

Domains of Quality of Life and Symptoms in Male Veterans Treated for Posttraumatic Stress Disorder

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This study examined the relationship between domains of quality of life and posttraumatic stress disorder (PTSD) symptoms in 319 male veterans in a randomized trial of group psychotherapy. Confirmatory factor analyses suggested a 4-factor model of quality of life (achievement, self-expression, relationships, and surroundings) fit better than a unidimensional model. Clinically meaningful symptom change was associated with greater change in all quality of life domains. At pretreatment, numbing symptoms uniquely predicted all quality of life domains. Change in avoidance and hyperarousal uniquely predicted change in achievement. Change in reexperiencing uniquely predicted change in self-expression. Change in numbing uniquely predicted change in relationships. Examining change in PTSD symptoms and quality of life domains may provide important information for treatment planning and evaluation.

Posttraumatic stress disorder (PTSD) is related to poor quality of life (e.g., Magruder et al., 2004; Stein, Walker, Hazen, & Forde, 1997; Zatzick et al., 1997). In a recent study, participants with PTSD showed impairments in quality of life that were both more likely to be severe and more pervasive (across multiple domains), as compared with participants who had other anxiety disorders (Rapaport, Clary, Fayyad, & Endicott, 2005). Clinical trials have shown that quality of life improves after treatment for PTSD (e.g., Malik et al., 1999; Rapaport, Endicott, & Clary, 2002).

A major impediment to understanding the impact of PTSD on quality of life is the lack of consensus on how to define and measure it (e.g., Becker & Diamond, 2006;

Katschnig, 2006). In their review of quality of life in anxiety disorders, Mendlowicz and Stein (2000) suggest that despite the variety of theoretical approaches and different measures available, there is agreement that a good definition should emphasize both the subjective experience of well-being and the multidimensional nature of the construct. Similarly, Mogotsi, Kaminer, and Stein (2000) point out that quality of life measures can be distinguished from measures of functional impairment and disability by their focus on “the patient’s subjective satisfaction with his or her current functioning and sense of general well-being” (p. 274).

The Quality of Life Inventory (QOLI; Frisch, 1994) encompasses both the multidimensional and subjective

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nature of quality of life. Gladis, Gosch, Dishuk, and Crits-Christoph (1999) describe the QOLI as “perhaps the ‘purest’ life satisfaction measure” (p. 322). Satisfaction and importance are rated for 16 aspects of life, including health, work, relationships, and community. The overall measure is an average of satisfaction weighted by importance for those areas rated as important. The QOLI is multidimensional in the sense that it covers many aspects of life, but the overall measure, which sums across all important domains, assumes a unidimensional structure (Frisch & Sanford, 2003).

The QOLI has been used to assess the impact of PTSD on quality of life. Gudmundsdottir, Beck, Coffey, Miller, and Palyo (2004) found a moderate negative correlation between PTSD symptoms and the QOLI in motor vehicle accident (MVA) survivors. The QOLI has also been shown to be sensitive to treatment-related change in PTSD. In a study comparing cognitive-behavior therapy and exposure therapy in the treatment of PTSD, Paunovic and Öst (2001) found that QOLI scores improved significantly after treatment.

In a previous study using the QOLI as one of several indicators of psychosocial quality of life (Schnurr, Hayes, Lunney, McFall, & Uddo, 2006), we found that higher levels of PTSD symptoms were associated with lower quality of life before treatment for participants in a clinical trial of group therapy for PTSD (Schnurr, Friedman, Lavori, & Hsieh, 2001; Schnurr et al., 2003). Even though average quality of life did not change significantly over time, there was substantial intraindividual variation in the amount of change in both symptoms and quality of life, and PTSD symptom change was significantly related to change in quality of life from pre- to posttreatment, and from posttreatment to follow-up 12 months later.

Although average QOLI scores did not change significantly over time in the previous study, inspection of the individual item ratings raised the possibility that related groups of items, or domains, might be differentially associated with PTSD, and thus might change differently. Recent factor analytic studies of the QOLI in patients with social anxiety disorder (Eng, Coles, Heimberg, & Safren, 2005), HIV (O’Cleirigh & Safren, 2006), and anxiety and de-

pressive disorders (McAlinden & Oei, 2006) suggest that looking at the QOLI by domain can provide additional insight into the nature of life satisfaction in different populations. Evaluating quality of life by domain may also have important treatment implications (Katschnig, 2006). Frisch (1994) suggests that looking at the pattern of QOLI item scores may prove useful in treatment planning. Looking at change by domain would also allow comparison of various treatments and identification of areas that require further intervention.

Despite the potential utility of examining the by-item scores on the QOLI, most authors present only the overall score. One exception is a crosscultural validation study (Paunovic & Öst, 2004) of a Swedish version of the QOLI, comparing crime victims with PTSD to gender- and age-matched controls. Paunovic and Öst reported both the overall QOLI and the mean scores for each QOLI item for the PTSD and control groups. The PTSD group was significantly lower on 13 of the 16 items (except helping, relationships with children, and home). Paunovic and Öst also looked at the relationship between the overall QOLI score and the three symptom clusters of PTSD (reexperiencing, avoidance/numbing, and hyperarousal). Correlations were low to moderate, with the strongest correlation between the QOLI and the avoidance/numbing cluster.

Other cross-sectional studies have examined the possibility that PTSD symptom clusters are differentially related to domains of quality of life. The avoidance/numbing cluster, and in particular, emotional numbing symptoms, are related to psychosocial functioning. Numbing symptoms uniquely predict intimate relationship distress (Riggs, Byrne, Weathers, & Litz, 1998), parenting satisfaction (Ruscio, Weathers, King, & King, 2002), and several other areas of psychosocial functioning (recreation, family, and friends; Kuhn, Blanchard, & Hickling, 2003); the combined avoidance/numbing cluster also uniquely predicts parenting satisfaction (Samper, Taft, King, & King, 2004). A suggested explanation for these findings is that the emotional numbing symptoms of PTSD lead to withdrawal and difficulties expressing emotion (Litz, 1992; Litz & Gray, 2002; Riggs et al., 1998; Samper et al., 2004).

Fewer studies have examined how PTSD symptom clusters relate to other domains of quality of life. Kuhn et al. (2003) found that hyperarousal symptoms uniquely predicted major role functioning in a treatment-seeking sample of MVA survivors. However, in a sample of MVA survivors with lower symptom severity, avoidance and numbing both uniquely predicted major role functioning. For health-related quality of life, several authors have suggested that the physiological correlates of PTSD symptoms such as hyperarousal may be interpreted as signs of physical illness (e.g., Litz, Keane, Fisher, Marx, & Monaco, 1992; Zoellner, Goodwin, & Foa, 2000). Kimerling, Clum, and Wolfe (2000) found that hyperarousal symptoms uniquely predicted self-reported health symptoms and health perceptions. Woods and Wineman (2004) found that both avoidance and hyperarousal symptoms clusters were related to physical health symptoms, although they did not test the unique contribution of each cluster. Although Zoellner and colleagues (2000) predicted that hyperarousal symptoms would be most related to self-reported health symptoms, they found that the reexperiencing cluster uniquely predicted physical symptoms. However, direct comparison of these findings is complicated by the fact that their analysis also included negative life events and depression.

The primary goal of the present study was to extend prior findings by examining how domains of quality of life change in relation to PTSD symptom change. Quality of life (as measured by the QOLI) and PTSD symptoms were assessed before and after participation in a randomized clinical trial of group therapy for PTSD (Schnurr et al., 2001, 2003). Confirmatory factor analysis (CFA) was used to compare the fit of a unidimensional model to a multidimensional model of the QOLI proposed by O'Leirigh and Safren (2006). Quality of life for each domain was examined as a function of clinically significant change in PTSD symptoms.

The secondary goal was to explore relationships among domains of quality of life and PTSD symptom clusters. First, we looked at these relationships before treatment. To extend the cross-sectional findings, we also looked at relationships between change in each quality of life domain and change in PTSD symptom clusters. For each of these

questions, multiple regression was used to compare unique contributions of each symptom cluster to predicting both pretreatment and change in each quality of life domain.

METHOD

Participants

Participants were 319 male Vietnam veterans with PTSD in a randomized clinical trial of group therapy for PTSD (Schnurr et al., 2001, 2003). Forty-one veterans from the original sample of 360 were excluded because they were missing one or both of the primary measures at pre- or posttreatment. These 41 men were comparable in age, education, marital status, and pretreatment PTSD symptoms and quality of life. They were, however, more likely to be unemployed: 70.7% ($n = 29$) versus 49.8% ($n = 159$), $\chi^2(1, N = 360) = 6.35, p < .05$.

Participants' average age was 50.7 years ($SD = 3.7$). Most were White (66.1%, $n = 211$), 73 (22.9%) were Black, and 35 (11.0%) were from other ethnic groups; 23 across all groups (7.2%) were Hispanic. Most had at least a high school education (89.3%, $n = 285$). About half (52.7%, $n = 168$) were married or cohabitating; 49.8% ($n = 159$) were unemployed.

Measures

Quality of life. Quality of life was measured using the Quality of Life Inventory (Frisch, 1994). Each of 16 aspects of life (see Table 1) are rated in terms of satisfaction ($-3 = \textit{very dissatisfied}$ to $3 = \textit{very satisfied}$) and importance ($0 = \textit{not important}$ to $2 = \textit{extremely important}$). Weighted satisfaction ratings for each item are calculated by multiplying each satisfaction rating by its importance value. This weighted satisfaction score ranges from -6 (most negative) to 6 (most positive).

PTSD symptoms. The PTSD symptoms were assessed using the Clinician-Administered PTSD Scale (CAPS; Weathers, Keane, & Davidson, 2001), a structured interview in which the frequency and intensity of each of the 17

Table 1. Descriptive Information by Quality of Life Inventory (QOLI) Item and Domain ($N = 319$)

QOLI Domain/Item	Pretreatment		Posttreatment		Standardized coefficients ^a	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	Pretreatment	Posttreatment
Achievement	-0.94	2.28	-0.84	2.16		
Health	-1.33	3.67	-1.47	3.45	.56	.43
Self-esteem	-0.78	3.44	-0.79	3.34	.78	.72
Goals and values	-0.54	3.23	-0.57	3.01	.77	.72
Money	-1.02	2.61	-0.63	2.75	.45	.46
Work	-0.99	2.88	-0.72	3.01	.54	.62
Self-expression	-0.52	2.31	-0.42	2.14		
Play	-0.86	2.65	-0.76	2.53	.73	.67
Learning	-0.39	3.10	-0.34	3.06	.73	.61
Creativity	-0.33	2.71	-0.17	2.50	.68	.69
Relationships	0.36	2.27	0.58	2.26		
Helping	0.33	2.95	0.67	2.88	.62	.65
Love	-0.13	3.86	-0.01	3.89	.64	.60
Friends	-0.03	2.77	0.13	2.62	.59	.64
Children	1.02	3.62	1.32	3.70	.55	.58
Relatives	0.60	2.78	0.77	2.77	.68	.60
Surroundings	0.90	2.38	0.85	2.28		
Home	1.21	3.39	1.14	3.34	.70	.62
Neighborhood	0.97	2.82	0.79	2.61	.73	.79
Community	0.52	2.48	0.62	2.35	.73	.78

^aStandardized coefficients are from the 4-factor confirmatory factor analysis model.

PTSD symptoms, as defined by the *Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition (DSM-IV;* American Psychiatric Association, 1994), is rated on a 5-point scale (from 0–4). Scores are summed to create an overall severity measure. Higher scores reflect higher severity. A change of ± 10 points (roughly 0.5 standard deviations) is defined as clinically meaningful (Schnurr et al., 2001; Weathers et al., 2001). Using this guideline, three categories of clinically significant symptom change were created: (a) increase (worsening of ≥ 10 points), (b) no change (change of ± 9 points), and (c) decrease (improvement of ≥ 10 points).

We also computed severity scores for the PTSD symptom clusters. Reexperiencing symptoms (B cluster) and hyperarousal symptoms (D cluster) were defined according to the *DSM-IV*. The C cluster (avoidance/numbing) was separated into avoidance (avoidance of thoughts or feelings associated with the trauma and avoidance of people or places that are reminders of the trauma) and numbing

(psychogenic amnesia, diminished interest, detachment, numbing, and sense of foreshortened future), based on evidence that avoidance and numbing symptoms form separate symptom clusters (e.g., King, Leskin, King, & Weathers, 1998).

Data Analysis

Confirmatory factor analyses performed using AMOS 5.0 (Arbuckle, 2003) allowed us to evaluate and compare the fit of a unidimensional model, with all 16 items loading on a single quality of life factor, and the 4-factor model proposed by O’Cleirigh and Safren (2006; see Table 1 for the item groupings). This model was chosen because the four domains of quality of life (achievement, self-expression, relationships and surroundings) correspond well to conceptual groupings of the items. For the multidimensional model, factors were allowed to correlate with each other, and each item loaded on only one factor. Correlations

between errors were set to 0. To establish scale, factor variances were set to 1.

Model fit was evaluated separately at pretreatment and posttreatment, using the overall chi square, Akaike's Information Criterion (AIC; Akaike, 1987), the Comparative Fit Index (CFI; Bentler, 1990), the Tucker-Lewis Index (TLI; Tucker & Lewis, 1973), and the root mean square of approximation (RMSEA; Steiger, 1990). Chi-square difference tests were performed to compare the relative fit of the two models. The relative value of the AIC for two models can be interpreted as a measure of relative fit (smaller values reflect better fit). Conventional cutoffs for the RMSEA are .10 or greater for unacceptable fit, .08–.06 for acceptable fit, and .06 or less for close fit; for the CFI and TLI, conventional cutoffs are .90–.95 for acceptable fit, and .95 or above for close fit (Browne & Cudeck, 1992; Hu & Bentler, 1999).

Domain scores for the 4-factor model were calculated by averaging items within each domain. Analysis of covariance was used to test the relationship between change in each QOLI domain score and clinically significant PTSD symptom change (increase, no change, and decrease), controlling for pretreatment QOLI domain score and pretreatment CAPS score. Change scores in each QOLI domain were predicted from symptom change group, controlling for pretreatment QOLI domain score, and pretreatment CAPS. Bonferroni correction was used for the pairwise comparisons between the adjusted means for the three symptom change groups.

Multiple regression and correlational analyses were used to investigate the relationship between the four QOLI domains and the four PTSD symptom clusters. For the analyses to predict pretreatment QOLI in each domain, we first computed bivariate correlations between each QOLI domain score and each PTSD symptom cluster to provide a baseline for interpreting the multiple regression results. Next, we performed simultaneous multiple regressions, regressing each QOLI domain on the four PTSD symptom clusters. The partial correlations resulting from these analyses can be interpreted as the unique contribution of each symptom cluster in predicting a given QOLI domain score. The corresponding analyses for prediction of change in

each QOLI domain used change scores. First, we regressed change in each QOLI domain on change in each symptom cluster separately, controlling for pretreatment scores on the QOLI domain and PTSD symptom in question. We report these results as partial correlations. Next, we regressed change in each QOLI domain on change in the four PTSD symptom clusters simultaneously, along with pretreatment scores for each symptom cluster and the relevant QOLI domain. Partial correlations from this analysis can be interpreted as the unique contribution of change in each symptom cluster to the prediction of change in the QOLI domain.

RESULTS

Table 1 contains descriptive information for each item, grouped by the domains proposed by O'Leirigh and Safren (2006). Although there was no significant change in the overall QOLI measure after treatment (Schnurr et al., 2003), there were significant increases over time for money, $t(318) = 2.43$, $p < .05$, and helping, $t(318) = 2.03$, $p < .05$. On average, there was a small improvement in PTSD symptoms ($M_{diff} = -5.93$), $t(318) = 5.83$, $p < .001$. Using a change of 10 or more points as an indicator of clinically significant change, 18.8% ($n = 60$) showed a clinically significant increase and 37.9% ($n = 121$) showed a clinically significant decrease in the overall CAPS score. The rest (43.3%, $n = 138$) had an increase or decrease of < 10 on the CAPS.

The unidimensional model for the QOLI failed to meet conventional fit criteria at pretreatment, AIC = 549.28, CFI = .79, TLI = .76, RMSEA = .103 (90% CI = .093–.113) and posttreatment, AIC = 567.35, CFI = .75, TLI = .68, RMSEA = .105 (90% CI = .096–.115). For both pre- and posttreatment, there was a significant improvement in model fit for the 4-factor model, $\Delta\chi^2$ ($df = 6$) = 240.52 for pretreatment and 254.68 for posttreatment, $ps < .001$. Fit indices for the 4-factor model were between acceptable and close for pretreatment, AIC = 320.76, CFI = .93, TLI = .92, RMSEA = .061 (90% CI = .050–.072) and posttreatment, AIC = 324.67, CFI = .92, TLI = .89, RMSEA = .062 (90% CI = .051–.073). Standardized

coefficients for items at pre- and posttreatment for the 4-factor model are presented in Table 1.

Given the support for the 4-factor model, we averaged the items within each domain (Table 1). The reliability of unit-weighted scales at pretreatment ranged from .74 (relationships) to .76 (achievement). At posttreatment, reliability ranged from .70 (self-expression) to .75 (relationships and surroundings). Only relationships changed significantly over time ($M_{diff} = 0.22$), $t(318) = 2.14$, $p < .05$.

Figure 1 shows the mean QOLI domain change for the three PTSD symptom change groups. The QOLI change scores were adjusted for pretreatment quality of life in each domain and pretreatment CAPS. For each domain, groups differed in change in quality of life, $F_s(2, 314) = 9.66$ – 21.94 , all $p_s < .001$. Effect sizes were relatively small (η^2 ranging from 4.1% for self-expression to 9.3% for achieve-

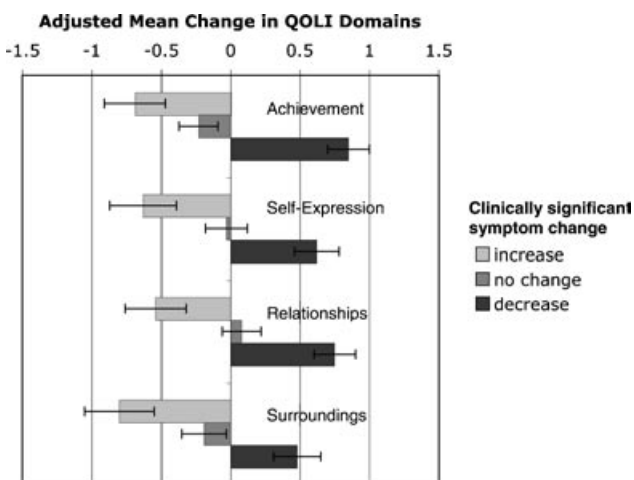


Figure 1. Adjusted mean change for each Quality of Life Inventory (QOLI) domain by clinically significant PTSD symptom change group. Adjusted means and standard errors are from the ANCOVA predicting pre- to posttreatment change in each QOLI domain from clinically significant PTSD change group, controlling for pretreatment QOLI domain score and pretreatment score on the Clinician-Administered PTSD Scale (CAPS). Clinically significant symptom change was defined as a change of 10 or more points on the CAPS; Increase = increase of 10 or more points; No Change = increase or decrease of 9 or fewer points; Decrease = decrease of 10 or more points.

ment). For achievement, self-expression, and surroundings, participants whose symptoms decreased differed significantly from participants whose symptoms increased or did not change. For relationships, all three groups differed from each other.

Results from the analyses to examine relationships between the four PTSD symptom clusters and each QOLI domain are presented in Table 2. Separate correlations between each domain and each PTSD symptom cluster are included to provide a basis for interpreting the multiple regressions that included all clusters simultaneously. For symptom measures, higher values reflect more severity, and higher scores on the QOLI domains reflect higher quality of life, so we would expect the correlations to be negative.

The top half of Table 2 contains findings from analyses to predict pretreatment quality of life. Looking first at the separate relationships, we found that numbing was related to all domains, reexperiencing and hyperarousal were related to all domains except surroundings, and avoidance was related only to achievement. Results from the combined analyses examining the unique relationships among symptom clusters and QOLI domains showed that before treatment, only numbing had a unique association with quality of life in all domains.

A different picture emerged in the analyses predicting change in each QOLI domain from change in PTSD symptom clusters (Table 2, bottom). In analyses that examined each cluster separately, change in all PTSD clusters was related to change in all QOLI domains, except for avoidance and surroundings. In the combined analyses, change in re-experiencing was uniquely associated with change in self-expression. Change in both avoidance and hyperarousal were uniquely associated with change in achievement. Last, change in numbing was uniquely associated with change in relationships.

DISCUSSION

We examined the relationship between subjective quality of life and PTSD symptoms in male veterans seeking treatment for PTSD. To our knowledge, this is the first study to investigate change in specific symptom clusters and change

Table 2. Results From the Multiple Regressions Predicting Pretreatment and Change in each Quality of Life Inventory (QOLI) Domain From Posttraumatic Stress Disorder (PTSD) Symptom Clusters

QOLI domain	Separate analyses				Combined analyses			
	Reexp	Avoid	Numb	Arousal	Reexp	Avoid	Numb	Arousal
Pretreatment								
Achievement	-.23***	-.11*	-.31***	-.25***	-.09	.00	-.22***	-.05
Self-expression	-.22***	-.11	-.30***	-.21***	-.11	.00	-.22***	-.01
Relationships	-.12*	-.09	-.31***	-.18**	.01	-.02	-.26***	-.02
Surroundings	-.02	-.01	-.25***	-.09	.05	.03	-.24***	.00
Change								
Achievement	-.30***	-.30***	-.28***	-.33***	-.06	-.14*	-.10	-.17**
Self-expression	-.27***	-.18**	-.22**	-.17**	-.16**	-.04	-.11	.01
Relationships	-.21***	-.12*	-.26***	-.18**	-.07	.01	-.18***	-.05
Surroundings	-.16**	-.09	-.15**	-.16**	-.06	.02	-.08	-.07

Note. Entries under Separate analyses show the relationship between each QOLI domain and each PTSD symptom cluster individually; entries for Pretreatment are correlations and Change entries are partial correlations controlling for pretreatment QOLI domain and symptom cluster score. For Pretreatment, table entries under Combined analyses are partial correlations from the multiple regression predicting each QOLI domain score from all 4 symptom clusters simultaneously. For Change, entries under Combined Analyses are partial correlations from the multiple regression change in each QOLI domain from change in all four symptom clusters simultaneously, controlling for pretreatment QOLI domain and symptom cluster scores. Reexp = Reexperiencing; Avoid = avoidance; Numb = numbing; Arousal = hyperarousal.
 p* < .05. *p* < .01. ****p* < .001.

in domains of quality of life. There were several main findings. First, quality of life was best described as a multidimensional construct. Second, clinically significant change in PTSD symptoms was associated with improvement in all domains of quality of life. Finally, numbing symptoms were uniquely associated with all domains of quality of life prior to treatment, but change in each symptom cluster was differentially related to change in each domain.

Results of confirmatory factor analysis suggest that quality of life was best described by the 4-factor model proposed by O’Cleirigh and Safren (2006). This model corresponds well to conceptual groupings of the items. Further study is needed to know whether this model applies in other populations. Although the details of past findings differ from each other, they all point to the utility of considering quality of life as a multidimensional construct (Eng et al., 2005; McAlinden & Oei, 2006; O’Cleirigh & Safren, 2006).

We also expanded on Paunovic and Öst’s (2004) study by presenting both pre- and posttreatment ratings for each item on the QOLI in male veterans being treated for PTSD. Frisch (1994) suggested using pretreatment norms specific

to the clinical population in question to assess improvement, rather than using the nonclinical standardization sample. In this way, our study adds to Paunovic and Öst’s (2004) by showing a profile for male veterans with PTSD, as well as showing the change in quality of life domains following treatment.

Clinically significant change in PTSD symptoms was associated with change in all QOLI domains. For relationships, all three symptom change groups differed from each other. For other domains, participants with clinically significant improvement in PTSD symptoms showed significant improvement in quality of life as compared with those who did not change or who worsened. These findings extend our previous work (Schnurr et al., 2006) by showing not only that symptom change is related to change in quality of life, but also that meaningful change in symptoms is needed for improvement in most domains of quality of life. It is important to note that the effect of treatment on PTSD symptoms in this study was relatively small; it is possible that the effects could be more pronounced in a study with more treatment change.

By investigating the relationship between PTSD symptoms and QOLI domains before treatment, we obtained a cross-sectional snapshot of the nature of these relationships in treatment-seeking male veterans. Numbing symptoms were uniquely associated with all QOLI domains at pretreatment. These findings are consistent with Kuhn et al.'s (2003) assertion that emotional numbing plays an important role in psychosocial functioning; hence, it should be a specific focus of treatment. Nonsignificance in the multiple regressions for the other clusters does not mean that they are unrelated to quality of life; rather, it means these clusters did not uniquely contribute to predicting quality of life.

In contrast to the pretreatment analyses, different patterns emerged for the analyses to predict change in each QOLI domain. Findings were generally consistent with past research, with some exceptions. Change in the hyperarousal and avoidance clusters was uniquely associated with change in achievement. Items in this domain cover health, role functioning (work, money) goals and values, as well as self-esteem. Prior studies have found that hyperarousal (Kimerling, Clum, & Wolfe, 2000) and avoidance (Woods & Wineman, 2004) are related to physical health symptoms. In MVA survivors, hyperarousal was uniquely associated with role functioning in a treatment-seeking sample, whereas both avoidance and numbing were uniquely associated with role functioning in a less-symptomatic sample recruited for an observational study (Kuhn et al., 2003).

Change in numbing was uniquely associated with change in relationships, which is consistent with past research showing the impact of numbing on intimate relationships and relationships with children (e.g., Kuhn et al., 2003; Riggs et al., 1998; Ruscio et al., 2002). Given findings that numbing is associated with reduced recreational functioning (Kuhn et al., 2003), and consideration of numbing symptoms such as "diminished interest in important activities" and "foreshortened future," we might have expected change in numbing to also have an impact on self-expression. We also might have expected changes in avoidance to be associated with changes in self-expression. However, change in reexperiencing was uniquely associated with change in self-expression. Evans, McHugh, Hopwood, and

Watt (2003) argue that reexperiencing symptoms may have the greatest impact on the person with PTSD, as compared with the potential interpersonal consequences of avoidance/numbing and hyperarousal. Similarly, the items in self-expression are also more self-oriented than the other domains.

Our analyses offer insight into how treatment-related change in different symptoms may affect aspects of quality of life. We had no a priori reason to expect differences between the pretreatment and change analyses, but such a result could occur by several avenues. Change in some domains may be more strongly related to change in symptoms because the conditions leading to satisfaction or dissatisfaction with that area of life are more difficult to change. For instance, it may be more difficult to change satisfaction with surroundings without also changing objective circumstances, whereas other areas of life may improve more easily along with symptom change because of a change in attitude or perception. Possibly, the time frame for the change in a particular domain may be outside the scope of a treatment episode. Further research is needed to determine whether these relationships are treatment-specific; for example, would treatments with differential impact on PTSD symptom clusters show the same patterns of relationships?

Another important question concerns the directionality of the relationship between PTSD and quality of life, and the implications of this relationship for treatment planning. We cannot definitively infer directionality from this or other studies. We know that treating PTSD can improve quality of life (e.g., Malik et al., 1999; Rapaport et al., 2002). Our prior research (Schnurr et al., 2006) is consistent with the interpretation we have chosen—that PTSD symptom change affects quality of life—but also shows evidence that changes in quality of life affect PTSD. Because it is likely that quality of life and symptoms interact mutually over time, it is prudent for clinicians who typically focus on symptoms to consider improved quality of life as a treatment goal as well.

Although we have discussed our analyses in the context of past findings and explanations based on theoretical and logical argument, it is important to remember that these analyses were exploratory, and beg both replication and

extension. Several potential limitations to the generalizability of our findings should be considered. Our sample consisted of male Vietnam veterans seeking treatment for chronic PTSD. Many of these men were unemployed and receiving disability payments. Future investigations should enroll samples that are more diverse. Additionally, the treatments used did not result in very much average change in PTSD over time, nor were they designed to improve quality of life specifically. Results might differ in a sample with greater PTSD symptom improvement or following an intervention targeting quality of life.

The value of including quality of life as an outcome in treatment studies seems obvious. What is less obvious, however, is the best way of measuring it, independently of disability and symptom status. Using item- and domain-level information provided in instruments such as the QOLI (Frisch, 1994) yields a wealth of information for treatment planning and assessment of treatment outcome (both on an individual level and in the assessment of improvement relative to pretreatment status). Continued examination of the relationship between change in the symptom clusters of PTSD and change in the domains of quality of life may help further elaborate our understanding of the mechanisms through which PTSD affects quality of life.

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