satisfaction, positive bonding, and conflict). In terms of disentangling effects, we found a number of differences in the models isolating between-subjects and within-subject sources of variance, which is not surprising. In fact, Hoffman and Stawski (2009) state: "In our experience, it has been the rule, rather than the exception, that the between-subjects and within-subject effects of time-varying predictors will differ from each other, if not in direction, almost certainly in magnitude" (p. 106). Overall, the hypotheses regarding a consistent pattern of significant associations between numbing and decreased relationship positives (bonding, satisfaction), compared to significant associations between hyperarousal and increased relationship negatives (conflict) were generally not supported. Rather, numbing, hyperarousal, reexperiencing, and effortful avoidance all showed varying associations based on whether between-subjects versus within-subject effects were evaluated, and whether clusters were separately or simultaneously evaluated. In this discussion, we will summarize and interpret both types of effects.

Between-Subjects Effects

As noted earlier, coefficients for between-subjects effects represent the associations in the sample between a husband's average level of PTSD cluster symptomatology and either the

husband's or the wife's average reports of the different domains of marital functioning, after controlling for husbands' variation in PTSD symptom levels over time (i.e., removing the within-subject effects). Overall, when evaluating each husband-reported PTSD cluster separately predicting each aspect of marital adjustment as reported by husbands or wives, we uniformly found that higher average levels of any given cluster were significantly related with poorer average adjustment (i.e., lower satisfaction and positive bonding, higher conflict behavior from the self and the partner). These findings are consistent with the general pattern of findings in the literature associating PTSD and these aspects of marital functioning (e.g., Allen et al., 2010).

Numbing has generally shown some of the strongest associations with impaired relationship functioning (e.g., Campbell & Renshaw, 2013), and in fact, when we modeled all clusters simultaneously (thus isolating unique variance per cluster), we found that numbing continued to evidence significant unique associations with all aspects of marital adjustment, but only for men. It is surprising that the unique between-subjects associations of numbing and marital adjustment were not significant for women, but this may be due to removing within-subject variance (see below). What we found for women was that higher levels of husband effortful avoidance symptoms were uniquely associated with lower average marital satisfaction and positive bonding for women (and, for men, that higher levels of husband effortful avoidance was associated with lower perceived conflict behavior toward one's partner).

Hoffman and Stawski (2009) describe between-subjects effects as often due to more chronic or stable factors, such as "personality variables," degree of chronic stressors, or general "lifestyle differences" (p. 106). Here, these effects may include such factors and also include the cumulative impact of fairly stable or chronic overall patterns of PTSD symptoms. It may be that husbands who, for example, more chronically avoid activities, situations, thoughts, feelings, and communications related to their trauma (i.e., more effortful avoidance) also tend to avoid conflict behavior with their wives. Moreover, their wives may also experience less positive bonding, which includes items such as her sense of whether her spouse is open and willing to engage with her, such as by talking about vulnerable feelings and joining her in fun activities as a couple. Although not directly tested in the current study, this could reflect a stable/chronic pattern of trauma related effortful avoidance, a more general underlying tendency to avoid, or other relatively stable factors. Moreover, husbands who experience more stable or chronic numbing symptoms (e.g., feeling distant or cut off from others, unable to have loving feelings for those close to them) seem to also experience more chronic dissatisfaction, conflict, and low positive bonding with the partner. Again, although this is not directly tested in the current study, this may reflect a direct link between chronic numbing and marital dissatisfaction, or it could be due to more stable personality factors, lower levels of interpersonal skills to navigate closeness and intimacy, or relatively chronic external factors influencing both this type of PTSD symptom and marital functioning.

As noted earlier, based on patterns of significance when all clusters were tested simultaneously, there was little evidence of the hypothesized specificity wherein numbing would predict a decrease in positives (satisfaction, positive bonding) and hyperarousal would predict an increase in overt negatives (conflict).

Within-Subject Effects

Recall that within-subject coefficients describe how intrapersonal variation in reports of a marital quality variable is predicted by intrapersonal variation in levels of husband PTSD symptom clusters over time, independent from between-subjects differences in average levels of PTSD, with the different data points representing different measurement times (waves) for each individual rather than a cross-sectional snapshot of many different individuals. For example, in the within-subject analyses, increasing husbands' numbing symptoms predicted decreasing wives' marital satisfaction. We interpret this to mean that at time points when their husbands' numbing symptoms were worse than usual, wives reported lower marital satisfaction, and conversely, at time points when their husbands experienced a lower level of numbing symptoms relative to their own average level (i.e., better than usual), wives reported higher marital satisfaction.

Overall, the simultaneous (controlling across PTSD clusters) analyses showed significant within-subject effects for numbing and hyperarousal only. Increasing husband numbing was associated with decreasing satisfaction for wives, as well as decreasing positive bonding for both husbands and wives. Husbands and wives both reported that they personally engaged in more conflict behaviors as numbing increased. Men also perceived that they and their wives engaged in more conflict as their hyperarousal symptoms increased. There was a surprising finding wherein wives reported that their marital satisfaction increased as husbands' hyperarousal symptoms increased. When clusters are analyzed in combination, it is common for re-experiencing to "flip direction" such that higher levels are associated with less relationship distress, perhaps related to attribution processes, suppressor effects, or other factors that emerge when combining clusters (e.g., Renshaw & Caska, 2012)—it may be that similar (including some potentially spurious) processes are operating for this surprising hyperarousal finding. On the other hand, it is possible that hyperarousal, holding all other symptoms constant, can lead to higher engagement or reassurance seeking in the relationship, which could be associated with higher marital satisfaction for wives.

Based on patterns of significance and non-significance, findings for husbands supported the hypothesis that hyperarousal would be associated with higher levels of conflict. However, the primary story seems to be that variations over time in both numbing and hyperarousal showed the most unique associations with marital problems over time, independent from mean levels of PTSD. These couples may agree that, over and above general levels of PTSD symptoms, there are also "bad times" when symptom exacerbation is associated with more conflict and less connection for the couple. Times that are worse than usual may prompt fights (high conflict) and drive couples apart (low positive bonding). As more stressful times (in terms of symptom exacerbation or other factors that might contribute to symptom exacerbation) accumulate, our results suggest that marital functioning will continue to deteriorate relative to couples' average functioning. And this could also mean that as "good times" accumulate, where symptoms are improving or stress is relieved, this may help couples interact more peacefully and with more connection and intimacy, improving their marital functioning relative to their average level.

Given the relatively novel nature of these analyses, further details contrasting a between-versus within-subject finding in the current study may be useful. Again, within-subject

effects control for the between-subjects effects, so that they represent only the over-time association between marital functioning and PTSD within individuals and rule out potentially confounding effects of differences in overall levels of husbands' PTSD symptoms that exist between different couples. Thus, for example, the between-subjects results show that men who have a high level of numbing symptoms tend to report lower satisfaction with their marriages on average. However, we found no evidence that those men experienced any changes in their marital satisfaction when their levels of numbing symptoms changed, because the within-subject results were nonsignificant. Thus, the negative association between numbing symptoms and marital satisfaction for men can be thought of as a stable difference between different people: there may be some relatively stable feature characterizing men with high numbing, or their life situation, that makes it likely that they will also have lower marital satisfaction. In contrast, the results for women do suggest significant within-subject effects of their husbands' numbing symptoms that are independent from the between-subjects differences. In the simultaneous analyses, women showed no unique between-subjects effects for numbing, but they did report within-subject effects, such that women reported decreasing marital satisfaction while their husbands had increasing levels of numbing symptoms. It may be that the lack of unique between-subjects effects found for husband numbing and wife report of marital functioning is attributable to the removal of within-couples effects of this association. That is, it could be that wives' perceptions of the marriage are less affected by relatively stable patterns of husband numbing in the context of overall PTSD symptoms, but when there are changes over time in these symptoms above and beyond other symptom clusters, wives are more likely to feel that the marriage is significantly affected.

Limitations

Although this study had considerable analytic (e.g., disentangling effects), conceptual (e.g., evaluating multiple aspects of both PTSD and marital functioning), and methodological (e.g., dyadic data, five time points over a two year period) strengths, some limitations exist. Shared method variance based on reporter could have influenced the nature or degree of covariation. For example, the fact that numbing showed between-subjects effects only for men in the controlled analyses could represent some inflation due to this type of method variance, as this represents convergence between two variables as reported by men. Yet, the overall pattern of results, wherein in other cases wives' report of marital functioning did converge with husbands' self-report of PTSD, suggest that this was not the primary mechanism of results. Nevertheless, it may be that we would find different results had we examined wives' perceptions of husbands' PTSD, and that perhaps each individual's perception of husband PTSD is a better representation of this subjective experience in terms of how it might relate to dyadic interaction patterns.

It is also important to note that, in this discussion, speculations about stable factors compared to relative more acute factors are based on the examples provided by Hoffman and Stawski (2009) on the type of stable factors (e.g., "a high stress person" p. 108) that may better explain between-subjects effects, in contrast with the possibly acute factors that may better explain within-subjects effects (e.g., high stress times). In prior literature, both types of factors have been shown to link with PTSD symptoms, with likely chronic and acute

effects on the relationship as well. For example, prior research suggests that pre-deployment traits such as negativism predict PTSD symptom severity after deployment, even controlling for trauma exposure during deployment (Bramsen, Dirkzwager, & van der Ploeg, 2000), and traits such as neuroticism may moderate the association between certain deployment experiences and symptoms of PTSD, such that this link is stronger when neuroticism is high (Caska & Renshaw, 2013). At the same time, postdeployment life stressors predict PTSD symptoms even in models accounting for a range of predeployment and deployment stressors (Vogt & Tanner, 2007). Thus, findings from the current analyses may map onto conceptualizations of both stable and acute factors contributing to PTSD. However, the current study did not evaluate actual contributions of variables such as personality, lifestyle, or acute stressors to these associations between PTSD and marital functioning, and these types of interpretations should be considered possibilities rather than definitive conclusions.

This study's generalizability may be limited by the couples in the study sample, who are married, opposite-sex couples with only the husband serving in the U.S. Army. Importantly, this means that female service members and same sex couples are not represented in these analyses, which should be a focus in future research efforts. Army families have other ways they are unique, in that Army families tend to be more likely to marry and have children at younger ages and have experienced unique stressors such as deployment and combat stress. But they are also often part of an Army support system (e.g., base housing, health care, family readiness groups), and likely have relatively greater understanding of the effects of combat and PTSD. These distinct risk and protective factors may have various effects on the associations between PTSD and marital functioning in Army couples as compared to civilian couples. Moreover, this sample originally joined a study of a marriage education intervention, and thus may be relatively invested in the marriage. In fact, there are, on average, high levels of relationship adjustment in this sample. Thus, it is unclear how well this study can generalize to a sample with relatively lower investment or adjustment, and the discussion of clinical implications should be thus interpreted with the understanding that these were associations found in a non-clinical sample. Although assignment to intervention versus the control group generally did not moderate outcomes, there could be more complex intervention effects that would influence the results in unknown ways. Moreover, the analyses did not account for partner effects (e.g., how the spouse's marital functioning may affect the association between husband PTSD symptoms and one's own marital functioning); such dyadic factors may have also influenced the outcomes.

Clinical Implications

Relationship functioning and psychopathology are intertwined across a range of disorders, and there is a strong developing literature on how couple-based interventions can be employed to address psychopathology along with concomitant relationship issues (Baucom, Whisman, & Paprocki, 2012). In fact, the co-occurrence of PTSD and relationship difficulties is the foundation for cognitive-behavioral conjoint therapy for PTSD (CBCT for PTSD; Monson & Fredman, 2012), a couple therapy which simultaneously addresses PTSD and relationship functioning. CBCT for PTSD has shown positive effects in reducing PTSD symptoms and increasing relationship adjustment. A number of articles have focused on the theoretical application and positive treatment outcomes of this therapy for military couples

(see review and findings by Schumm, Fredman, Monson, & Chard, 2013). Although our sample was not characterized in general by clinical levels of either PTSD or marital distress, the significant within-subject effects found in the current study further bolster the theoretical assumption that simply improving PTSD symptoms could result in some concomitant improvements in relationship functioning. Numbing appears to be the symptom cluster with the most consistent within-subjects effects, supporting prior literature on the particularly strong associations of numbing with variables such as marital distress, sexual dysfunction, and reduced intimacy (e.g., Campbell & Renshaw, 2016; Taft et al., 2008). Thus, clinicians may find it most productive to focus on reduction of numbing symptoms or the effects of numbing on the relationship. Campbell and Renshaw (2016) recommend helping partners communicate about numbing symptoms and restructure attributions regarding these symptoms to be more “external” (i.e., as a feature of PTSD) instead of “internal” (i.e., as a feature of the partner’s personality). Again, the within-subject effects suggest that clinicians may wish to monitor changes from session to session and help couples understand that such variations from what they themselves are used to in terms of PTSD symptoms may have significant effects on their relationship functioning at that time. It may be that increased knowledge about such fluctuations could help couples better maintain relationship skills through changes in PTSD symptom levels and be less sensitive to fluctuations. And of course, effects may be bidirectional, such that variations in the relationship may lead to flare ups or amelioration of PTSD symptoms.

Although there were a number of significant within-subject effects, the robust between-subjects effects (particularly for men) also indicate the need to comprehensively evaluate and address what may be more chronic or stable factors characterizing couples experiencing both relationship distress and partner PTSD. This can include chronic PTSD symptoms, but may also include chronic stressors, personality variables, enduring relationship interaction patterns, or lifestyle differences. The 15 session protocol for CBCT for PTSD does include broad relationship skills training (e.g., communication skills, positive connections, conflict management) that can transcend PTSD related conflict or relationship issues regarding PTSD (e.g., conflict about PTSD symptoms, reduced socialization due to PTSD symptoms). The individualized nature of the treatment also allows clinicians to idiographically identify stable factors that may transcend time specific variations in symptom levels. For couples with additional chronic issues not addressed by the CBCT for PTSD protocol, this therapy may be a first step, with follow up treatment warranted.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Table 1

Unstandardized fixed-effects coefficients for primary results for husbands (left) and wives (right) from analyses predicting four aspects of marital functioning from four PTSD clusters.

| | Husbands | | | | Wives | | | |
|---------------------------------|----------------------|------------------|-----------------|--------------------|----------------------|------------------|-----------------|--------------------|
| | Marital Satisfaction | Positive Bonding | Conflict - Self | Conflict - Partner | Marital Satisfaction | Positive Bonding | Conflict - Self | Conflict - Partner |
| Between-Subjects Effects | | | | | | | | |
| Numbing | -0.479*** | -0.451*** | 0.265*** | 0.281*** | -0.326*** | -0.289*** | 0.122*** | 0.162*** |
| | -0.768*** | -0.832*** | 0.294*** | 0.391*** | -0.228 | -0.208 | 0.050 | 0.046 |
| Hyperarousal | -0.310*** | -0.276*** | 0.210*** | 0.185*** | -0.247*** | -0.216*** | 0.103*** | 0.145*** |
| | 0.152 | 0.160 | 0.019 | -0.126 | 0.025 | 0.059 | 0.011 | 0.043 |
| Effortful Avoidance | -0.306*** | -0.259*** | 0.183*** | 0.206*** | -0.317*** | -0.286*** | 0.121*** | 0.155*** |
| | 0.125 | 0.197 | -0.142* | -0.026 | -0.299* | -0.261* | 0.078 | 0.061 |
| Re-experiencing | -0.316*** | -0.268*** | 0.222*** | 0.216*** | -0.261*** | -0.245*** | 0.117*** | 0.162*** |
| | 0.044 | 0.068 | 0.098 | 0.040 | 0.177 | 0.112 | -0.007 | 0.028 |
| Within-Subject Effects | | | | | | | | |
| Numbing | -0.094 | -0.293*** | 0.132*** | 0.131*** | -0.190** | -0.140* | 0.070* | 0.052 |
| | -0.080 | -0.335*** | 0.073* | 0.070 | -0.273** | -0.226** | 0.114** | 0.080 |
| Hyperarousal | -0.103* | -0.199*** | 0.118*** | 0.117*** | -0.023 | -0.031 | 0.005 | 0.003 |
| | -0.119 | -0.104 | 0.070* | 0.083* | 0.185* | 0.062 | -0.051 | -0.050 |
| Effortful Avoidance | -0.011 | -0.062 | 0.078*** | 0.086** | -0.053 | -0.007 | 0.019 | 0.023 |
| | 0.025 | 0.053 | 0.024 | 0.054 | 0.075 | 0.052 | -0.000 | 0.005 |
| Re-experiencing | -0.012 | -0.074 | 0.094*** | 0.074* | -0.141* | 0.024 | 0.012 | 0.022 |
| | 0.093 | 0.140 | -0.010 | -0.061 | -0.157 | 0.027 | -0.020 | 0.001 |

Note:

*** $p < .001$;

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**
*
 $p < .01$;
 $p < .05$.

Between-subjects effects ($\gamma 010$) are shown in the top panel of the table (i.e., top four rows with the header “between-subjects effects”), and within-subject effects ($\gamma 200$) are shown in the bottom panel (i.e., bottom four rows with the header “within-subjects effects”). Coefficients for models including only one PTSD symptom cluster at a time (separate analyses) are shown in the top line of each cell; coefficients for models including all PTSD symptom clusters at once (simultaneous analyses) are shown in the bottom line of each cell. All analyses included deployment status as a covariate.