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Anger and Avoidant Coping as Predictors of Treatment Outcome in Military-Related Posttraumatic Stress Disorder

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Abstract. The present study examined the impact of pre-treatment anger and avoidant coping on treatment outcome in military-related posttraumatic stress disorder (PTSD). Data from 83 Dutch veterans with PTSD attending treatment in a specialized institute were utilized. The effect of both prognostic factors was firstly investigated with repeated-measures analyses of variance using split-plot design, and subsequently with linear regression analyses. Regarding anger a greater decline in PTSD severity from pre-treatment to follow-up for high pre-treatment levels of anger compared to low levels of anger was found. Anger was also found to predict change in PTSD severity, but concerning the three separate PTSD symptom clusters anger only predicted change in the hyperarousal cluster. The interaction between pre-treatment PTSD severity and anger was furthermore found to predict change in PTSD severity, suggesting that higher pre-treatment anger was associated with better treatment responses as pre-treatment levels of PTSD severity decreased. With respect to avoidant coping no impact on treatment outcome was found. These results are inconsistent with the existing literature. This study stresses the importance of anger as a predictor of treatment outcome and is novel in suggesting its positive impact, raising questions about the previously assumed role of this prognostic factor. It is discussed how the findings of this research may help improve the screening and treatment process, however, replication is self-evidently required.

Samenvatting. Het huidige onderzoek keek naar de invloed van boosheid en vermijdende coping voorafgaand aan behandeling op behandeluitkomst bij militair-gerelateerde posttraumatische stress stoornis (PTSS). Dit is gedaan aan de hand van data voor 83 Nederlandse veteranen met PTSS die zijn behandeld in een gespecialiseerd instituut. Beide prognostische factoren zijn eerst onderzocht aan de hand van herhaalde metingen variantieanalyses met split-plot design, en vervolgens met lineaire regressieanalyses. Hoge boosheid bleek over het algemeen een grotere afname van PTSS ernst teweeg te brengen dan lage boosheid. Boosheid was tevens een voorspeller van verandering in PTSS ernst, maar betreffende de drie PTSS symptoomclusters afzonderlijk voorspelde boosheid alleen verandering in het hyperactiviteit cluster. Daarnaast werd er gevonden dat de interactie tussen PTSS ernst en boosheid (voorafgaand aan behandeling) een voorspeller was van verandering in PTSS ernst. De interactieterm suggereert dat hogere niveaus van boosheid waren geassocieerd met betere behandelresponsen naarmate niveaus van PTSS ernst daalden. Met betrekking tot vermijdende coping werd er geen invloed op behandeluitkomst gevonden. Deze resultaten staan in contrast met de bestaande literatuur. Dit onderzoek benadrukt de relevantie van boosheid als voorspeller van behandeluitkomst en is vernieuwend omdat het een positieve invloed van boosheid impliceert. Daarmee wordt de voorheen veronderstelde rol van deze prognostische factor in twijfel getrokken. Er wordt besproken hoe de bevindingen van dit onderzoek zouden kunnen helpen om het screening- en behandelproces te verbeteren. Replicatie van de resultaten is echter vereist.

Introduction

Exposure to a potentially traumatic event may result in intrusive thoughts, flashbacks, and nightmares of the event, avoidance of reminders of the event, hypervigilance, heightened arousal, and sleep disturbance. Together, these symptoms are indicative of the psychiatric condition posttraumatic stress disorder (PTSD; American Psychiatric Association, 2000). PTSD is associated with a high degree of disability, including interpersonal dysfunction, health-related problems, occupational impairment, suicidality, and lower quality of life (Olatunji, Cisler, & Tolin, 2007; Sareen et al., 2007). Other problematic aspects of the disorder are its often chronic nature and its association with high rates of comorbidity (Brady, Killeen, Brewerton, & Lucerini, 2000; Zlotnick et al., 2004). Besides the impact of PTSD on the individual level, the society as a whole faces a considerable financial burden (Kessler, 2000).

Veterans who experienced military trauma are one of the most at-risk populations for development of PTSD (Prigerson, Maciejewski, & Rosenheck, 2001). Military-related PTSD may arise after combat duty in wars or deployments to peacekeeping and humanitarian missions (Hoge et al., 2004; Litz, 1996). Prevalence estimates of military-related PTSD diverge across studies and nations, as they vary from 4–17% in the USA and from 3–6% in the UK (Richardson, Frueh, & Acierno, 2010). Among Dutch soldiers deployed to Iraq, 3–4% is diagnosed with PTSD (Engelhard et al., 2007). Since there are over 130.000 veterans in the Netherlands, military-related PTSD is not uncommon (Foundation the Veterans Institute, 2013). Given the prevalence and high impact of PTSD, the availability of effective treatment for the disorder is of great importance.

The effectiveness of treatment for PTSD is well established, with most evidence in favor of trauma-focused cognitive behavioral interventions (Foa, Keane, Friedman, & Cohen, 2009). However, the disorder is not easily treatable. Bradley, Greene, Russ, Dutra, and Westen (2005) reviewed several outcome studies and reported that the majority of patients remains symptomatic after treatment. Moreover, military-related PTSD was associated with the lowest effect size. In this context, knowledge of prognostic factors that influence treatment outcome is critical. This knowledge may help indicate treatments of choice and adapt treatments to individual needs. Furthermore, it can be helpful in optimizing treatment procedures. Understanding relevant predictors may thus help improve treatment outcome.

Data from several studies indicate that anger is a key predictor of treatment outcome in military-related PTSD, with higher pre-treatment anger predicting poorer clinical responses. Anger refers to an internal emotional state and is considered to be a multifaceted construct,

involving specific cognitive (e.g. attributions of blame or injustice), phenomenological (e.g. labelling of angry feelings), physiological (e.g. general sympathetic arousal), and behavioral (e.g. angry facial expressions) components (Kassinove, 1995). PTSD and anger frequently co-occur, and this link is particularly prominent in military veterans (Novaco & Chemtob, 2002). Forbes, Creamer, Hawthorne, Allen, and McHugh (2003) found that among several comorbid factors anger was the strongest predictor of treatment outcome in Vietnam veterans. Pre-treatment anger accounted for 8.7% of the variability in PTSD severity change. Further studies by Forbes et al. additionally demonstrated the influence of anger on treatment outcome in peacekeeper veterans (2005) and another sample of Vietnam veterans (2008). Pitman et al. (1991) found that trauma-related anger was associated with clinical responses in combat veterans, although the study was limited due to low statistical power. Moreover, research by Owens, Chard, and Cox (2008) suggested that anger interacts within another prognostic factor in the prediction of treatment outcome, namely the pre-treatment level of PTSD severity. In their study the interaction between anger expression and PTSD severity predicted treatment outcome in veterans, accounting for 5.4% of the variability in post-treatment PTSD severity. The interaction indicated that low pre-treatment anger was associated with better treatment responses as pre-treatment levels of PTSD severity increased. Anger may therefore not only serve as an independent predictor of treatment outcome. Its potential interaction with pre-treatment PTSD severity may provide additional information.

Another construct that has been studied as a predictor of treatment outcome in military-related PTSD is avoidant coping. Avoidant coping has been defined as cognitive and affective activity oriented away from the stressor. Approach coping on the other hand is oriented toward the stressor (Roth & Cohen, 1986). Avoidant coping strategies are characterized by denial, wishful thinking, and avoidance of thoughts and feelings about the problem (Tobin, Holroyd, Reynolds, & Wigal, 1989). These strategies seem useful as they usually reduce immediate stress, but they may be maladaptive in the long term. Indeed, several studies found that avoidant coping predicts PTSD severity outside the context of treatment (e.g. Eid, 2003; Gil, 2005; Pineles et al., 2011). Two studies among veterans in treatment have shown that higher pre-treatment levels of avoidant coping are associated with poorer treatment responses. Tiet et al. (2006) firstly demonstrated that cognitive avoidant coping predicted treatment outcome among veterans. Furthermore, avoidant coping was similarly related to treatment outcome in the study of Badour, Blonigen, Boden, Feldner, and Bonn–Miller (2012).

Foa, Riggs, Massie, and Yarczower (1995) propose that in the prediction of treatment outcome anger and avoidant coping are related to one another. In their study anger inhibited

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fear activation during exposure therapy, thereby impeding treatment outcome. The authors suggest that fear activation gets blocked because anger reflects an avoidant manner of coping with emotional pain. By activating diffuse anger, clients are thought to be capable of speaking about the traumatic event without reliving it emotionally. However, Foa et al. have never studied their proposed explanation empirically. At present, only one study has investigated the manner in which anger interferes with treatment. Forbes et al. (2008) demonstrated among Vietnam veterans that alcohol use and fear of experiencing one's own anger mediated the relationship between pre-treatment anger and treatment outcome. This result may be compatible with the theory that anger and avoidant coping are associated in the context of treatment outcome. Substance use can firstly be classified as an avoidant coping strategy (Litman, 2006). Moreover, fear of experiencing anger may lead to an avoidant style of coping with traumatic memories in order to prevent anger. Hence, it is questioned whether avoidant coping mediates the relationship between pre-treatment anger and treatment outcome. Both the rationale of Foa et al. and the study of Forbes et al. are consistent with this hypothesis.

The purpose of the present study is to assess the impact of anger and avoidant coping on treatment outcome in Dutch veterans with military-related PTSD. Such investigation may help advance treatment of this potent disorder, especially considering that these predictors can be influenced therapeutically. Given the amount of evidence with respect to anger, it is expected that pre-treatment anger has a negative impact on treatment outcome. Regarding anger this study will also examine whether there exists an interaction between pre-treatment PTSD severity and anger in the prediction of treatment outcome. Based on the study by Owens et al. (2008), it is hypothesized that low pre-treatment anger is associated with better treatment responses as pre-treatment levels of PTSD severity increase. Concerning avoidant coping, a similar negative impact on treatment outcome is expected, given the two available studies that researched this predictor (Tiet et al., 2006; Badour et al., 2012). Lastly, this study is the first to investigate avoidant coping as a potential mediator of the relationship between anger and treatment outcome. This may provide information about whether additional emphasis on lowering avoidant coping strategies could enhance treatment outcome for veterans with elevated anger. Considering the speculation of Foa et al. (1995) and the study by Forbes et al. (2008), it is hypothesized that avoidant coping mediates the relationship between pre-treatment anger and treatment outcome.

Method

Participants

Participants comprised 83 Dutch adult veterans with chronic military-related PTSD attending treatment at Foundation Centrum '45. This institute is specialized in diagnostics and treatment of psychological trauma due to persecution, war, and violence. Participants' ages ranged from 25 to 67, with a mean age of 43.1 (SD = 9.02). The sample included males only. Trained clinicians used non-structured psychiatric clinical interviews to diagnose participants with PTSD. Comorbid diagnoses were similarly obtained and included substance abuse/dependence (13%), major depressive disorder (32%), and an additional anxiety disorder (7%).

Measures

The Zelfinventarisatielijst (ZIL) was used to assess PTSD severity (Hovens, Bramsen, & Van der Ploeg, 2000). The ZIL is a Dutch screening instrument for PTSD based on the criteria of the DSM–IV. This 22-item self-report questionnaire measures to what extent respondents have been bothered by PTSD symptoms in the past four weeks. Items are phrased in a trauma-independent way and scored on a four-point Likert scale. The ZIL contains three subscales based on the DSM–IV symptom clusters: hyperarousal, avoidance, and re-experiencing. The questionnaire has demonstrated good internal consistency, test–retest reliability, and concurrent and discriminant validity with various populations (Hovens, Bramsen, & Van der Ploeg, 2002). In the present study, the ZIL demonstrated an excellent internal consistency (Chronbach's α = .93). Internal consistencies of the subscales were good (all Chronbach's α's > .83).

PTSD severity was additionally measured using the Harvard Trauma Questionnaire (HTQ; Mollica et al., 1996). The HTQ is a self-report questionnaire designed for the assessment of trauma and torture related to mass violence, and contains four sections. In the present study only the first 16 items of the fourth section were used. These items correspond to the PTSD symptoms of the DSM–IV and do not refer to a specific traumatic event. Respondents rate to what extent each symptom has bothered them in the previous week on a four-point Likert scale. For the HTQ the three subscales based on the DSM–IV symptom clusters can also be derived. Certified interpreters of the Centre for Interpretation South Holland have translated the HTQ into Dutch. The specific section of the HTQ used in the present study has demonstrated excellent internal consistency (Chronbach's α = .96) and test–retest reliability (r = .92; Mollica et al, 1996). For the present sample, the internal consistency was likewise excellent (Cronbach's α = .95). The subscales demonstrated good internal consistencies (all Chronbach's α's > .86).

The Dutch version of the Symptom Checklist–90–Revised (SCL–90–R) was used to measure anger (Arrindell & Ettema, 2003; Derogatis, 1994). The SCL–90–R is a 90-item self-report symptom inventory that evaluates a broad range of psychological problems and symptoms. Respondents indicate for each symptom to what extent they have been bothered by it in the previous week. Items are scored on a five-point Likert scale and comprise eight symptom clusters: agoraphobia, anxiety, depression, somatization, inadequacy in thinking and acting, distrust and interpersonal sensitivity, hostility, and sleeping problems. The hostility subscale (thoughts, feelings, and behaviors that characterize anger) was utilized in the present study as an indicator of anger. The hostility subscale has demonstrated good internal consistency, test–retest reliability, and convergent validity with other conceptually related scales (Arrindell & Ettema, 2003). For the present sample, the internal consistency of the hostility subscale was good (Cronbach's α = .84).

Anger was additionally assessed using the Brief Symptom Inventory (BSI), a shortened version of the SCL–90–R that contains 53 of the initial 90 items (De Beurs, 2004; Derogatis, 1993). The rest of the format is similar to the SCL–90–R. Psychometric properties are also comparable to the SCL–90–R. In this study, the hostility subscale of the BSI demonstrated an excellent internal consistency (Cronbach's α = .93).

Avoidant coping was measured with the COPE–Easy, a Dutch adaptation of the COPE inventory (Carver, Scheier, & Weintraub, 1989; Kleijn, Van Heck, & Van Waning, 2000). This 32-item self-report questionnaire assesses what stable coping strategies respondents use to handle problematic situations. Each item represents a coping reaction, and respondents rate to what extent they use these reactions in general. Items are scored on a four-point Likert scale and constitute fifteen distinct coping styles. The subscales denial, behavioral disengagement, and mental disengagement comprise the broader factor avoidant coping, used in this study (Kleijn et al., 2000). The reliability and validity of the COPE inventory have been established (Carver et al., 1989; Kallasmaa & Pulver, 2000). However, not much is known about the psychometric properties of the Dutch COPE–Easy and the avoidant coping factor. The internal consistency of the avoidant coping factor was poor for the present sample (Cronbach's α = .45). No alternative questionnaires that measure avoidant coping were available in this study.

Procedure

Data from an existing database available at Foundation Centrum '45 were utilized. Initially the data were not collected in a structured manner, therefore no fixed protocol was used. Veterans in treatment between January 2004 and September 2013 were invited to participate in a

standardized assessment for diagnostic and treatment purposes. This assessment consisted of a standard test battery and additional questionnaires when requested by the therapist. Moreover, the composition of the standard test battery changed over time. For these reasons, participants completed different compositions of questionnaires, which will be explicated later on. The first 40.7% of the assessments were administered using a paper-and-pencil format. Active written informed consent was obtained prior to these assessments. The remaining 59.3% of the assessments were administered digitally on a computer using a passive informed consent procedure. Clients were invited to complete the assessment during their intake and thereafter once a year.[1] Treatment varied and could comprise a mix of psychotherapies, including mentalization-based therapy, stabilizing therapy, and trauma-focused therapy. Therapies were delivered individually or in a group format.

Now the flow of participants and the compositions of questionnaires will be discussed in more detail. Note that the statistics presented are limited to the for this study relevant questionnaires. Initially, the available dataset consisted of 209 participants, 118 of which did not participate in a follow-up assessment and were therefore excluded. The remaining 91 participants completed a follow-up assessment varying from 9 to 35 months after the initial assessment, with a mean of 19.0 months ($SD = 7.27$). Participants completed either the ZIL or the HTQ, which was used to assess PTSD severity. Likewise, participants completed either the SCL–90–R or the BSI, used to assess anger. Two participants did not complete either the ZIL or the HTQ, and were excluded for that reason. Furthermore, five participants were not diagnosed with PTSD and were additionally removed from the study. Various tests of normality indicated the presence of an outlier with respect to the constructed ZIL-score at pre-treatment, consequently this participant was excluded. This resulted in a final sample of 83 participants. At pre-treatment, 60 of these participants (72.3%) completed the SCL–90–R and the ZIL, and the remaining 23 (27.7%) completed the BSI and the HTQ. At follow-up, 8 participants (9.64%) completed the ZIL, and 75 (90.4%) completed the HTQ. Finally, 24 participants did not complete the COPE–Easy and were therefore excluded in analyses that incorporated avoidant coping as a variable. Hence, these analyses were performed with 59 participants (71.1%). Figure 1 summarizes the flow of participants from the database to the analyses.

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[1] See Van der Aa (2013a; 2013b; 2013c) for more information on the assessment by Foundation Centrum '45.
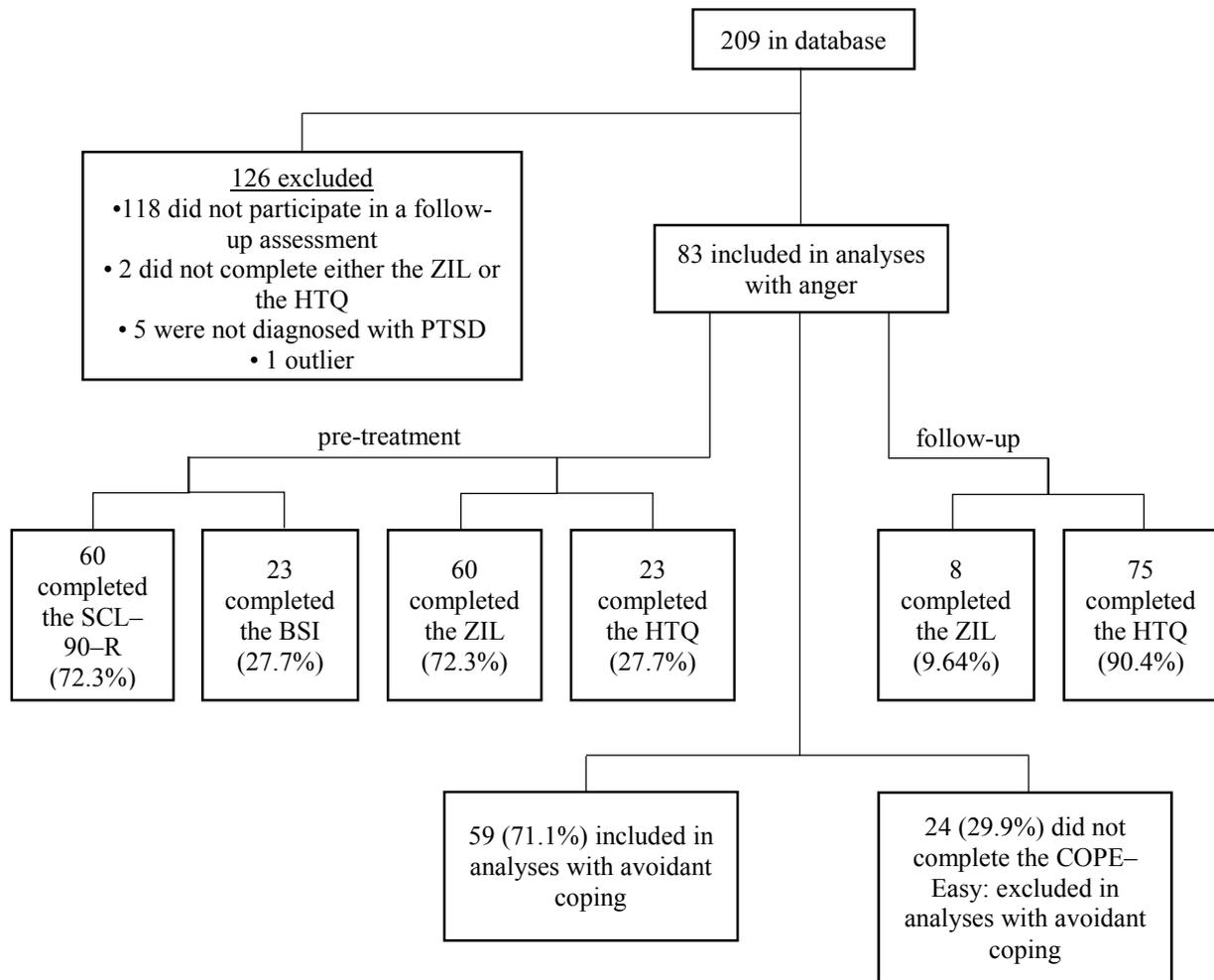
Figure 1. Summary of flow of participants from the database to the analyses.

Data Analyses

For the remainder of this study a nominal significance level of 5% was utilized. Statistical procedures were performed using SPSS Version 22.0 (IBM Corp., 2013). As highlighted in the previous paragraph, participants completed either the ZIL or the HTQ. Comparison of the content and scale of these questionnaires suggested that they could be combined to construct a common measure of PTSD severity. This was statistically supported as two two sample Kolmogorov–Smirnov tests indicated that the distributions of the ZIL and HTQ groups did not differ significantly, both at pre-treatment ($p = .059$) and follow-up ($p = .36$). Depending on the questionnaire that was completed, the participant was given a PTSD severity score consisting of the mean of the answers on that questionnaire. The SCL–90–R and BSI were likewise combined to construct a measure of anger, as participants again completed only one questionnaire. A two sample Kolmogorov–Smirnov test did not reject that the SCL–90–R and BSI groups came from identical distributions ($p = .99$). As the hostility subscale of the SCL–

90–R included one more question than the corresponding subscale of the BSI, this question was left out of the analyses. Furthermore, four missing items were imputed using multiple imputation in order to increase statistical power.

A 2 × 2 repeated measures analysis of variance using split-plot design was utilized to examine the relationship between pre-treatment anger and treatment outcome. To extend this result, simple linear regression analyses were performed to assess whether anger would predict treatment outcome. Here the three symptom clusters were also used individually as outcome measures. Lastly with respect to the prognostic factor anger, a forced-entry multiple linear regression analysis was conducted to examine whether the interaction between pre-treatment PTSD severity and anger would predict treatment outcome.

With the exception of the last analysis, all mentioned analyses were similarly performed to assess the relationship between pre-treatment avoidant coping and treatment outcome. That is, a 2 × 2 repeated measures analysis of variance using split-plot design and simple linear regression analyses were conducted. The latter also utilized the three symptom clusters individually as outcome measures.

Conditional on the assumption that the prime hypotheses regarding anger and avoidant coping would not be rejected, a simple mediation analysis following Preacher and Hayes' (2008) non-parametric bootstrapping method would be conducted. This would examine whether avoidant coping mediates the relationship between anger and treatment outcome.[2]

Results

Descriptive Statistics

Descriptive statistics for anger, avoidant coping, total PTSD severity and severity of the three symptom clusters individually are listed in Table 1. A paired samples t test was performed to detect change in total PTSD severity from pre-treatment to follow-up for the total sample. Model assumptions, including normality, were tested and not rejected. A significant change in total PTSD scores was found, $t(82) = 4.20$, $p = < .001$. An effect size analysis suggested that this change represents moderate clinical improvement, with a Cohen's d statistic of 0.45. Descriptive statistics for PTSD change scores (Δ = follow-up − pre-treatment) are additionally reported in Table 1. The high standard deviations indicate large variability in symptom change.

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[2] More information on the data analysis of the hypothesized mediation effect can be found in the Appendix.

Table 1

Descriptive Statistics for Anger, Avoidant Coping, and PTSD Measures

Measure	Pre-treatment		Follow-up		Change score	
	M	*SD*	*M*	*SD*	*M*	*SD*
Total PTSD	1.84	0.56	1.54	0.77	-0.30	0.65
Hyperarousal	2.14	0.61	1.76	0.82	-0.38	0.78
Avoidance	1.72	0.64	1.37	0.77	-0.35	0.69
Re-experiencing	1.69	0.69	1.56	0.87	-0.13	0.79
Anger	1.76	1.04	–	–	–	–
Avoidant coping	1.02	0.46	–	–	–	–

Notes. *n* = 59 for avoidant coping, *n* = 83 for all other measures. The minimum possible score for all measures was zero, and the maximum was three, except for anger where it was four.

Anger and Treatment Outcome

Analysis of variance. To assess the relationship between anger and treatment outcome, the median was used to divide anger scores into halves. Considering that equal groups contribute to the robustness of the analysis, the median itself was excluded (Field, 2009). This resulted in two groups: low anger (*n* = 39, *M* = 0.86, *SD* = 0.38) and high anger (*n* = 37, *M* = 2.74, *SD* = 0.65). A 2 × 2 repeated-measures analysis of variance using split-plot design was conducted. The two-level within-group factor was time (pre-treatment and follow-up), the two-level between-groups factor was anger (low and high), and the outcome measure was total PTSD severity. Levene's test indicated that the assumption of homogeneity of variance was violated at pre-treatment, $F(1, 74) = 5.72$, $p = .019$. However, as a result of the nearly equal sample sizes, the analysis is robust to this violation (Field, 2009). Further model assumptions, including normality, independence, and homogeneity of inter-correlations, were tested and not rejected. An overview of all results regarding the analysis of variance is presented in Table 2.

Table 2

Results of the 2 × 2 Repeated-Measures Analyses of Variance Using Split-Plot Design With Anger and Avoidant Coping as the Alternating Two-Level Between Groups Factors

Effect	F	p	η_p^2
Anger			
Main effect anger	19.6	<.001**	.21
Main effect time	17.1	<.001**	.19
Time × Anger interaction	4.70	.033*	.060
Avoidant coping			
Main effect avoidant coping	4.18	.047*	.087
Main effect time	14.7	<.001**	.25
Time × Avoidant coping interaction	0.019	.89	.0004

Note. * $p < .05$, ** $p < .01$.

Relevant for the hypotheses of the present study is the Time × Anger interaction. There was a significant interaction in PTSD scores across time and anger groups, $F(1, 74) = 4.70$, $p = .033$. The partial eta-squared ($\eta_p^2 = .060$) was of medium size. This indicates that there was a greater decline in total PTSD severity from pre-treatment to follow-up for the high anger group compared to the low anger group. The interaction effect is graphically illustrated in Figure 2a.
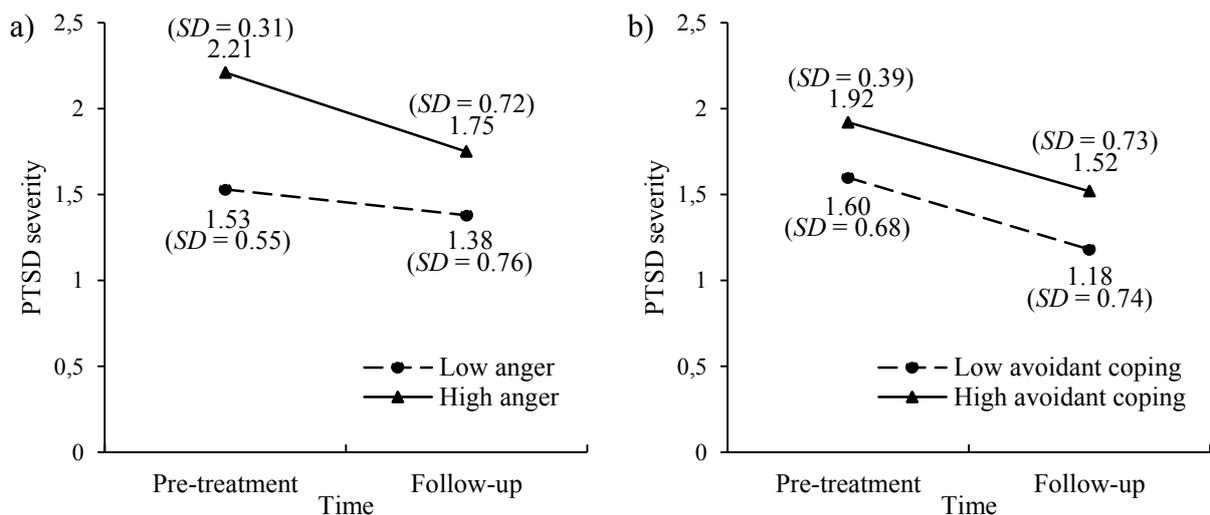

Figure 2. Total PTSD scores from pre-treatment to follow-up for (a) anger groups and (b) avoidant coping groups, including means and standard deviations.

Simple regression analyses. A benefit of the repeated-measures analysis of variance using split-plot design is the availability of an interval scale regarding the outcome measure. Considering that pre-treatment score values were not the same, this provides meaningful information about the relative distance between pre-treatment and follow up scores, unlike when using change scores as outcome measure. However, the division of anger scores into halves as used for this analysis resulted in loss of relevant variation in scores. A regression analysis could therefore provide additional information. Furthermore, it is possible that anger has differential impact on the three symptom clusters. Hence, four simple linear regression analyses were performed to assess whether anger is predictive of change overall and across the symptom clusters individually. The predictor variable was pre-treatment anger, and the alternating outcome variables were change scores for total PTSD, avoidance, hyperarousal, and re-experiencing. Model assumptions of linearity, independent errors, and homoscedasticity were statistically tested and not rejected. Regarding the assumption of normally distributed errors, the Shapiro–Wilk test indicated that the error distribution was non-normal for the analysis with hyperarousal as the outcome variable, $W(83) = 0.96$, $p = .021$. Although the least squares estimator of an effect is still unbiased, the finite sample distribution of the t statistic is unknown under non-normality of the errors. A common approach is to use the asymptotic distribution as an indication. Hence, the standard normal distribution should be used to find the critical values (and corresponding p values) in these cases, see for instance Davidson & MacKinnon (2004). For the other analyses, normal distributions of errors were not rejected. The results of the regression analyses are presented in Table 3.

Table 3

Results of the Simple Linear Regression Analyses for Anger Predicting PTSD Change Scores

Outcome measure	B	SE_B	β	t	p	$CI_{95\%}$
Total PTSD	-0.16	0.068	-0.25	-2.28	.025*	[-0.29, -0.020]
Hyperarousal	-0.22	0.080	-0.29	-2.77	.006**	[-0.38, -0.063]
Avoidance	-0.14	0.073	-0.21	-1.97	.052	[-0.29, 0.001]
Re-experiencing	-0.098	0.084	-0.13	-1.17	.25	[-0.26, 0.068]

Notes. $R^2 = .060$ for total PTSD, $R^2 = .086$ for hyperarousal, $R^2 = .046$ for avoidance, $R^2 = .017$ for re-experiencing. * $p < .05$, ** $p < .01$.

Anger was found to significantly predict total PTSD change scores, accounting for 6.0% of the variability in change scores. The relationship was negative, indicating that higher pre-treatment anger predicts more improvement in total PTSD severity. Moreover, anger significantly predicted hyperarousal change scores, accounting for 8.6% of the variability. Regarding the remaining two symptom clusters, anger was not found to be a significant predictor.

Multiple regression analysis. A forced-entry multiple linear regression analysis was conducted to examine whether the interaction between pre-treatment PTSD severity and anger is predictive of treatment outcome. This was done with total PTSD change scores as the outcome variable and with the following predictor variables: pre-treatment PTSD severity, pre-treatment anger, and the Pre-treatment PTSD severity × Anger interaction. Centered values of the predictor variables were used in order to mitigate the effect of multicollinearity. The Shapiro–Wilk test suggested a non-normal distribution of errors, $W(83) = 0.96$, $p = .016$. Therefore the standard normal distribution was again utilized to calculate the critical values. The presence of multicollinearity will be discussed shortly. Further model assumptions were statistically tested and not rejected. The results of the regression analysis are listed in Table 4.

Table 4

Results of the Multiple Linear Regression Analysis Predicting Total PTSD Change Scores

Predictor	B	SE_B	β	t	p	$CI_{95\%}$
PTSD severity	0.057	0.18	0.048	0.33	.74	[-0.29, 0.41]
Anger	-0.22	0.097	-0.35	-2.26	.024*	[-0.41, -0.026]
PTSD severity × Anger	0.31	0.15	0.25	2.02	.043*	[0.005, 0.61]

Notes. $R^2 = .11$, $R^2_{Adj} = .077$. * $p < .05$.

The overall model predicting PTSD change scores was significant, $F(3, 79) = 3.27$, $p = .026$, accounting for 11% (7.7% adjusted) of the variability in change scores. Anger, in contrast to PTSD severity, was a significant predictor of PTSD change scores with a variance inflation factor (VIF) of 2.08. This means that the variance of the estimated effect was roughly twice as high as it would be in the absence of multicollinearity. The interaction between PTSD severity and anger also significantly predicted PTSD change scores with a VIF of only 1.33. The VIF of PTSD severity was found to be 1.96, meaning that multicollinearity may have caused the insignificance of the effect. In order to check this, a simple regression analysis was performed with only PTSD severity as a predictor. Even in this setting PTSD severity did not significantly

predict PTSD change scores. Combined with the fact that both the effect of anger and the interaction effect were significant, this shows that the impact of multicollinearity was limited.

In order to interpret the interaction term, representative values of PTSD severity (low, moderate, high) were selected and the corresponding regression lines were estimated using the MODPROBE macro for SPSS as programmed by Hayes and Matthes (2009). Again centered values of anger and PTSD severity were used. The interaction term suggests that high pre-treatment anger was associated with better treatment responses as pre-treatment levels of PTSD severity decreased. A visual depiction of the interaction effect is presented in Figure 3.
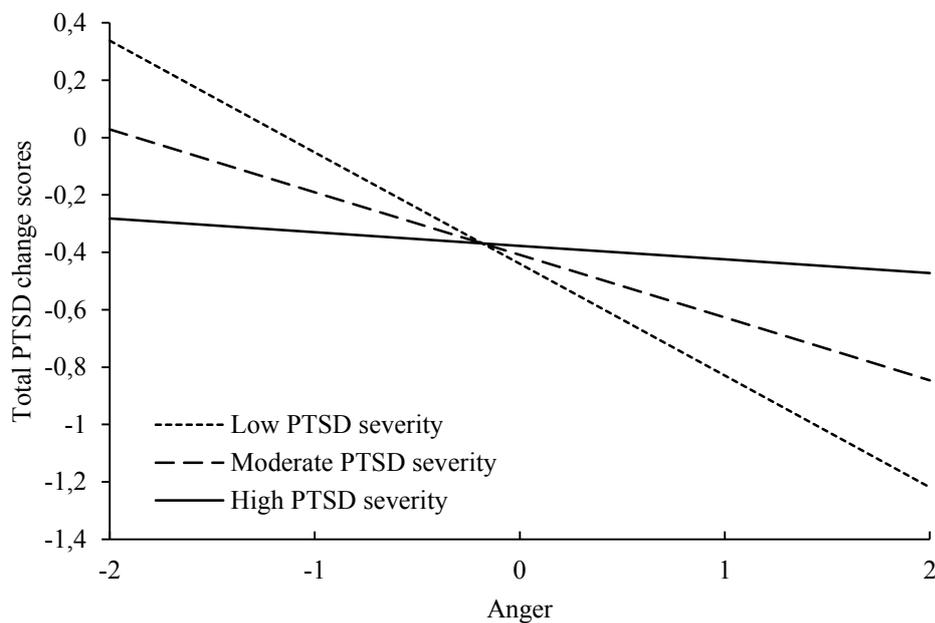

Figure 3. Interaction between pre-treatment PTSD severity and anger. Δ = Follow-up − pre-treatment, thus lower change scores represent better treatment responses. PTSD severity values: low = $M - 1\ SD$, moderate = M, high = $M + 1\ SD$.

Avoidant Coping and Treatment Outcome

Analysis of variance. To examine the relationship between avoidant coping and treatment outcome, a 2 × 2 repeated-measures analysis of variance using split-plot design was performed. The approach used for the predictor anger as described earlier was followed once more, now with avoidant coping (low [$n = 24$, $M = 0.58$, $SD = 0.22$] and high [$n = 22$, $M = 1.51$, $SD = 0.23$]) as the between-groups factor. Levene's test indicated that the assumption of homogeneity of variance was violated at pre-treatment, $F(1, 44) = 4.41$, $p = .042$. Further model assumptions were not rejected. An overview of the results regarding the analysis is shown in

Table 2. Relevant for the present hypotheses is the Time × Avoidant coping interaction, that was found to be non-significant, $F(1, 44) = 0.019$, $p = .89$, $\eta_p^2 = .0004$. This reveals that there was an equivalent decline in total PTSD severity from pre-treatment to follow-up for the high avoidant coping group compared to the low avoidant coping group (see Figure 2b).

   Simple regression analyses. Four simple linear regression analyses were performed to investigate whether avoidant coping is predictive of change overall and across the symptom clusters individually. The predictor variable was pre-treatment avoidant coping, and the alternating outcome variables were again change scores for total PTSD, avoidance, hyperarousal, and re-experiencing. Model assumptions of linearity, independent errors, normally distributed errors, and homoscedasticity were statistically tested and not rejected. The results of the regression analyses are reported in Table 5. Avoidant coping did not significantly predict total PTSD, hyperarousal, avoidance, and re-experiencing change scores.

Table 5

Results of the Simple Linear Regression Analyses for Avoidant Coping Predicting PTSD Change Scores

Outcome measure	B	SE_B	β	t	p	$CI_{95\%}$
Total PTSD	-0.063	0.20	-0.042	-0.32	.75	[-0.46, 0.34]
Hyperarousal	0.14	0.24	0.075	0.57	.57	[-0.34, 0.61]
Avoidance	-0.35	0.20	-0.22	-1.73	.090	[-0.76, 0.056]
Re-experiencing	0.14	0.24	0.080	0.61	.55	[-0.33, 0.62]

Note. $R^2 = .002$ for total PTSD, $R^2 = .006$ for hyperarousal, $R^2 = .050$ for avoidance, $R^2 = .006$ for re-experiencing.

Avoidant Coping as Mediator of Anger

The direction of the relationship between anger and treatment outcome was unexpected and the relationship between avoidant coping and treatment outcome was found to be non-significant. Hence, there was no foundation to examine the hypothesized mediation effect. Therefore the mediation analysis that would be used to investigate whether avoidant coping mediates the relationship between pre-treatment anger and treatment outcome could not be conducted.[3]

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[3] For academic teaching purposes the mediation analysis was performed despite the violated assumptions. The results of the analysis are reported in the Appendix.

Discussion

To gain more knowledge of prognostic factors that influence treatment outcome of military-related PTSD, this study investigated the impact of pre-treatment anger and avoidant coping on treatment outcome among Dutch veterans. Regarding the relationship between anger and treatment outcome, a greater decline in PTSD severity from pre-treatment to follow-up for high pre-treatment levels of anger compared to low levels of anger was found. Congruently, pre-treatment anger negatively predicted change in PTSD severity. Concerning the three PTSD symptom clusters separately, anger only significantly predicted change in the hyperarousal cluster. The interaction between pre-treatment PTSD severity and anger was moreover found to predict change in PTSD severity. Higher pre-treatment anger was associated with better treatment responses as pre-treatment levels of PTSD severity decreased. These results are in contrast to what was hypothesized regarding anger. With respect to the relationship between avoidant coping and treatment outcome, no difference between high and low pre-treatment levels of avoidant coping concerning the decline in PTSD severity was found. Avoidant coping furthermore did not predict change in PTSD severity, nor in any of the symptom clusters. These results again contradict the formulated hypothesis. Given these unexpected results, there was no foundation to examine whether avoidant coping mediates the relationship between anger and treatment outcome.

The prime finding with regard to anger implies that the presence of low levels of anger prior to treatment leads to less reduction of PTSD severity during treatment. This highly conflicts with previous research that found that high levels of anger predict poorer treatment responses. A factor possibly influencing this discrepancy is the manner in which the construct of anger was measured. Prior research used questionnaires especially designed to assess anger, whereas in the present study a subscale of a broader symptom inventory was utilized. It is possible that the context of other symptoms in which the anger questions were embedded influenced the participants' answers, such as by interpreting the anger items as symptoms as opposed to personal behaviors (Gordon & Holden, 1998). This speculation is compatible with another possible explanation of the unexpected effect. Earlier research has shown that greater pre-treatment PTSD severity predicted better clinical responses (Foa et al., 1995; Forbes, Creamer, Hawthorne, et al., 2003). One hypothetical reason for this is that higher levels of symptomatology may enable more room for improvement. Over-reporting as a call for help may be involved (Forbes, Creamer, Hawthorne, et al., 2003). Considering that anger is an important symptom of PTSD, falling within the hyperarousal symptom cluster, it might

influence treatment outcome in the same manner as PTSD severity. Consistent with this line of thought is the finding that anger significantly predicted change in the hyperarousal symptom cluster, as opposed to the other clusters. It is possible that the more severe particular symptoms (for instance anger symptoms) are at intake, the more these specific symptoms will reduce during treatment. Lastly, the finding that PTSD severity and anger interact in the prediction of treatment outcome additionally indicates that these prognostic factors are associated. The existence of such interaction corresponds with earlier research by Owens et al. (2008), the direction was however opposite. The interaction found in this study suggests that anger is particularly beneficial for improvement in PTSD severity when pre-treatment levels of PTSD severity are relatively low. This effect evaporates when levels of PTSD severity are high. An explanation for this could be that only when other pre-treatment symptoms are low, anger has predictive value. Otherwise these symptoms may already allow for enough room for improvement, irrespective of the level of anger. Of course such speculation deserves further research in order to gain true meaning.

The finding with respect to avoidant coping implies that the level of avoidant coping prior to treatment does not affect the degree of reduction of PTSD severity during treatment. This conflicts with two earlier studies that demonstrated that greater pre-treatment avoidant coping predicted poorer clinical responses (Badour et al, 2012; Tiet et al., 2006). Perhaps the effect was not found in the present study as a result of insufficient psychometric properties of the COPE–Easy, as pointed out by the poor internal consistency. The questionnaire may be inadequate to measure avoidant coping, thereby not detecting the impact of this predictor. It is on the other hand also possible that avoidant coping genuinely did not affect treatment in this sample. Considering that treatment was often trauma-focused, clients were stimulated to engage with traumatic memories, an act incompatible with avoidant coping. Veterans who frequently use avoidant coping strategies may therefore nonetheless have benefited from treatment (Leiner, Kearns, Jackson, Astin, & Rothbaum, 2012).

This study is valuable for several reasons. Firstly, to the author's knowledge no other study showed a positive impact of anger on treatment outcome. Two analytic approaches were utilized to achieve a complete picture of this remarkable effect. The present study thus adds novel information to the current literature and raises questions about the previously assumed role of the predictor anger. The finding that avoidant coping does not affect treatment is also novel, albeit less surprising. Researchers must pay attention to this null result to realistically assess the influence this prognostic factor. Furthermore, this study investigated the impact of the predictors of interest on the three PTSD symptom clusters separately, an extension rarely

employed in similar research (see Forbes, Creamer, Allen, et al., 2003, for an exception). Considering that these are related but distinct symptom clusters, different components of treatment may be needed to accomplish improvement in all clusters. Thus, to adequately advance treatment of PTSD, the differential impact of predictors on these three clusters must not be ignored. In the present study such extension indeed contributed to the explanation of the finding regarding anger. Finally, this study pursues a socially relevant topic and suggests practical implications for treatment and screening purposes, as specified later on.

The present study is also subject to a number of limitations, including the insufficient internal consistency of the COPE–Easy, the sole reliance on retrospective self-report, and the entirely male veteran chronic-disordered sample. The latter constrains the generalizability of the results to other samples, for instance individuals exposed to other traumas or veterans with non-chronic PTSD. The possible existence of sample selection furthermore limits this study, as the participants that did not complete the follow-up assessment might not have done so randomly. Moreover, in the absence of a randomized controlled design it cannot be concluded for certain that changes in PTSD severity were due to the effect of treatment. However, because clients suffered from chronic PTSD for a considerable period, one would not expect large spontaneous improvement during an average period of treatment. Another limitation is the use of a non-structured procedure, especially the variable intervals between pre-treatment and follow-up, the variable treatment techniques and number of sessions participants received, and the requirement to combine distinct questionnaires.

Further research on the predictors anger and avoidant coping is recommended, preferably with the combination of self-report and objective measures. Considering that the present results conflict with the existing literature, it is possible that this sample was anomalous, indicating the need for replication. With respect to anger, future research should re-examine the predictor afresh, determining if the effect found in the present study was a one-off contingency or not. In this context it is important to keep taking the three symptom clusters separately and the interplay with the predictor PTSD severity into account. Regarding avoidant coping it may be useful to complement an adequate questionnaire with real-time assessment of avoidant coping, for instance assessing behavioral avoidance in reaction to controlled stress inductions (Gratz, Bornovalova, Delany–Brumsey, Nick, & Lejuez, 2007). Lastly, a supplementary step would be to use more varied samples to determine the generalizability of the results.

If future studies in this area replicate the present results, there may be important implications for the treatment and screening process. The finding regarding anger may imply that high anger should not be considered a barrier to treatment response for veterans with PTSD.

Adapted treatment programs, such as additional emphasis on anger management, would then be unneeded. Anger may rather decrease as a side effect of the overall symptom reduction accomplished by regular treatment. The findings on anger do imply that assessing anger and its interaction with PTSD severity prior to treatment may be useful, as it possibly provides an estimate of treatment success. Particularly the presence of both low anger and low PTSD severity would be a poor prognostic sign. For these clients treatment with a direct focus on symptom relief may perhaps be less optimal, since there is not much room for immediate improvement. Hence, they may benefit more from in-depth treatments that are longer and more intensive. Moreover, if the finding with respect to avoidant coping would be replicated, it implies that the tendency to use this coping style may be no contraindication for regular treatment. In such case there would be no added value in assessing this predictor for indication of the treatment of choice. Additional focus on lowering avoidant coping strategies would then be futile.

In conclusion, this study suggests that anger has a positive impact on PTSD treatment outcome, particularly with respect to the symptom cluster of hyperarousal and in interaction with low PTSD severity. It furthermore suggests that avoidant coping does not affect treatment outcome. The results imply that to improve treatment effectiveness it may be useful to assess veterans' anger, but not avoidant coping style. However, the author is aware of the limitations of the present study. It is therefore important to acknowledge that the findings of this research should be regarded tentatively and require replication.

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Appendix. Mediation Analysis With Anger, Avoidant Coping, and Treatment Outcome

Data Analysis

It was predicted that avoidant coping would mediate the relationship between anger and treatment outcome. To assess this hypothesis, a simple mediation analysis was performed following Preacher and Hayes' method (2008a).[1] This technique estimates the total, direct and indirect effect of the independent variable (X) on the dependent variable (Y) through a proposed mediator variable (M). The total effect (c-path, denoted by **c**) represents the sum of the direct and indirect effect. The direct effect (c'-path, denoted by **c'**) represents the effect of X on Y with M in the model. The indirect effect (denoted by **ab**) represents the product of the a- and b-paths, and can likewise be expressed as the difference between the c- and c'-paths. Hence, $\mathbf{c = c' + ab}$. The a-path represents the effect of X on M, and the b-path represents the effect of M on Y with X in the model. The present analysis included pre-treatment anger as the independent variable, total PTSD change scores (Δ = follow-up − pre-treatment) as the dependent variable, and pre-treatment avoidant coping as the mediator variable. The proposed mediational model is presented in Figure A1.
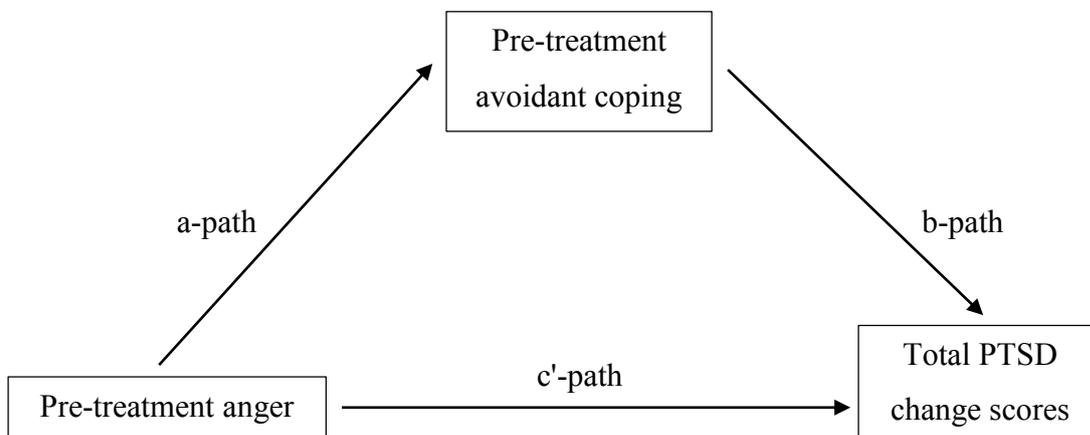

Figure A1. Proposed mediational model showing relationships between pre-treatment anger, pre-treatment avoidant coping, and total PTSD change scores.

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[1] Preacher, K. J., & Hayes, A. F. (2008a). Asymptotic and resampling strategies for assessing and comparing indirect effects in multiple mediator models. *Behavior Research Methods*, *40*, 879–891.

The mediation analysis was carried out using the INDIRECT macro for SPSS as programmed by Preacher and Hayes (2008b).[2] This macro applies a non-parametric bootstrapping method based on resampling with replacement. This method provides a point estimate of the indirect effect, its standard error and the corresponding 95% confidence interval. The confidence interval corrects for bias in estimating the indirect effect. The indirect effect is determined to be significant ($p < .05$, two-tailed) if zero is not contained in the confidence interval. The bootstrapping method is preferable to the causal steps method (Baron & Kenny, 1986),[3] because it formally examines the significance of the indirect effect and has greater statistical power. Moreover, bootstrapping is superior to the product of coefficients approach (Sobel test), because it does not require the assumption that the sampling distribution of the indirect effect is normal (Hayes, 2009; Sobel, 1982).[4][5] For the present analysis, bias-corrected bootstrapping with 5000 replications was chosen.

Results

Regression-based path analyses between all variables were conducted. The results are listed in Table A1. The a- and b-paths were not significant, whereas the c- and c'-paths (or total and direct effect) were significant. Subsequently, the test of indirect effect (ab) using the confidence interval generated by the bootstrapping analysis was performed. The bootstrapped point estimate of the indirect effect was 0.006, $SE = 0.044$. The bias corrected and accelerated 95% confidence interval was -0.14 to 0.047. Because the confidence interval contains zero, the indirect effect was not significant. This indicates that avoidant coping does not function as a mediator between anger and treatment outcome.

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[2] Preacher, K. J., & Hayes, A. F. (2008b). *SPSS macro for multiple mediation*. The Ohio State University. Written by A.F. Hayes. Retrieved from http://www.afhayes.com.

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Table A1

Results for the Regression-Based Path Analyses

Path	*B*	*SE$_B$*	*t*	*p*
a-path	-0.028	0.088	-0.32	.75
b-path	0.37	0.26	1.40	.17
c-path (total effect)	-0.39	0.18	-2.24	.029*
c'-path (direct effect)	-0.38	0.17	-2.20	.032*

Note. * *p* < .05.