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## Trauma-related guilt and pain among veterans with PTSD

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### Abstract

Despite the well-known co-occurrence of posttraumatic stress disorder (PTSD) and chronic pain, large gaps remain in understanding how these two conditions influence each other. The aim of the present study was to examine the association between trauma-related guilt and pain among veterans with PTSD. Participants were 140 veterans enrolling in treatment for PTSD and alcohol use disorder. Trauma-related guilt was assessed by the trauma-related guilt inventory, including the global guilt, distress, and guilt cognitions scales. Measures of pain included pain severity, pain disability, and fear of pain. Several significant bivariate associations were observed between trauma-related guilt scales and pain outcomes; however, in linear regression models, only the association between thoughts of trauma-related guilt and fear of pain remained statistically significant after controlling for confounding factors. Further, thoughts of trauma-related guilt, specifically thoughts of wrongdoing, partially mediated the association between PTSD severity and fear of pain. Our findings suggest that trauma-related guilt may play a role in the relationship between PTSD and chronic pain. Future research is encouraged to examine thoughts of trauma-related guilt as a potential therapeutic target in the treatment of persons with comorbid PTSD and chronic pain.

### Keywords

Trauma-related guilt; Pain; Fear of pain; Posttraumatic stress disorder

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CRediT authorship contribution statement

**Matthew S. Herbert:** Conceptualization, Formal analysis, Methodology, Writing - original draft, Writing - review & editing. **Anne L. Malaktaris:** Conceptualization, Methodology, Writing - review & editing. **Robert Lyons:** Conceptualization, Methodology, Writing - review & editing. **Sonya B. Norman:** Conceptualization, Funding acquisition, Methodology, Supervision, Writing - review & editing.

Declaration of Competing Interest

The authors have no conflicts of interest to report.

## 1. Introduction

Posttraumatic stress disorder (PTSD) is the most common mental health diagnosis received by treatment-seeking veterans (Seal et al., 2007). A complicated feature of PTSD is that it rarely occurs in isolation. Indeed, PTSD commonly co-occurs with several mental and physical health conditions (Campbell et al., 2007; Debell et al., 2014; Qureshi et al., 2009), including chronic pain. Among veterans seeking treatment for PTSD, chronic pain is as high as 66% (Shipherd et al., 2007), with up to 87% reporting pain as a problem (Porter et al., 2013). In civilian samples with PTSD, the prevalence of chronic pain is lower, but still substantial with estimates between 11 and 23% (Liebschutz et al., 2007; McWilliams et al., 2003). The co-occurrence of chronic pain is related to increased symptom severity, poorer functioning, greater healthcare utilization and higher rates of medication use compared to those with PTSD alone (Ang et al., 2014; Outcalt et al., 2015, 2014).

The mutual maintenance model theorizes that PTSD and chronic pain bi-directionally maintain and exacerbate each other through several factors (Sharp and Harvey, 2001). These include attentional bias towards threatening or painful stimuli, a tendency to misinterpret and catastrophize physical sensations, avoidant coping style, and elevated anxiety. A related model is the shared vulnerability model, which proposes that higher dispositional sensitivity to anxiety predisposes the development of PTSD and chronic pain (Asmundson et al., 2002). Although several studies provide support for the mutual maintenance (Alschuler and Otis, 2012; Jenewein et al., 2009) and shared vulnerability models (Afari et al., 2008; Asmundson and Taylor, 2006), large gaps remain in understanding the relationship between PTSD and chronic pain. In the present study, we posit that trauma-related guilt may be an important, unexplored construct in understanding the co-occurrence of PTSD and chronic pain.

Trauma-related guilt refers to experiencing distressing emotions while negatively appraising action or inaction during a traumatic event as incongruent with a person's value system (Kubany and Watson, 2003). Trauma-related guilt is implicated in the maintenance of PTSD. Among Vietnam veterans, trauma-related guilt was highly endorsed nearly four decades following combat exposure and strongly related to ratings of PTSD severity and negative affect (Kubany et al., 1995). Further, among Iraq and Afghanistan combat veterans and active duty military, trauma-related guilt partially mediated the relationship between PTSD and psychosocial functioning (Norman et al., 2018). Although guilt can serve as an adaptive emotion in promoting reparative behavior (Tangney et al., 2007), when trauma-related guilt is avoided it can exacerbate PTSD (Norman et al., 2014). For example, Held and colleagues found that thoughts of trauma-related guilt were associated with increased disengagement coping, and disengagement coping mediated the relationship between thoughts of trauma-related guilt and PTSD severity (Held et al., 2011).

The link between guilt and pain has received less attention (Eccleston, 2018). The limited research on guilt and pain dates back to the 1950s in the investigation of "psychogenic" pain where psychodynamically oriented accounts suggested that experiencing pain may represent an attempt to assuage guilt related to feelings of responsibility for a traumatic event (Engel, 1959). In modern research, guilt has been shown to manifest among patients with chronic pain who fear their pain may negatively impact family members (Lumley et

al., 2011; Serbic and Pincus, 2013; Snelgrove et al., 2013). Guilt related to pain also affects functional status. Among patients with low back pain, pain-related guilt was associated with greater disability and lower mood (Serbic et al., 2016). Others have reported non-significant associations between guilt and pain. In a study comparing individuals with and without subacute low back pain, no differences were found on the guilt item of the Beck Depression Inventory (Lopez-Lopez et al., 2017). Further, guilt was unrelated to perceptions of pain following a spinal cord injury (Conant, 1998). We are aware of only one study that has specifically examined trauma-related guilt as it relates to pain. Among torture survivors, post-traumatic guilt was negatively associated with experimental pain sensitivity (Lahav et al., 2019). Although the authors concluded that post-traumatic guilt may decrease the experience of pain among individuals with PTSD, this study contained no clinical measures of pain. Further, the study sample (torture survivors) may not generalize to individuals whom experience PTSD related to other traumatic experiences.

There are several reasons why trauma-related guilt may be associated with increased pain and pain-related functioning in PTSD that are consistent with the mutual maintenance and shared vulnerability models. First, trauma-related guilt represents a catastrophic style of thinking (Norman et al., 2014), similar in nature to thoughts hypothesized to maintain PTSD and chronic pain. Second, negative affect is associated with heightened pain sensitivity and increased pain disability in chronic pain (Jamison et al., 2013). Thus, negative affect associated with trauma-related guilt may be related to increased pain in individuals with PTSD. Third, the persistence of trauma-related guilt may underlie the avoidant coping and maintenance of fear networks that contributes to both PTSD and chronic pain.

The aim of the current study was to examine the association among trauma-related guilt and pain severity, pain disability, and fear of pain in veterans with PTSD. Data used for this study was collected during the baseline visit of a randomized controlled trial comparing two psychosocial treatments for PTSD and alcohol use disorder (Norman et al., 2015). Although all participants in the current study had an alcohol use disorder, our focus was on the association between PTSD and pain, and therefore alcohol use severity was considered an *a priori* covariate given its potential impact on pain (Egli et al., 2012). We expected a positive association between trauma-related guilt and pain outcomes, and that trauma-related guilt would help explain the association between PTSD severity and pain outcomes.

## 2. Methods

### 2.1. Participants

Participants were 140 U.S. military veterans. All participants met diagnostic criteria for PTSD and alcohol use disorder. Data for the present study came from participants who were enrolled in the clinical trial and completed measures at baseline. The study was approved by the VA San Diego Healthcare System Institutional Review Board and Research and Development Committee. Participants provided written consent prior to enrollment.

## 2.2. Measures

**2.2.1. Trauma-related guilt**—The Trauma-Related Guilt Inventory (TRGI) is a 32-item self-report questionnaire that measures cognitive and emotional attributes of guilt related to a traumatic event (Kubany et al., 1996). It consists of three scales: global guilt (4-items), distress (6-items), and guilt cognitions (22-items). The global guilt scale reflects the frequency and intensity of guilt (e.g., “I experience intense guilt that relates to what happened.”). The distress scale indicates the amount of distress experienced when thinking about the trauma (e.g., “What happened caused me emotional pain”). The guilt cognitions scale, or thoughts of trauma-related guilt, identifies various conclusions of a respondent’s guilt. This scale can be summed into a single scale or divided into three subscales: hindsight-bias/responsibility (7-items), wrongdoing (5-items), and lack of justification (4-items). Examples items from the subscales include (respectively): “I could have prevented what happened”, “What I did was inconsistent with my beliefs”, and “I can justify what I did” (reverse scored). The TRGI has excellent test-retest reliability and internal consistency (Myers Wilkins et al., 2012).

**2.2.2. Pain severity**—The Short-Form Health Survey (SF-36) is a widely used instrument to assess functioning and well-being that consists of eight subscales (Ware and Sherbourn, 1992). For the purposes of the present study, we used a single item from the Functioning Due to Bodily Pain subscale to capture pain severity. On this item, participants are asked to rate the severity of bodily pain over the last 4 weeks. Response options are: none, very mild, mild, moderate, severe, or very severe, which are scored from 1 to 6, respectively.

**2.2.3. Pain disability**—The Pain Disability Questionnaire (PDQ) is a 15-item self-report questionnaire that measures perceptions of disability and functioning related to pain (Anagnostis et al., 2004). Each item is rated on a Likert scale from 0 to 10 with higher scores indicating greater pain disability. Scores from 0 to 70 are indicative of mild/moderate disability, 71 to 100 severe disability, and 101 to 150 extreme disability. The PDQ has excellent test-retest reliability, internal consistency, and construct validity (Anagnostis et al., 2004).

**2.2.4. Fear of pain**—The Pain Anxiety Symptoms Scale-Short Form (PASS) is a 20-item self-report questionnaire that measures fear and anxiety related to pain symptoms (McCracken and Dhingra, 2002). Example items include: “When I hurt I think about pain constantly” and “When I feel pain I am afraid that something terrible will happen.” Each item is rated on a Likert scale from 0 to 5 with higher scores indicating greater fear of pain. The PASS has strong internal consistency, reliability and construct validity (McCracken and Dhingra, 2002).

**2.2.5. PTSD severity**—PTSD severity was measured with the Clinician-Administered PTSD Scale for DSM-5 (CAPS-5) (Weathers et al., 2018). The CAPS-5 is a semi-structured clinical interview that produces severity scores that range from 0 to 80, with higher scores representing greater PTSD severity. It is a well-established instrument with strong internal consistency, inter-rater reliability, and convergent validity (Weathers et al., 2018).

**2.2.6. Alcohol use severity**—Alcohol use severity was measured using the Structured Clinical Interview for DSM-IV Axis 1 Disorders (SCID-IV) (First et al., 2002). The SCID-IV is a semi-structured interview purposed for making DSM-IV diagnoses. As the SCID for DSM-5 was not available at the outset of the study, DSM-IV alcohol abuse and dependence symptom items were summed to approximate alcohol use severity as in previous research (Mills et al., 2012).

### 2.3. Statistical analysis

We first inspected bivariate associations among TRGI scales (global guilt, distress, guilt cognitions), pain variables (pain severity, pain disability, fear of pain), PTSD severity, and alcohol-use severity using Pearson's *R*. Significant correlations observed between TRGI scales and pain variables were subsequently inspected using hierarchical linear regression. Unadjusted models were first examined (step 1), followed by models adjusted for PTSD and alcohol use severity, as well as any demographic variables that were significantly related to pain variables (step 2). Pain severity was included as an additional covariate (step 3) when assessing pain disability and fear of pain. Cross-sectional mediation analyses were conducted using PROCESS, version 3 (Hayes, 2017). A 95% bias-corrected bootstrapped confidence interval was calculated to determine if the *total effect* (path *c*) of PTSD severity on pain outcomes comprised a significant *direct effect* (path *c'*) and/or a significant *indirect effect* (path *ab*) through trauma-related guilt. Path *a* refers to the effect of PTSD severity on trauma-related guilt and path *b* refers to the effect of trauma-related guilt on pain outcomes. A significant indirect effect between PTSD severity and pain outcomes is determined if the 95% confidence interval does not contain zero. Due to the limited research in this research area and exploratory nature of this study, we did not adjust for multiple testing (Armstrong, 2014). Statistical analyses were done using the Statistical Package for Social Sciences version 24 (IBM-Corporation, 2016) and the alpha level set at 0.05.

## 3. Results

Table 1 shows demographics and clinical characteristics of the sample. The majority of the sample was male (90%) with an average age of 42.12 (*SD* = 12.70). On average, pain severity (*M* = 3.54, *SD* = 1.15) and pain disability scores (*M* = 53.27, *SD* = 38.90) were in the mild/moderate range. Race was significantly related to fear of pain (*p* = .02). Although follow-up analyses did not show significant pair-wise comparisons, race was nonetheless included as a covariate in hierarchical linear regression models and cross-sectional mediation analyses. No other demographic variables were significantly related to pain outcomes.

Table 2 shows bivariate correlations among study variables. Several significant associations between trauma-related guilt and pain outcomes were found. The global guilt scale was positively associated with pain disability and fear of pain, the distress scale with pain severity, pain disability, and fear of pain, and thoughts of trauma-related guilt with fear of pain. Further, PTSD severity was related to greater pain disability and fear of pain, as well as greater scores on all three TRGI scales. Alcohol use severity was unrelated to pain variables but was related to thoughts of trauma-related guilt.

Based on the observed bivariate correlations, we ran a total of six hierarchical linear regression models (see Table 3). The association among the global guilt scale and pain disability and fear of pain, as well as the association among the distress scale and pain severity and pain disability became non-significant after adjusting for PTSD severity, alcohol use severity, and race (step 2). The association between the distress scale and fear of pain remained significant after step 2 but became non-significant after adjusting for pain severity (step 3). The association between thoughts of trauma-related guilt and fear of pain remained significant after steps 2 and step 3.

We proceeded to determine if the association between PTSD severity and fear of pain could be explained by thoughts of trauma-related guilt. There was a significant direct effect of PTSD severity on fear of pain ( $B = 0.47$ ,  $SE = 0.17$ , 95% CI: 0.12, 0.81), as well as a significant indirect effect of thoughts of trauma-related guilt ( $B = 0.22$ ,  $SE = 0.10$ , 95% CI: 0.05, 0.43), demonstrating partial cross-sectional mediation. We conducted an additional cross-sectional mediation model simultaneously considering the three subscales of the guilt cognitions scale. This analysis showed a significant direct effect of PTSD severity on fear of pain ( $B = 0.47$ ,  $SE = 0.17$ , 95% CI: 0.13, 0.81) and a significant indirect effect of the wrongdoing subscale ( $B = 0.18$ ,  $SE = 0.09$ , 95% CI: 0.03, 0.37). The indirect effect of hindsight bias/responsibility and lack of justification was not significant. Fig. 1 shows a graphical display of this analysis.

#### 4. Discussion

In the present study, significant associations were found between trauma-related guilt and pain outcomes, with the most robust association between thoughts of trauma-related guilt and fear of pain. This suggests trauma-related guilt may be most strongly related to the cognitive-affective component of pain. Further, thoughts of trauma-related guilt, specifically thoughts of wrongdoing, partially explained the association between PTSD severity and fear of pain. Our findings suggest that trauma-related guilt may be involved in the PTSD-pain relationship and potentially a therapeutic target in the treatment of persons with comorbid PTSD and chronic pain.

The findings of the present study are seemingly opposite of Lahav et al., who found post-traumatic guilt was associated with reduced experimental pain sensitivity among torture survivors (Lahav et al., 2019). However, Lahav et al. did not incorporate any clinical measures of pain, whereas our study relied exclusively on clinical measures. This is important because experimental pain does not necessarily correlate well with clinical measures of pain (Kim et al., 2004). Further, Lahav et al. combined all three subscales of the TRGI into one scale of post-traumatic guilt. Our results suggest a nuanced relationship between post-traumatic guilt and pain, specifically between thoughts of trauma-related guilt and fear of pain. There are at least two potential explanations for this finding. First, theorists have proposed that trauma-related guilt impedes the emotional processing of fear experienced at the time of the traumatic event(s) (Brewin et al., 1996; Lee et al., 2001). Therefore, thoughts of trauma-related guilt may serve to maintain the “fear structure” believed to underlie the development and maintenance of PTSD (Foa et al., 1989). Components of the fear structure include higher sensitivity to potential threats and

exaggerated appraisal of anticipated harm. Given the intrinsic threat of pain, it is possible thoughts of trauma-related guilt also function to increase fear of pain.

A second and related explanation is that thoughts of trauma-related guilt may be associated with fear of pain via avoidant coping. Avoidant coping strategies, such as withdrawing from others or disengagement of thoughts and emotions related to a stressor, are associated with the development and severity of chronic pain (Leeuw et al., 2007). Indeed, the fear-avoidance model is one of the most prominent models used to explain the transition from acute to chronic pain (Vlaeyen and Linton, 2012). Further, among veterans with PTSD, thoughts of trauma-related guilt were positively associated with avoidant coping strategies and mediated the relationship between thoughts of trauma-related guilt and PTSD severity (Held et al., 2011). Thus, it is possible thoughts of trauma-related guilt increase avoidant coping, which in turn increase fear of pain. Future research is encouraged to tease apart the role of avoidant coping strategies in the relationship between trauma-related guilt and pain.

In the development of the TRGI, the authors posited that negative affect is a necessary component of trauma-related guilt (Kubany et al., 1996). Negative affect is also a feature of chronic pain (Jamison et al., 2013) and related to greater pain sensitivity in healthy adults (Wiech and Tracey, 2009), and thus could be a mechanism by which trauma-related guilt influences pain. In bivariate analyses, the distress scale was associated with pain outcomes; however, these associations became non-significant after controlling for confounding factors including PTSD severity. It is possible the distress scale contains too much overlap with the PTSD-related distress. Indeed, others have raised similar concerns about the TRGI distress scale (Stotz et al., 2015).

The significant bivariate associations among the global guilt scale and pain disability and fear of pain became non-significant after considering PTSD severity, alcohol use severity, and race. Our bivariate analyses revealed a strong correlation between the global guilt scale and PTSD severity, and thus it possible our sample was not sufficiently powered to detect associations with pain disability or fear of pain beyond what could be explained by PTSD severity. This also points to the unique contribution of thoughts of trauma-related guilt when considering the relationship between trauma-related guilt and pain.

Thoughts of trauma-related guilt, specifically thoughts of wrongdoing, partially explained the association between PTSD severity and fear of pain. Maladaptive thoughts play an important role in the chronicity and severity of both PTSD (Spinoven et al., 2015) and chronic pain (Quartana et al., 2009). Catastrophizing, or the tendency to exaggerate the meaning of negative stimuli and feelings of helplessness, is a type of maladaptive thinking observed in both PTSD and chronic pain (Otis et al., 2003). Thoughts of trauma-related guilt may also represent a kind of catastrophic thinking, in which individuals exaggerate or overly interpret their role in a traumatic event. In this way, catastrophizing may be associated with the development of thoughts of wrongdoing after a traumatic event, which may in turn generalize to catastrophizing about other negative experiences such as pain. Future longitudinal studies are encouraged to test this potential route of influence.

There are limitations to the present study. First, the cross-sectional nature of the data limits inference about causal relationships. This is particularly important to keep in mind for our cross-sectional mediation results. Second, our measure of pain severity consisted of a single item and did not capture other important aspects of pain (e.g., current pain severity, fluctuations of pain severity). Third, veterans with chronic pain were not specifically recruited for the present study. Pain severity and pain disability were in the mild/moderate range on average, and this may be one reason why these variables were not more strongly associated with trauma-related guilt. Further, veterans in the current study had both PTSD and alcohol use disorder. Although correlations between alcohol use severity and pain outcomes were small, it is possible our findings do not completely generalize to veterans with PTSD only.

In summary, thoughts of trauma-related guilt were uniquely related to fear of pain in veterans with PTSD. Further, thoughts of wrongdoing partially explained the association between PTSD severity and fear of pain. Our results suggest that trauma-related guilt may be an important variable in understanding the relationship between PTSD and chronic pain, and has implications for the role of guilt in the treatment of individuals with PTSD and chronic pain.

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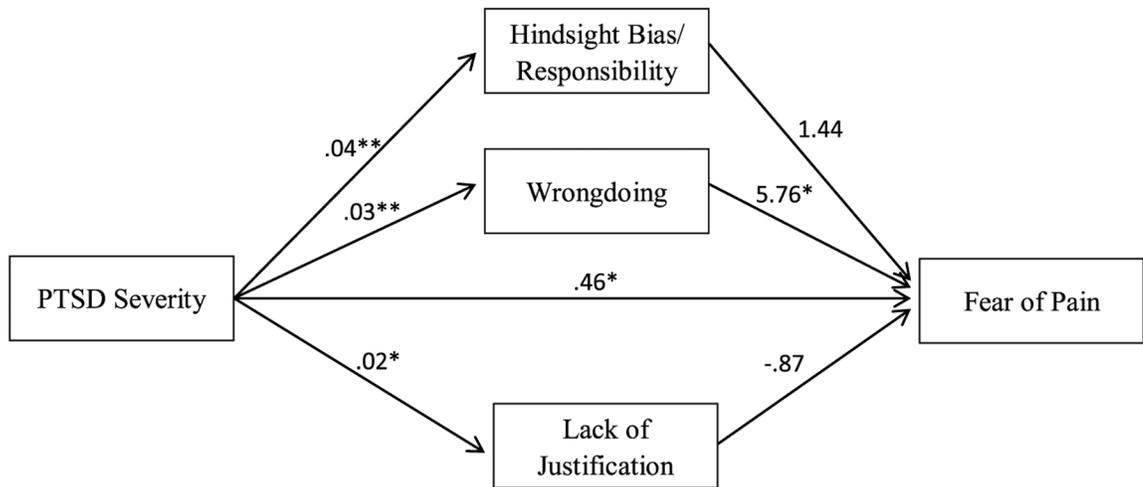
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**Fig. 1.** Diagram showing thoughts of wrongdoing as a cross-sectional partial mediator in the association between PTSD severity and fear of pain. Note:  $* = p < .05$ ;  $** = p < .001$ ; Model adjusted for alcohol use severity, race, and pain severity.

**Table 1.**Demographics and clinical characteristics ( $N= 140$ ).

<b>Demographics</b>	
Age	42.12 (12.70)
Male	126 (90.0)
Race	
White	87 (62.1)
African American	19 (13.6)
Asian	10 (7.1)
Other or unknown	24 (15.7)
Hispanic ethnicity	38 (27.1)
Education	
GED/ High school or less	95 (67.9)
Branch of Military	
Army	53 (37.9)
Navy	41 (29.3)
Marines	40 (28.6)
Other	6 (4.2)
<b>Clinical characteristics</b>	
Global Guilt Scale	2.31 (1.15)
(Guilt) Distress Scale	1.61 (0.92)
Guilt Cognitions Scale	3.03 (0.75)
Pain Severity	3.54 (1.15)
Pain Disability	53.27 (38.90)
Fear of Pain	40.61 (23.96)
PTSD Symptoms	40.61 (11.50)
Alcohol Use Severity	7.64 (2.21)

Note: Values refer to mean (SD) or count (%); PTSD = posttraumatic stress disorder.

**Table 2.**Bivariate correlations of study variables ( $N = 140$ ).

	1.	2.	3.	4.	5.	6.	7.	8.
1. Global Guilt Scale	–							
2. (Guilt) Distress Scale	.62**	–						
3. Guilt Cognitions Scale	.61**	.39**	–					
4. Pain Severity	.10	.19*	.03	–				
5. Pain Disability	.23*	.29*	.16	.71**	–			
6. Fear of Pain	.35**	.37**	.38**	.45**	.57**	–		
7. PTSD severity	.63**	.55**	.50**	.09	.28*	.40**	–	
8. Alcohol Use Severity	.27*	.20*	.34*	–0.04	–0.01	.19*	.42**	–

Note:.

\*  
 $p < .05$ .\*\*  
 $p < .001$ .

**Table 3.**

Hierarchical linear regression analyses showing the association among trauma-related guilt scales and pain severity, pain disability, and fear of pain in unadjusted models (step 1), after adjusting for PTSD severity, alcohol use severity, and race (step 2), and pain severity (step 3<sup>a</sup>) ( $N = 140$ ).

Variables	Pain Severity			Pain Disability			Fear of Pain			
	Step	<i>B</i> (SE)	$\beta$	<i>p</i>	<i>B</i> (SE)	$\beta$	<i>p</i>	<i>B</i> (SE)	$\beta$	<i>p</i>
Global Guilt	1	-	-	-	7.67 (2.80)	.23	< 0.01	7.25 (1.66)	.35	< 0.001
	2	-	-	-	2.68 (3.56)	.08	.45	3.09 (2.09)	.15	.14
	3	-	-	-	1.14 (2.53)	.03	.67	2.52 (1.88)	.12	.18
(Guilt) Distress	1	.29 (0.13)	.19	.03	15.00 (4.23)	.29	< 0.01	11.90 (2.54)	.37	< 0.001
	2	.29 (0.16)	.19	.07	9.35 (5.06)	.18	.07	6.63 (2.98)	.21	.03
	3	NA	NA	NA	2.76 (3.67)	.05	.45	4.23 (2.73)	.13	.12
Guilt Cognitions	1	-	-	-	-	-	-	9.76 (2.05)	.38	< 0.001
	2	-	-	-	-	-	-	6.01 (2.33)	.23	.01
	3	-	-	-	-	-	-	6.13 (2.08)	.24	< 0.01

Note: Step 3 applicable only when assessing pain disability and fear of pain as outcome.