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Defining posttraumatic stress disorder recovery: Benchmarking symptom change against functioning indicators

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The dataset that supports the findings of this study is owned by the Department of Veterans Affairs and contains sensitive personal information. Restrictions apply to the accessibility of the data and the dataset is not publicly available.

Defining posttraumatic stress disorder recovery in veterans: Benchmarking symptom change against functioning indicators

Improved metrics of PTSD treatment response that extend beyond a focus on symptom reduction to incorporate meaningful, patient-centred indicators of functioning are needed in veteran populations. The aim of this study was to extend previous research by investigating whether indicators of functioning can successfully distinguish against symptom response categories derived from the Posttraumatic Stress Disorder Checklist (PCL-5) pre- and post- PTSD treatment. Participants were 472 veterans receiving hospital-based treatment for PTSD. In addition to the PCL-5, measures included quality of life, social relationships, physical health and psychological distress. Four mutually exclusive, progressive response categories were used to define treatment response including: No Response; Response; Response and Below Threshold; and Remission. PTSD symptom reductions were associated with corresponding improvements in broader indicators of functioning. However, it was only when the magnitude of symptom reduction placed the individual in the ‘Response and Below Threshold’ category that improvement on functioning measures achieved levels indicative of a good end state. Traditional metrics of treatment ‘response’ in PTSD treatment do not necessarily indicate recovery on important functioning indicators. Only when an individual both responds and drops below threshold for probable disorder are they likely to report having restored meaningful levels of functioning.

Keywords: posttraumatic stress disorder, recovery, veterans, treatment, benchmarking.

Defining posttraumatic stress disorder recovery in veterans: Benchmarking symptom change against functioning indicators

Posttraumatic stress disorder (PTSD) is a debilitating condition that can have profound effects on function and quality of life (Hamner, Robert, & Frueh, 2014; Magruder et al., 2004). Although international guidelines recommend trauma-focussed psychological interventions as first-line treatments for PTSD, clinical outcomes are frequently sub-optimal, particularly amongst more complex groups including veteran and military populations (Foa et al., 2018). Within this group as few as one-third of patients achieve good outcomes (Steenkamp, Litz, Hoge, & Marmar, 2015). There is agreement that improvements in PTSD treatments are needed, however a significant limitation of the current literature is the lack of consensus regarding an operational definition of treatment response (Varker et al., 2020).

Standardized measures of PTSD symptoms typically have their own operational definitions based on pre-to-post treatment reductions in scores. For example, on self-report measures of symptom change, such as the Posttraumatic Stress Disorder Symptom Scale–Self-Report (PSS-SR), a 50% reduction is suggested to provide a reliable benchmark of positive improvement (Ehlers et al., 2003). Equally, a 5-10 point reduction on the Posttraumatic Stress Disorder Checklist is reportedly indicative of a significant response to treatment (Bovin et al., 2016; Dunlop, Kaye, Youngner, & Rothbaum, 2014). Although yet to be empirically confirmed, a 10 point decrease (or alternatively, a 30% reduction) in total scores from pre-to-post treatment is a recommended indicator of response to treatment on the Clinician Administered PTSD Scale (CAPS-5); which is also considered the gold standard tool for assessment of PTSD (Varker et al., 2020; Weathers et al., 2015). Beyond individualized metrics of treatment response, researchers have applied the same quantitative benchmark in PTSD symptoms across measures, with a recent systematic review reporting that the majority of randomized controlled trials testing first and second line PTSD treatments employed a universal 10-12 point decrease in symptoms as the primary metric of a positive response to treatment, regardless of the measure (Steenkamp et al., 2015).

However, reductions in scores on standardized PTSD measures may not necessarily translate into meaningful symptom improvement, particularly when baseline scores are high. Some researchers have thus used alternative methods to define treatment response which have referenced discrete categories such as ‘loss of diagnosis’, ‘remission’ and ‘recovery’. However, there is no consistency in how these terms have been defined or applied (Varker et al., 2020). The absence of a universal definition of response to PTSD treatment could be linked, in part, to the lack of data regarding what constitutes recovery beyond symptom reduction. There are several important reasons why this situation remains problematic. PTSD is associated with particularly poor levels of quality of life, and has been identified as a primary driver of disability (O'Donnell et al., 2013). As such, an ideal conceptualization of recovery from PTSD should extend beyond the absence of illness to include a return to pre-disorder functioning (Crosby, Kolotkin, & Williams, 2003). Indeed, research shows that a significant motivation for veteran and military populations initiating PTSD treatment is not just symptom reduction, but rather, improvement in multiple domains of functioning, including physical, social, and emotional (Rosen, Adler, & Tiet, 2013). Changes in PTSD symptoms do not necessarily result in changes to other impairments, nor necessarily reduce disability or increase quality of life. Conversely, the opposite may also be true. A narrow focus on PTSD symptom reduction can underrepresent the efficacy of a given treatment. That is, even with sub-optimal reductions in PTSD symptoms, other critically important aspects of functioning may nevertheless improve.

For veteran and military populations, where response to first-line treatments is sub-optimal (Varker et al., 2020) and intensive efforts are under way to develop new treatment approaches (Metcalf et al., 2019), the field requires improved definitions of PTSD treatment response. Work has begun in military and veteran populations to move beyond symptom severity and set benchmarks for how much improvement in PTSD symptoms is necessary to effect meaningful changes in other indicators of recovery. For example, in a sample of female veterans receiving evidence-based treatments, several categories of symptom improvement for PTSD derived from the CAPS were benchmarked against quality of life indices with the aim of establishing concordance between symptom reductions and improvements on measures of functional impairment and quality of life (Schnurr & Lunney, 2016). These findings were notable and demonstrated that an improvement of >10 points on the CAPS, the previously recommended ‘target’ for treatment, was not consistently associated with improvements on domains of quality of life. Rather, it was only those treated to a point below the diagnostic threshold for PTSD, who achieved reliable improvements in quality of life. Although this study, the only previous investigation of its kind, used the gold standard CAPS to benchmark recovery, this clinician-administered tool has limited utility in busy clinical settings given the investment of time and resources necessary to complete in full. To that end, the current study has adopted the PTSD Checklist (PCL-5), a widely used self-report measure of PTSD severity in clinical settings with established metrics by which to measure treatment response (Weathers et al., 2013). Our aims were to apply four PCL-5 symptom change categories (i.e., No Response, Response, Response and Below

Threshold, and Remission) in a sample of veterans pre- and post- PTSD treatment, and investigate whether significant changes in four functioning indicators commonly used to assess clinical outcomes in veterans with PTSD (i.e., quality of life; social relationships, psychological distress and physical health) distinguish these PCL-5 symptom change categories. We hypothesize that ‘Response and Below Threshold’ will be most consistently associated with improvements in functioning.

Method

Participants

The sample consisted of 472 (435, 92% males) veterans and ex-serving members of the Australian Defence Force (ADF), who participated in an accredited outpatient PTSD treatment programme funded by the Australian Department of Veterans’ Affairs (DVA) between January 2014 and June 2019. The treatment program followed accredited standards involving elements of symptom management (including input for comorbid problems anxiety, anger, depression, and substance use issues), trauma-focused therapy, interpersonal skills, graded in vivo exposure, physical health and lifestyle issues, psychoeducation regarding PTSD and common comorbid mental health conditions, and relapse prevention. Programs incorporated 20 – 30 treatment days with each cohort of 6-10 participants receiving a combination of individual and group therapy. Participants were excluded from the program if they were currently psychotic, actively suicidal, had current substance use disorders or were currently involved in a major life crisis. Qualified clinicians as per accreditation standards conducted intake to the treatment program. Referral pathways include GPs, specialist mental health providers, and other dedicated veteran counselling services.

Veterans completed self-rated questionnaires at intake (pre-test) and at discharge (post-test) routinely as part of a program evaluation process. This longitudinal data consisting of two time points was utilised for the current study. Inclusion criteria for the current study were: (a) veterans were diagnosed with PTSD according to the Clinician Administered PTSD Scale (CAPS-5), (b) completed both pre- and post-treatment assessments for PTSD and quality of life and function measures. Exclusion criteria included: (a) current serving ADF personnel; (b) veterans who did not meet threshold criteria for probable PTSD at treatment intake. The Departments of Defence and Veterans' Affairs Human Research Ethics Committee approved the use of this data for purposes of secondary analyses.

Measures

Demographic information collected at treatment intake included sex, age, education, marital status, employment status and presence of comorbid psychological problems.

Posttraumatic stress disorder symptoms

PTSD symptom severity was measured using the self-reported 20-item PTSD Checklist-5, in which each *Diagnostic and Statistical Manual*-5 *DSM*-5 PTSD symptom is rated on a 5-point Likert scale ranging from 0 (Not at all) to 4 (Extremely) (Blevins, Weathers, Davis, Witte, & Domino, 2015). Probable PTSD was defined using the recommended cut-off score of 33 or greater (Blevins et al., 2015). Higher scores on the PCL-5 indicate higher PTSD severity. On the basis of this measure, veterans were classified into one of four progressive and mutually exclusive response categories identified as amongst the most frequently used descriptors of treatment response

(Schnurr, Hayes, Lunney, McFall, & Uddo, 2006; Varker et al., 2020). Categories included: No Response, Response, Response and Below Threshold and Remission. Change scores (Δ) on the PCL-5 from pre-treatment to post-treatment were defined on the basis of recommendations from the literature in veteran samples (U.S. National Centre for PTSD, 2017; Wortmann et al., 2016) extrapolating only to define treatment response as follows:

1. No Response: Worsening, no change or < 10 point reduction on the PCL-5.
2. Response: Reductions of ≥ 10 with post-treatment scores that remained ≥ 33 on the PCL-5.
3. Response and Below Threshold: Reductions of ≥ 10 with post-treatment scores that were < 33 (below threshold for probable PTSD on the PCL-5) but ≥20 on the PCL-5.
4. Remission: Post-treatment scores < 20 on the PCL-5.

Bentler's (2005) dimension free lower bound reliability for the PCL-5 pre-test scores was .93 in the current study.

Functioning indicators

Recommendations regarding the assessment of functioning suggest a balance between broad, subjective, self-report ratings of satisfaction with health and quality of life matched by objective measures of one or a combination of emotional functioning, health status, social support and metrics associated with general living standards (Gladis, Gosch, Dishuk, & Crits-Christoph, 1999). In line with these recommendations, there were four indicators of functioning available in the study that were used for the analyses: quality of life; social relationships, psychological distress and physical health, which are used as part of a routine clinical assessment battery for all Australian veteran and military personnel undergoing PTSD treatment in accredited hospitals. Using the method described in Schnurr and Lunney (2016), two indices of change in functioning were calculated: clinically meaningful improvement and good end point functioning. Calculations for both of these indices on each functioning measure are reported below.

To assess quality of life, two items from the EUROHIS-QOL 8-item index were used: “How would you rate your overall quality of life?” scored on a 5-point Likert from 1 (*Very Poor*) to 5 (*Very Good*), and “How satisfied are you with your health?” scored on a 5-point Likert from 1 (*Very Dissatisfied*) to 5 (*Very Satisfied*) (da Rocha, Power, Bushnell, & Fleck, 2012). There are no available norms for interpreting change or good end point functioning for the two EUROHIS-QOL items. As such, for the purposes of this study, clinically meaningful improvement was defined by a one-point improvement from pre-test to post-test or a maximum score of 5 on both measurement occasions (Schnurr & Lunney, 2016). Good end point functioning was defined by scores > 3, which correspond to a rating of either satisfied or very satisfied with quality of life and/or overall health.

The Social Relationships (SR) subscale from the Assessment of Quality of Life (AQoL; Hawthorne, Richardson, & Osborne, 1999) was used to assess the quality of relationships with friends and family over the previous week. The 3-item SR scale is scored on a 4-point item response format with diffuse response alternatives. Higher scores indicate poorer quality social relationships. Using the formula of Hawthorn & Osborn (2004), clinically meaningful improvement was defined as a decrease larger than the reliable change index (RCI), defined as 1.96 x standard error of measurement (SEM) of the difference. The SEM is calculated as: SD_{pre} x $\sqrt{2}$ x $\sqrt{1-\alpha}$, where SD_{pre} is the standard deviation of the pre-test scores and α is the Cronbach's alpha of the internal consistency of the pre-test scores (Jacobson & Truax, 1991). The RCI in the current study was 3.20. A good end point was defined as being less than the lowest category score of 3.

Non-specific psychological distress over the past month was measured using the Kessler-10 (Kessler et al., 2002), a 10 item scale that uses a 5-point Likert response format anchored from 1 (*None of the time*) to 5 (*All of the time*). Andrews and Slade (2001) suggest that patients scoring < 20 are likely to be well, while a score of ≥ 20 indicates the likely presence of mental disorder (Andrews & Slade, 2001). Guidelines for what constitutes clinically meaningful improvement on the K10 have not been developed. Instead, a 10-point reduction from pre-test to post-test was used, which is consistent with an improvement of 1-point per item across all items, and previous research on clinically meaningful improvement as defined by movement from higher to lower distress categories across treatment (Schnurr & Lunney, 2016). Good end point functioning was defined by scores < 20 characterized as the point at which an individual is "likely to be well" (Andrews & Slade, 2001; Kessler et al., 2002). Cronbach's alpha for the internal consistency of the scale scores at pre-test was .91 (CI 95% .90, .92) in the current study.

The Patient Health Questionnaire (PHQ-15) is a 15-item scale that measures the severity of 15 common somatic symptoms in the last month. Items are scored on a 3-point response scale ranging from 0 (*Not at all*) to 2 (*Bothered a lot*), with higher scores indicating greater severity. Severe somatic symptoms are associated with high levels of distress, impaired functioning, pain, and medical help-seeking (Leonhart et al., 2018). Clinically meaningful improvement was defined as moving from a higher category of severity to a lower category as defined by the total score (Kroenke, Spitzer, & Williams, 2002). These categories are: Minimal (1-4), Mild (5-9), Medium (10-14), and Severe (15-30). Good end point functioning was defined by post-test scores < 5 (van Ravesteijn et al., 2009)./

Data analysis plan

Pre-treatment demographic and clinical characteristics of the four treatment response groups, along with x^2 tests of independent samples and one-way ANOVA tests of between-group differences on these characteristics were reported. Welch's F-test was used where the ANOVA assumption of homogeneity of variance was violated. For statistically significant F-tests, post-hoc comparisons were undertaken with Bonferroni corrections together with Games and Howell corrections to maintain a family-wise Type I error rate of $p = .05$. The proportions of veterans who achieved clinically meaningful change and good end points were reported for each treatment response category. To quantify the magnitude of between-group differences in treatment response, a series of binary logistic regression models were estimated in which each outcome variable (QoL - Overall and QOL – Health, PHQ-15 and K10) was regressed onto PTSD treatment response indicators. These categories were coded and compared using Darlington and Hayes' sequential coding scheme (Darlington & Hayes, 2016). This method determined how the outcome variable changed as the ordinal predictor variable increased by one step, for example, from the treatment response category 'Non-Response' to the response category 'Response'. To achieve this we use three dummy variables, D_1–D_3. D_1 is coded 1 for anyone in a treatment response category higher than 'Non-response', and for those in the 'Non-response' category, D_1 is coded 0. Next D_2 is coded 1 for anyone in a treatment response category higher than 'Response' and for those in the 'Non-Response' and 'Response' categories, D_2 is coded 0. Lastly, D_3 is coded 1 for anyone with a treatment response higher than ‘Response and Below Threshold and for those in the ‘Non-response’, ‘Response’, and ‘Response and Below Threshold’ categories, D_3 is coded 0. Odds Ratios (ORs) with 95% CIs were used to indicate the magnitude of differences. Binary logistic regressions were not conducted for the AQOL – SR subscale, given insufficient variability on this measure that was observed across adjacent groups (e.g., non-response versus response, response and below threshold versus remission).

Results

Table 1 shows the number of participants in the PTSD symptom change categories. Pre-treatment demographic and clinical characteristics across the four treatment response groups, along with tests of between-group differences are reported in Table 2. Figure 1 shows the proportion of veterans in each response category who were classified as having exhibited clinically meaningful improvement across functioning measures. When change was defined by scores on the QOL-Health item, the proportion of veterans indicating clinically meaningful improvements increased linearly across response categories from 30.2%, to 48.8%, to 66.1%, and to 80.0%. Non-overlapping confidence intervals for these proportions indicate significant differences (for example, there was a significant difference between no response and all other categories on the QOL-Health item, but no significant difference between the response and below threshold category and remission).

The patterns of difference also approached linear relationships when change was defined by the K10, and to a lesser extent the PHQ-15 (although there was no discernible difference between the response and response and below threshold groups on this measure). In contrast, when change was defined in terms of QOL - Overall there was only evidence of a clear demarcation between no response and all other categories, with no clear distinctions across any of the latter groups. Finally, there were low rates of improvement and thus limited variability when change was defined by the social relationships scale. Figure 2 shows the proportion of veterans in each response group achieving good end point functioning across measures.

As can be seen from Table 3, analyses of clinically meaningful improvement indicated the largest between-group differences across outcome measures were observed for the comparison between non-response and response. For example, the response category was associated with 5.7-fold increase in reports of improvement on the K10, when compared to the non-response category, as well as 3.9 fold increase in the likelihood of change on the QOL – Overall. For analyses of clinically meaningful improvement there was only one significant difference in comparison between response and below threshold and response (for QOL – Health), while the remission and response and below threshold categories were distinguished in terms of change on the K10 and PHQ but not the QOL – Overall or QOL – Health. In contrast, there were different patterns observed across models of end-point functioning. These indicated that the demarcation across groups was primarily between the response and below threshold and response categories, with few other significant differences observed across groups (although the differences between response and below threshold and remission were consistent with expectations).

Discussion

The aim of this study was to investigate whether common metrics of PTSD treatment recovery in veterans correspond with improvements in functioning indicators, specifically to quality of life, physical health, general psychological distress, and social relationships. Consistent with previous research, the current findings indicated that even though PTSD treatment offered benefits, as is common in veteran populations, the majority remained symptomatic and continued to endure challenges associated with compromised functioning following treatment (Steenkamp et al., 2015). In itself, this finding further reinforces the need for a more sophisticated understanding of the nuances of treatment response noting further intervention following treatment is indicated for many.

Our findings support the position of Schnurr & Lunney (2016), and suggest that treating a PTSD patient until they no longer meet diagnostic criteria as achieved in the response and below threshold or remission categories, results in the best outcomes. Furthermore, these findings extend support of this approach to male veterans, who comprise the majority of the population, as previous research focused solely on female veterans. Although clinically meaningful improvement was useful for distinguishing ‘non-response’ from ‘response’ against the majority of functioning indicators (i.e., QoL Overall; QoL Health; and general psychological distress), in practical terms improvements were insufficient to resolve functioning issues. In contrast, when using the metric of good end point functioning, indicators approached or exceeded thresholds indicative of functioning without distress and disability. Even though the good end point metric did not distinguish between ‘non-response’ and ‘response’ categories, it did distinguish between the ‘response’ and ‘response and below threshold’ categories. Specifically, treatment that resulted in ‘response and below threshold’ on the PCL-5 (i.e., < 33), compared to a treatment ‘response’, was associated with a six-fold likelihood of good end point for overall quality of life, a five-fold likelihood of good end point in health-related quality of life, and a 44-fold likelihood of good end point for general psychological distress. Furthermore, using the good end point metric there was a marginal additional improvement in psychological distress for those in ‘remission’ compared to those with ‘response and below threshold’, but not for any other functioning indicator.

Together, these results suggest that treating a PTSD patient to the point of ‘response’ alone, as defined by a 10 point reduction on the PCL-5, likely reflects a meaningful change in symptoms, but is unlikely to secure noticeable positive improvement in day to day function and overall well-being for the individual (Schnurr & Lunney, 2016). As such, we recommend that setting a treatment goal of response and falling below threshold as determined by a score of <33 on the PCL-5, offers the greatest benefits to patients. These findings have important implications for our understanding of recovery in the treatment of PTSD and add support to the proposal that recovery metrics need to incorporate consideration of the impact of treatment on patients’ everyday lives. Patients do not engage in treatment simply to gain a reduction in PTSD symptoms; they also seek improvement in their quality of life and functioning (Rosen et al., 2013).

Interestingly, two of our functioning indicators did not follow the pattern described above. Firstly, few of the participants achieved good end point on the PHQ-15, whereas and in contrast, a significant number obtained improvements on the clinically meaningful improvement metric. As such, somatic symptoms as indicated by the PHQ-15 did not distinguish ‘Response’ from ‘Response and below threshold’ in terms of good end point. We suggest this is likely due to the very low variability and a floor effect evident between categories. The PHQ-15 is a measure of somatic severity, which may not change significantly after PTSD treatment in the same way QOL Health may. Arguably, the PHQ-15 offers an objective measure of physical health and physical ailments that are less amenable to change in the context of a PTSD intervention, in contrast to QOL Health, which is a subjective measure of the perception of physical health symptoms and distress more generally. In other words, although an individual's somatic complaints may not change significantly after PTSD treatment, their perceived distress relating to their physical pain may be modified (Ravn, Vaegter, Cardel, & Andersen, 2018). Therefore, even though physical health is a key aspect of functioning, there is limited utility in using objective measures of physical health and physical ailments to measure change in functioning associated with response to PTSD treatment.

In a similar vein the social relationships indicator used in the study also failed to differentiate between PTSD response categories. In part, this may be due the short period of evaluation of the study, in that social relationships are unlikely to change significantly during an 8-12 week treatment program, particularly for veterans with chronic PTSD who are likely to have negatively affected relationships dating back over many years. Furthermore, to the extent that family functioning contributes to the quality of social relationships of veterans, previous research into the relationship between the two suggests that PTSD does not drive poor family functioning, but rather, poor family functioning drives PTSD (Evans, Cowlishaw, Forbes, Parslow, & Lewis, 2010). In this context a reduction in PTSD symptoms would have had little impact on social relationships within the family.

The poor fit of some of the functioning metrics used in the study emphasizes the need for further research to identify a suitable suite of outcome measures that offer a reliable and valid means to assess functioning in the context of PTSD treatment for veterans. These functioning metrics were selected as they have been used routinely to measure PTSD recovery in veterans receiving hospital treatment, but more empirical research is needed to understand how they map onto PTSD symptom change. Ideally, these would be appropriate for use in broad populations of trauma survivors as well as more specialist populations like veterans, as well as being as brief as possible to support routine clinical use. In addition, it raises the issue of how we might identify indicators of response to PTSD treatment that will predict valued long term benefits to functioning in the form of, for example, better quality social relationships, social connectedness, engagement in meaningful activity and employability. Given none of these can be identified immediately following treatment but are nonetheless recognized as critical to improved quality of life and functioning over the longer term, we suggest that due consideration is given to how valued distal outcomes might be accounted for in assessing treatment response amongst PTSD treatment recipients in future work (Bryant et al., 2016; Cederbaum, Wilcox, Sullivan, Lucas, & Schuyler, 2017; Tran, Canfield, & Chan, 2017).

Our study was primarily male, and despite this being consistent with the general composition of military and veteran populations, this does limit the conclusions to female veterans in addition to other PTSD populations. As discussed, only some aspects of functioning were included in this study and a limited number of metrics chosen. We did not consider more objective economic metrics nor did we look at aspects of wellbeing including improved engagement in pleasant events and meaningful activity all of which are considered as high priority functioning metrics in some quarters (Kobau, Sniezek, Zack, Lucas, & Burns, 2010; Linton, Dieppe, & Medina-Lara, 2016). Our experience is consistent with others looking at broader definitions of recovery seeking to better measure, analyse and understand functioning in the context of treatment response (Linton et al., 2016). In addition, the current study used self-report measures and did not assess symptom validity. Of note, the Australian disability system, which rigorously employs clinical assessment for intake to programs in addition to self-report measures and decouples the treatment outcomes from any compensation outcomes, means these findings are unlikely to be significantly influenced by compensation-seeking status, consistent with prior research in this population (Phelps et al., 2018).

Conclusion

Although symptom improvement following treatment is a clear priority for targeted PTSD treatments, concomitant improvements in functioning are an equally relevant priority for treatment recipients. In this study, treatment to the point of response and falling below threshold offered the greatest advantages to PTSD patients in both symptom and functioning domains and a clear treatment goal for clinicians. As such, on the PCL-5, a popular, easily sourced and readily completed self-report measure of PTSD, a score of < 33 was identified as a treatment target. Ongoing research is needed with the goal of achieving consensus on a suite of priority functioning metrics against which indices of symptom change can be benchmarked and set as a target outcome for PTSD treatment providers.

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Table 1

PTSD Symptom Change on the PCL-5 from pre- to post-treatment

PTSD symptom change	*n*	%	M	SD	Minimum & Maximum
No response	255	54.0	0.61	6.96	-9 to 22
Response	125	26.5	-17.17	6.18	-38 to -10
Response and below threshold	62	13.1	-24.89	9.58	-49 to -11
Remission	30	6.4	-35.40	9.64	-59 to -20

Notes. PTSD Symptom change was determined using the PCL-5; No response was defined as either worsening, no change or change of less than 10 on the PCL-5; Response was defined as a reduction of 10 or more points and greater than or equal to 33 on the PCL-5; Response and below threshold was defined as response plus no longer meeting the moderate symptom criteria in having a severity score < 33 (i.e., less than the PCL-5 probable diagnosis cut off); Remission - defined as falling below the threshold for probable PTSD plus a severity score < 20.

Table 2

Demographic and clinical characteristics of PTSD subgroupss at intake

	No response		Response		Loss of diagnosis		Remission		Omnibus tests for group differences
	n = 255		*n* = 125		*n* = 62		*n* = 30		
	M /n	*SD* /%	*M* /n	*SD* /%	*M* /n	*SD* /%	*M* /n	*SD* /%	
					Intake				
Age in years	50.452	12.555	49.178	12.637	49.194	13.704	51.832	15.175	*F* (3, 467) = .533, p = .647
Sex - Male (%)	234	49.58	118	25.00	57	12.08	27	5.72	x^{2} (3, N = 472) = 1.120, *p* = .772
Marital status - Married, Defacto (%)	169	35.81	92	19.49	42	8.90	21	4.45	x^{2}(3, N = 466) = 1.862, *p* = .601
Education - Diploma, certificate or degree (%)	134	28.39	71	15.04	30	6.36	15	3.18	x^{2} (3, N = 399) = 1.775, *p* = .620
Employment status - Unable to work (%)	113	23.94	54	11.44	29	6.14	13	2.75	x^{2} (3, N = 412) = 0.594, *p* = .898
PCL-5 severity	54.380	11.216	60.536	7.595	50.290	9.503	49.300	9.563	*Welch's F* (3, 106.720) = 28.633, *p* < .001
AQoL - SR	8.068	1.859	8.508	1.773	7.525	1.885	7.414	1.637	*F* (3, 459) = 5.397, *p* = .001
K10 Total Score	34.529	7.340	36.064	6.442	30.468	6.842	29.567	7.181	*F* (3, 468) = 13.215, *p* < .001
PHQ Total Score	13.584	5.005	14.000	4.917	12.613	4.761	12.500	4.424	*F* (3, 468) = 1.542, *p* = .203
QOL - Overall	2.384	0.901	2.176	0.814	2.726	0.853	2.733	0.828	*F* (3, 468) = 13.215, *p* < .001
QOL - Health	2.122	0.886	2.024	0.847	2.290	0.818	2.267	0.785	*F* (3, 468) = 1.607, *p* = .187
					Discharge				
PCL-5 severity	54.992	11.325	43.368	7.270	25.403	3.792	13.900	3.968	*Welch's F* (3, 137.456) = 712.974, *p* < .001
AQoL - SR	8.202	1.840	7.928	1.738	6.311	1.512	5.862	1.597	*F* (3, 464) = 30.713, *p* = .001
K10 Total Score	33.561	7.518	28.968	5.743	20.758	3.874	16.733	4.307	*Welch's F* (3, 121.108) = 177.482, *p* < .001
PHQ Total Score	14.337	5.249	12.760	3.942	10.468	3.844	8.367	4.021	*Welch's F* (3, 110.737) = 26.495, *p* < .001
QOL - Overall	2.635	0.907	3.040	0.734	3.694	0.561	3.833	0.592	*Welch's F* (3, 116.588) = 60.194, *p* < .001
QOL - Health	2.263	0.942	2.584	0.805	3.323	0.785	3.567	0.679	*F* (3, 468) = 38.932, *p* < .001

Notes. AQoL-SR = Assessment of Quality of Life Social Relationships Scale, PCL-5 = The PTSD Checklist for *DSM*-5; PTSD = Post-traumatic Stress Disorder; for the intake assessments the Games and Howell post-hoc comparisons found statistically significant differences between all change categories of the PCL-5 at p < .05; Bonferroni post hoc comparisons found statistically significant differences between PCL change categories for the K10 means in No Response vs Response and below threshold No Response vs Remission and Response vs Response and below threshold, Response vs Remission at *p* < .05; Bonferroni post hoc comparisons found statistically significant differences between PCL change categories for the QOL-Overall means in No Response vs Response and below threshold, Response vs Response and below threshold, Response vs Remission at $p < .05$; for discharge assessments the Games and Howell post-hoc comparisons found statistically significant differences in the PCL-5 and the K10 between all change categories; Games and Howell post-hoc comparisons found statistically significant differences in the PHQ and the QOL-Overall for all comparisons except Remission vs Response and below threshold at $p < .05$; Bonferroni post hoc comparisons found statistically significant differences between PCL change categories for the AQoL-SR for all categories except Remission vs Response and below threshold and Remission vs No Response at $p < .05$; Bonferroni post hoc comparisons found statistically significant differences between PCL change categories for the QOL-Health for all categories except Remission vs Response and below threshold.

Table 3

Odds ratio of achieving good quality of life outcomes in PTSD symptom response groups

	Clinically meaningful improvement			Good End Point		
	Non-Response vs Response	Response vs Loss of Diagnosis	Loss of Diagnosis vs Remission	Non-Response vs Response	Response vs Loss of Diagnosis	Loss of Diagnosis vs Remission
QOL - Overall	3.91*** [2.48, 6.17]	0.95 [0.50, 1.83]	1.31 [0.50, 3.45]	1.58 [0.94, 2.66]	6.37*** [3.26, 12.44]	1.91 [0.67, 5.40]
QOL - Health	2.20*** [1.42, 3.42]	2.05* [1.089, 3.85]	2.05 [0.73, 5.78]	1.25 [0.68, 2.31]	5.23*** [2.60, 10.50]	1.60 [0.66, 3.87]
PHQ	2.51*** [1.51, 4.18]	0.97 [0.504, 1.88]	3.39** [1.37, 8.42]	0.25 [0.03, 2.01]	6.31 [0.64, 61.91]	3.93 [0.87, 17.73]
K10	5.64*** [3.16,10.08]	1.85 [1.00, 3.45]	2.93* [1.13, 7.59]	0.58 [0.12, 2.81]	44.42*** [10.07, 196.18]	3.23** [1.28, 8.19]

Notes. PTSD Symptom changed was determined using the PCL-5; PHQ = Patient Health Questionnaire; K10 = Kessler 10; QOL = EUROHIS-QOL

Each outcome measure was coded 1 for veterans who experienced a clinically meaningful improvement from pre-test to post-test and 0 for veterans showing no clinically significant improvement; similarly, each outcome measures was coded 1 for those who experienced a good end point at post-test and 0 for those veterans who did not;

***p* < .025, ****p* < .001.

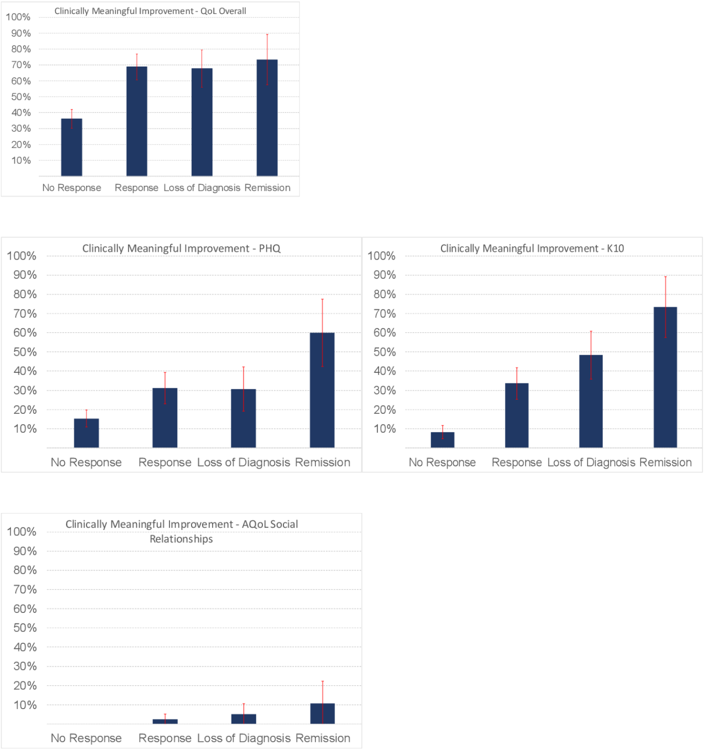

Figure 1. Proportions of veterans who achieve clinically meaningful change on QoL Overall; QoL Health; the PHQ, the K10, and the AQoL Social Relationships scale for each of the PTSD symptom response groups; PTSD Symptom change was determined using the PCL-5;

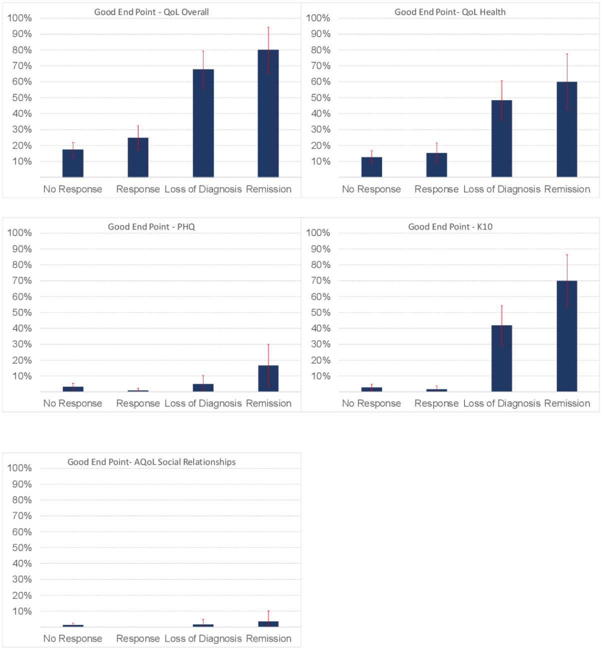

Figure 2. Proportions of veterans who achieve good end point on the two QoL items, Overall quality of life and satisfaction with heath, the PHQ, the K10 and the AQoL Social Relationships scale for each of the PTSD symptom response groups. Error bars show the 95% confidence interval for each proportion.