COGNITIVE PROCESSING THERAPY AND TRAUMA-RELATED NEGATIVE COGNITIONS: RELATIONSHIP AND EFFECT ON TREATMENT

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by

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Cognitive Processing Therapy (CPT) is based on the theory that posttraumatic stress disorder (PTSD) is a disorder of non-recovery after an exposure to a qualifying trauma. This non-recovery results in assimilated and overaccomodated trauma-related cognitions which negatively affects an individual's schema pertaining to self, the world, and self-blame. This post-trauma alteration in an individual's schema is typically expressed and reinforced in the form of trauma-related negative cognitions (NCs).

Although the theoretical underpinnings of NCs as well as their effect on symptom severity in individuals with PTSD have been studied, the role of NCs in therapeutic outcome is less understood. In particular, although CPT specifically targets and addresses NCs, there is limited research regarding the role of NCs during and after CPT treatment.

This dissertation consisted of two studies. The purpose of the first study was to examine the overall effectiveness of CPT in attenuating NCs from pre- to post-treatment. To address this study's aim, a meta-analysis of current peer-reviewed clinical trials that assessed NCs at pre- and post-CPT treatment was conducted. The purpose of the second study was to determine if NCs predict therapeutic outcome (i.e., decreases in PTSD and depression symptom severity) over the course of CPT treatment and at follow-up. To address this study's aim, a secondary analysis of a randomized clinical trial of CPT in women and men with military sexual trauma (MST)-related PTSD was performed. Specifically, cross-lagged panel analyses were conducted with NC scores entered as a predictor of subsequent reductions in PTSD and depression symptoms over the course of treatment and follow-up.

The first study concluded that CPT had a large effect size in reducing NCs from pre- to post-treatment. Results from the second study were indicative that NCs about self-blame predict subsequent reductions in PTSD symptom severity over the course of CPT and follow-up in veterans with MST-related PTSD. These studies provide further information regarding the effectiveness of CPT in addressing NCs as well as the mediating role of NCs during and after treatment.

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LIST OF ABBREVIATIONS

APA	American Psychiatric Association
CAPS	Clinician Administered PTSD Scale
CBT	Cognitive Behavioral Therapy
CPT	Cognitive Processing Therapy
CR	Cognitive Restructuring
DSM-IV	Diagnostic and Statistical Manual of Mental Disorders-IV
EBTs	Evidence-Based Treatments
HLM	Hierarchical Linear Modeling
MST	Military Sexual Trauma
NCs	Trauma-Related Negative Cognitions
PBRS	Personal Beliefs and Reactions Scale
PE	Prolonged Exposure Therapy
PCL-M	PTSD Checklist-Military
PTCI	Posttraumatic Cognitions Inventory
PTSD	Posttraumatic Stress Disorder
PCT	Present Centered Therapy
QIDS	Quick Inventory of Depressive Symptomatology

SECTION I

Introduction

Posttraumatic Stress Disorder (PTSD): Prevalence, Diagnosis, and Clinical Presentation

Approximately 89.7% of the general population will experience a traumatic event during their lifetime (Kilpatrick et al., 2013). According to the fifth edition of the *Diagnostic and Statistical Manual* (American Psychiatric Association [APA], 2013), a traumatic event is defined as an exposure to actual or threatened death, serious injury, or sexual violence in one (or more) of the following ways: directly experiencing; witnessing, in person, the trauma as it occurs to others; learning of the traumatic event (in cases where it occurred to a close family member or friend); and/or experiencing repeated or extreme work-related exposure to aversive details related to a trauma. Despite the high prevalence of exposure to trauma, only 8.3% of the general population will subsequently develop a lifetime diagnosis of PTSD (Kilpatrick et al., 2013).

PTSD is a psychiatric diagnosis that requires a characteristic pattern of symptoms which are both temporally and contextually tied to an individual's exposure to a qualifying trauma (APA, 2013; North, Surís, Davis, & Smith, 2009). To meet criteria for a diagnosis of PTSD, an individual must endorse symptoms from four distinct criteria: B (intrusion), C (avoidance), D (negative alterations in cognitions and mood), and E (arousal). Additionally, symptoms

must persist for more than 1 month and result in clinically significant distress or social, occupational, or functional impairment.

In addition to PTSD-related symptomatology, PTSD is associated with a number of negative health sequelae. Researchers have linked PTSD to psychiatric comorbidities including mood, anxiety, personality, and substance use disorders (Galatzer-Levy, Nickerson, Litz, & Marmar, 2013; Golier et al., 2003). PTSD is also associated with physical health concerns such as chronic pain, cardio-respiratory and gastrointestinal complaints (Pacella, Hruska, & Delahanty, 2013). Additionally, PTSD has been linked to decreased quality of life and psychosocial functioning (Olatunji, Cisler, & Tolin, 2007) as well as increased rates of self-directed violence (Bryan, Grove, & Kimbrel, in press). PTSD, its associated comorbid psychiatric diagnoses, and psychosocial issues, have an established economic burden that results in increased health care utilization and missed days of work (Galovski & Lyons, 2004; Possemato, Wade, Andersen, & Ouimette, 2010; Stellman et al., 2008).

PTSD in Veterans

Multiple large scale epidemiological studies have found that the prevalence rates of PTSD have consistently been higher in veteran samples compared to civilian samples (Kang, Natelson, Mahan, Lee, & Murphy, 2003; Kessler et al., 2005a; Kessler et al., 2005b; Kulka et al., 1990; Tanielian & Jaycox, 2008). Researchers have reported rates of PTSD in veterans across

multiple service eras to be as high as 13-23% (Fulton et al., 2015; Gates et al., 2012; Possemato et al., 2010; Seal, Bertenthal, Miner, Sen, & Marmar, 2007), which exceeds the estimated 8.3% rate of PTSD in the general population. A meta-analysis examining why veterans are particularly susceptible to developing PTSD determined that they have several unique risk factors, including higher likelihood of trauma exposure(s) as well as greater severity and chronicity of trauma exposure(s) during their military service (Brewin, Andrews, & Valentine, 2000).

Among traumatic experiences reported by veterans, combat and military sexual trauma (MST) are the most prevalent (Gates et al., 2012; Surís & Lind, 2008). Military-related combat trauma includes a number of experiences such as being fired upon, physical assault, improvised explosive devices, witnessing death, biochemical warfare, and exposure to the aftermath of battle (Vogt et al., 2011). Although rates of combat exposure differ based on service era, an estimated 85-90% of veterans in the most recent Operation Iraqi Freedom/Operation Enduring Freedom experienced combat trauma during service (Tanielian, 2009). These rates largely reflect the experiences of male veterans due to restrictions on female veterans serving in combat roles; however, the number of female veterans who experience combat trauma is expected to rise in the near future due to female veterans' recently gained ability to serve in combat roles (U.S. Department of Defense, 2015).

MST is defined as "physical assault of a sexual nature, battery of a sexual nature, or sexual harassment," with sexual harassment further defined as "repeated, unsolicited verbal or physical contact of a sexual nature which is threatening in character" (U.S. Code, Title 38 § 1720D). Approximately 1% of male and 24% of female veterans with experience MST during their service (Military Sexual Trauma Support Team, 2013). Although rates of MST differ between male and female veterans, the total number of male and female veterans who endorse MST is relatively similar due to higher overall number of male veterans serving in the military (Kimerling, Gima, Smith, Street, & Frayne, 2007).

Although both combat and MST are qualifying exposures for PTSD, researchers have noted that MST appears to be more predictive of PTSD diagnosis than combat trauma. Yaeger, Himmelfarb, Cammack, and Mintz found that MST was the strongest predictor of PTSD diagnosis than other forms of military (i.e., combat trauma) and non-military (e.g., physical assault, natural disasters) trauma. Similarly, Kang, Dalager, Mahan, and Ishii (2005) found adjusted odds ratios for PTSD were higher in veterans who reported MST when compared to veterans who endorsed combat trauma.

Treatment of Military-Related PTSD

Multiple psychological and pharmacological interventions have been developed to treat PTSD. Best practice guidelines endorse trauma-focused cognitive behavioral therapy (CBT) as an effective, first-line treatment for PTSD

(Foa, Keane, & Friedman, 2010; Institute of Medicine, 2008). Among the numerous available CBTs, Cognitive Processing Therapy (CPT) and Prolonged Exposure Therapy (PE) have become the established "first-line" treatments. Compared to other psychological and pharmacotherapy interventions, CPT and PE have the largest treatment effect sizes when compared to other interventions (Foa et al., 2010). Because of this, the Department of Veterans Affairs commissioned a national dissemination of both CPT and PE to treat military-related PTSD (Karlin et al., 2010; Karlin & Cross, 2014).

CPT: Theory and Evidence

Although PE and CPT both have robust evidence of PTSD treatment effectiveness, a meta-analysis of all current psychotherapy and pharmacotherapy interventions for PTSD found CPT to have among the highest effect sizes (Watts et al., 2013), suggesting that across multiple trials, CPT may be one of the most effective treatment for PTSD. Although originally developed as a treatment for civilian survivors of rape (Resick & Schnicke, 1992), CPT has since been validated as an effective treatment for multiple trauma types including combat-related (Forbes et al., 2012; Monson et al., 2006) and MST-related PTSD (Surís, Link-Malcolm, Chard, Ahn, & North, 2013).

CPT is based on a theoretical framework that PTSD is a "non-recovery" experienced after a qualifying traumatic exposure (Resick & Schnicke, 1992). In these instances, an individual is presented with schema-discrepant information

(e.g., sexual assault) which he or she has difficulty assimilating into his or her current world views. This occurs either in the form of erroneously assimilating (e.g., "maybe it wasn't a sexual assault") or over-accommodating (e.g., "all men are dangerous") the traumatic event. These processes are expressed through trauma-related negative cognitions (NCs) which further reinforce post-trauma alterations in one's schema.

Gaps in the Literature and Current Study

One of the core mechanisms of change during CPT is the process of identifying and restructuring NCs (LoSavio, Dillon, & Resick, 2017). Researchers theorize that by identifying and processing these cognitive "stuck points," individuals are able to experience therapeutic benefit in the form of reductions in PTSD and depression symptom severity. Although the theoretical underpinnings of CPT as well as the effect of NCs on predicting symptom severity in survivors of trauma have been studied (*see* Holliday, Link-Malcolm, Morris, & Surís, 2013; Resick et al., 2008), the role of NCs in CPT therapeutic outcome is less understood. Specifically, there is limited research examining the role of NCs during and after CPT. The purpose of this proposed dissertation is to address these gaps in the literature through two studies. The aim of study 1 is to determine the effectiveness of CPT in reducing NCs from pre- to post-treatment. To examine this aim, a meta-analysis of current peer-reviewed clinical trials was conducted. The purpose of study 2 is to determine the role of NCs in mediating therapeutic

gain from CPT as measured by improvements in depression and PTSD symptoms. Cross-lagged panel analyses was be conducted with NCs entered as a predictor of subsequent reductions in PTSD and depression symptoms over the course of treatment and follow-up. These studies have the potential to provide further information as to the overall effectiveness of CPT in addressing NCs as well as the mediating role of NCs during and after treatment.

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SECTION II
Study I

A Single Arm Meta-Analysis of the Effectiveness of Cognitive Processing Therapy in Attenuating Trauma-Related Negative Cognitions

Abstract

Cognitive Processing Therapy (CPT) is a first-line treatment for posttraumatic stress disorder (PTSD) designed to address cognitive "stuck points" connected to their trauma-related negative cognitions (NCs). Although CPT has well-established efficacy, the ability of CPT to address NCs remains understudied. The purpose of this proposed study is to conduct a single arm meta-analysis to determine the overall effectiveness of CPT in attenuating NCs pre- to post-treatment across multiple clinical trials. A review of the existing literature was performed with only peer-reviewed clinical trials being included in the meta-analysis. Nine studies with data from 583 participants were entered into the meta-analysis. CPT was found to have a large effect size in reducing NCs from pre- to post-treatment. Findings are limited by the single-arm nature of analyses and heterogeneity in included trial methodology (e.g., gender, trauma type, civilian versus veteran).

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INTRODUCTION

Approximately 89.7% of the general population will experience a traumatic event during their lifetime, with 8.3% of these individuals developing a lifetime diagnosis of posttraumatic stress disorder (PTSD) (Kilpatrick et al., 2013). PTSD is a psychiatric diagnosis characterized by persistent symptoms of intrusion, avoidance, negative alteration in cognitions and mood, and negative alteration in arousal and reactivity (American Psychiatric Association [APA], 2013). Individuals diagnosed with PTSD often experience significant psychiatric (e.g., depression, substance use disorders, anxiety disorders) and physical health (e.g., traumatic brain injury, cardiovascular and musculoskeletal disorders) comorbidities (Brady, Killeen, Brewerton, & Lucerini, 2000; O'Toole & Catts, 2008; Pagotto et al., 2015). Additionally, PTSD is associated with decreased quality of life and psychosocial functioning (Holliday, Williams, Bird, Mullen, & Surís, 2015; Kuhn, Blanchard, & Hickling, 2003; Mendlowicz & Stein, 2000; Pietrzak, Goldstein, Malley, Rivers, & Southwick, 2010; Surís, Lind, Kashner, and Borman, 2007).

There are currently numerous effective treatments for PTSD (Foa, Keane, & Friedman, 2010). Of currently available treatments, trauma-focused Cognitive Behavioral Therapies (CBT) have the most robust evidence of effectiveness. For instance, a recent meta-analysis by Watts et al. (2013) found effect sizes for CBTs outweighed all other forms of PTSD psychotherapy and pharmacotherapy

treatments. Of the identified CBTs, Cognitive Processing Therapy (CPT) had one of the largest effect size for decreasing PTSD symptom severity, suggesting it is a highly effective intervention for reducing PTSD symptom severity.

CPT is an evidence-based treatment (EBT) for PTSD that focuses on identifying cognitive "stuck points" (assimilated/overaccomodated erroneous beliefs regarding a traumatic experience) (Resick & Schnicke, 1992). These post-trauma alterations in one's belief system are typically expressed as trauma-related negative cognitions (NCs), typically relating to oneself, others, the world, as well as self-blame (Foa, Ehlers, Clark, Tolin, & Orsillo, 1999; LoSavio, Dillon, & Resick, 2017). Therapists administering CPTs address NCs by assisting the patient in challenging and reframing the NCs over the course of treatment. CPT operates under a theoretical framework that as NCs are cognitively restructured, reductions in PTSD symptoms will occur (Monson et al., 2006; Resick & Schnicke, 1992). Additionally, researchers have linked NCs as predictors of both increased PTSD symptom severity (Dekel, Peleg, & Solomon, 2013) and treatment effectiveness (Holliday, Link-Malcolm, Morris, & Surís, 2014; Moser et al., 2010; Smits et al., 2012). Therefore, a more comprehensive understanding of the ability of CPT to address NCs has the potential to better inform PTSD treatment.

A recent meta-analysis by Diehle, Schmitt, Daams, Boer, and Lindauer (2014) examining the effectiveness of psychotherapy in reducing NCs reported that CBT was the most effective intervention in addressing NCs; however, the authors

also indicated that further research is necessary regarding different modalities of CBT (e.g., CPT). To address this gap in the literature and based on the limited number of studies examining the effectiveness of CPT on addressing NCs (*see* Diehle et al., 2014), a single-arm meta-analysis was conducted of peer-reviewed publications that examined the efficacy of CPT in reducing NCs in participants with PTSD.

METHOD

Procedure

A comprehensive literature review was conducted using the following key words ("ptss" OR "ptsd" OR "post-traumatic" OR "post traumatic" OR "posttraumatic" OR "traumatic symptom") AND ("cognitions" OR "cognition") AND ("cognitive processing therapy"). Inclusion criteria for studies and the analytic strategy was based on the Diehle et al. (2014) methodology. Inclusion criteria were: (1) a *DSM* diagnosis of PTSD as confirmed by clinical interview or psychometrically valid measure, (2) assignment to CPT, (3) NCs were measured by a psychometrically valid measure, (4) measurement of NCs took place before and after treatment, and (5) the study was published in a peer-reviewed journal. Exclusion criteria were: (1) the study provides insufficient data for the calculation of an effect size (unless authors are able to provide these data) and (2) the article is published in a language other than English.

ANALYTIC PLAN

Meta-Essentials (Van Rhee, Suurmond, & Hak, 2015) was used to conduct the meta-analysis. In all analyses, *p* values less than .05 was considered significant.

To account for pretreatment differences between participants across studies, the meta-analysis was based on change in NCs from baseline scores rather than posttreatment scores. Imputed correlation coefficients of .50 for NCs was used per the methodology outlined by Diehle et al. (2014). Effect size was reported in terms of Hedges' *g*, rather than Cohen's *d*, to account for statistical bias that may be inherent in psychotherapy trials because of small sample sizes (Hedges & Olkin, 1985). Interpretation guidelines for effect size are as follows: 0.2 – 0.49 is small, 0.5 – 0.79 is medium, and 0.8 or greater is large. Because of study-related diversity (e.g., sample size, research population), a random-effects model was applied rather than a fixed-effects model. A random-effects model accounts for differences in diversity variables between studies' samples (Borenstein, Hedges, Higgins, & Rothstein, 2009). For studies providing outcome results in the format of subscale scores or subgroups, total mean and standard deviation were calculated using formulas recommended by Borenstein et al. (2009).

Heterogeneity was calculated with the *Q* statistic, where a small *p* value is indicative of heterogeneity. Based on the *Q* statistics, a I^2 statistic was calculated

which described the variation in effect estimates that can be attributable to heterogeneity. Percentages in the order of 25% are considered low, 50% are considered moderate, and 75% are considered high (*see* Diehle et al., 2014; Higgins, Thomas, Deeks, & Altman, 2003). A fail-safe N was also calculated based on the formula by Orwin (1983). The fail-safe N provides an indication of how many studies with an effect size of 0 would be necessary to reduce the mean effect size, found in the proposed meta-analysis, to a lower criterion effect size. Based on Diehle et al. (2014), the criterion effect size was set at 0.2.

RESULTS

Of the 331 articles reviewed, 11 studies met the inclusion criteria for the meta-analysis (see Figure 1 for a flow chart of the selection process). Of these, 2 were removed from the analysis due to incomplete data, resulting in the inclusion of 9 studies. Relevant sociodemographic and methodological information for each study can be found in Table 1.

The single-arm meta-analysis included 583 participants. The overall effect size was determined to be large, with CPT significantly reducing NCs from pre- to post-treatment, $g = 1.10$, 95% CI [.83, 1.37], $p < .001$ (see Table 2). Heterogeneity statistics were significant, $Q(9) = 25.41$, $p = .001$, with $I^2 = 69\%$, indicating a moderate heterogeneity between included studies. The fail-safe N for our analysis was 41, indicating that 41 studies with an effect size of 0 would be necessary to reduce the mean effect size.

DISCUSSION

The current meta-analysis provides strong evidence that CPT can effectively reduce NCs over the course of treatment. This finding supports the theoretical mechanism of action for CPT, where NCs are identified and addressed over the course of psychotherapy to reduce PTSD symptom severity (LoSavio et al., 2017; Resick & Schnicke, 1992). Additionally, the strong effect of CPT is consistent with findings by Diehle et al. (2014) who reported that trauma-focused CBTs, including CPT, had the largest effect sizes for reducing NCs over the course of treatment.

Because NCs are associated with poorer PTSD treatment response (Moser et al., 2010; Smits et al., 2012) as well as more severe PTSD-related sequelae (Dekel et al., 2013; Holliday et al., 2014; Jayawickreme, Yasinski, Williams, & Foa, 2012; Williams et al., 2015), interventions that can effectively reduce NCs are beneficial to recipients. Although theoretically similar groups of psychotherapeutic interventions, including CBT, have been examined in terms of their ability to address NCs (*see* Diehle et al., 2014), this meta-analysis is the first to document the effectiveness of a specific PTSD intervention (CPT) rather than a class of interventions (i.e., trauma-focused CBT). The overall effect of CPT on NCs based on 9 studies with varying methodology (e.g., differing clinical populations [i.e., veteran versus civilian, adult versus child], gender ratios, age ranges) was large, indicating that, on average, CPT significantly reduced NCs

from pre- to post-treatment. Further research is needed for variants of CPT, including CPT-Cognitive (CPT-C) (Resick et al., 2008), to examine if similar effect sizes among these interventions in pre- to post-treatment reductions in NCs are present.

The heterogeneity statistic was moderate in this meta-analysis. Diehle et al. (2014) reported that heterogeneity was likely not related to differing measures of NCs between studies. Rather, other study-related characteristics may have better accounted for heterogeneity. For example, researchers have found associations between baseline differences in NCs and ethno-racial identification (Hall-Clark et al., 2017). Additionally, changes in NCs during CPT treatment have been associated with sex (Galovski, Blain, Chappuis, & Fletcher, 2013) and clinical population (Gobin et al., 2017). Other factors, which have not been studied, may also have contributed to heterogeneity (e.g., age, type of trauma experienced). Despite heterogeneity, individual effect sizes were large for the majority of included studies, with a moderate effect detected for only one included study.

A single-arm meta-analytic approach was chosen based on the limited number of CPT RCTs as well as the inconsistency in comparison conditions in published CPT RCTs. For example, one randomized controlled trial (RCT) (Resick et al., 2008) was a dismantling study comparing CPT to its cognitive version (CPT-C) and an exposure component protocol (Written Account). Two

other RCTs compared CPT to emerging psychotherapies, Holographic Reprocessing (Basharpoor, Narimani, Gamari-give, Abolgasemi, & Molavi, 2011) and Dialogical Exposure Therapy (Butollo, Karl, König, & Rosner, 2016). While the two remaining RCTs entered into the meta-analysis compared CPT to either a trauma-focused, Prolonged Exposure Therapy (Resick, Nishith, Weaver, Astin, & Feuer, 2002), or a non-trauma focused PTSD EBT, Present Centered Therapy (Holliday et al., 2014). The limited number of RCTs as well as incongruence between these comparison interventions made interpreting results of a non-single-arm meta-analysis problematic. Additionally, a single-arm meta-analytic approach allowed for the inclusion of four quasi-experimental studies that examined the effectiveness of CPT without a comparison condition (Galovski, Blain, Chappuis, & Fletcher, 2013; Gobin et al., 2017; Owens, Pike, & Chard, 2001; Schumm et al., 2015). However, single-arm analytic approaches are vulnerable to significant statistical bias due to no active or control comparison (Hamre, Glockmann, Kienle, & Kienle, 2008). Publication of additional CPT RCTs are needed to replicate findings of this meta-analysis including a comparison arm to better understand the effectiveness of CPT in reducing NCs compared to active (e.g., PTSD EBT) or non-active (e.g., waitlist) comparison conditions.

Due to stringent inclusion/exclusion criteria and a focus on CPT, only 11 studies were eligible for inclusion. This total number was further decreased to 9 due to missing data, falling below the minimum standard cut off of 10 for meta-

regression analyses (Higgins & Green, 2011). Included studies differed on multiple demographic factors and methodological processes that may have affected results including age, gender, race, ethnicity, trauma type, number of sessions attended, method of administration (in-person versus telehealth; residential treatment versus outpatient), and clinical population. Therefore, additional studies examining the effect of CPT on NCs pre- to post-treatment are necessary to identify additional variables that may moderate the effectiveness of CPT on NCs.

The current meta-analytic study is the first to document the effectiveness of CPT on reducing NC from pre- to post-treatment. Despite the large effect size of CPT, results are limited by the single-arm meta-analytic approach, a small number of included studies, and between-study methodological and sociodemographic variability.

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Table 1

Baseline Characteristics of Studies Included in Meta-Analysis

Study	*N*	% female	Age	Age range or *SD*	Trauma type	NC measure
Basharpoor et al., 2011	16	0.0	15.56	3.31	Physical trauma, natural disasters, accidents, hospitalizations	PTCI
Butollo et al., 2016	67	67.2	33.67	19-53	Interpersonal trauma, accident, loss, medical issue	PTCI
Galovski et al., 2013	69	68.1	40.46	Not reported	Childhood or adult sexual or physical trauma	TRGI-GC
Gobin et al., 2017	126	100.0	46.43	11.92	Civilian or military-related trauma[b]	PTCI
Holliday et al., 2014	32	71.9	44.91	9.72	Military sexual trauma	PTCI
Owens et al.,	53	100.0	33.00	9.15	Childhood sexual trauma	WAS

2001						
Resick et al., 2008	53	100.0	35.40[a]	12.40[a]	Childhood or adult sexual or physical trauma	TRGI-GC
Resick et al., 2002	41	100.0	32.00[a]	9.90[a]	Childhood or adult sexual trauma	TRGI-GC
Schumm et al., 2015	195	46.67	48.02	11.15	Childhood or adult sexual or physical trauma; combat-related trauma	PTCI

Note. NC = trauma-related negative cognitions; PTCI = Posttraumatic Cognitions Inventory; TRGI-GC = Trauma-Related Guilt Inventory- Guilt Cognitions; WAS = World Assumptions Scale.

[a]Sociodemographic information only reported for total intent-to-treat sample, not for CPT condition. No significant difference in age between CPT and other intervention conditions.

[b]Breakdown of trauma type experienced not reported.

Table 2

Pre- to Post-Treatment Effect Sizes for NCs

Study	*N*	*g*	95% CI	Weight
Basharpoor et al., 2011	16	2.00	[1.09, 2.91]	4.34%
Bustollo et al., 2016	66	1.01	[.71, 1.31]	12.92%
Galovski et al., 2013	58	.68	[.39, .97]	13.20%
Gobin et al., 2017	105	1.36	[1.09, 1.63]	13.65%
Holliday et al., 2014	32	.87	[.45, 1.29]	10.43%
Owens et al., 2001	34	1.19	[.74, 1.64]	9.72%
Resick et al., 2002	35	1.67	[1.14, 2.20]	8.29%
Resick et al., 2008	42	.84	[.48, 1.19]	11.64%
Schumm et al., 2015	195	1.04	[.86, 1.21]	15.81%

Note. NCs = trauma-related negative cognitions.

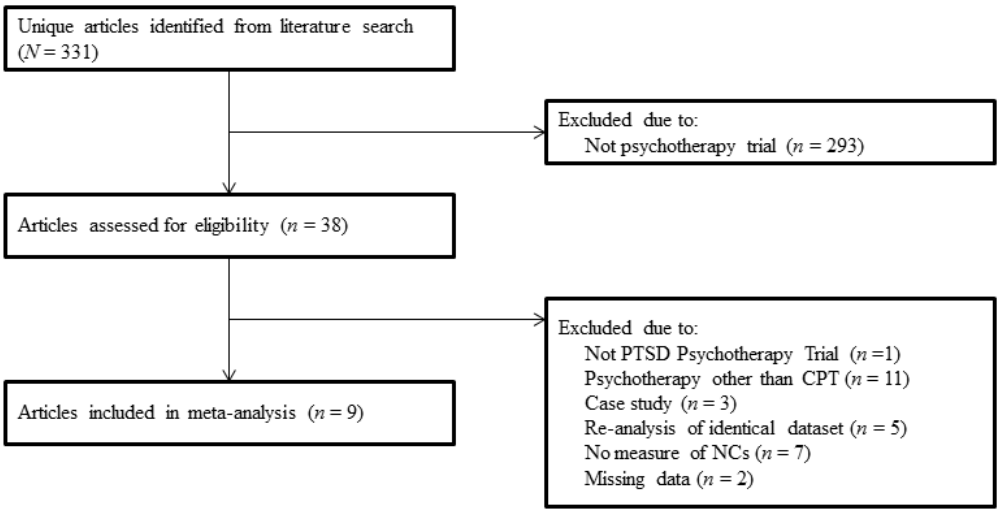

Figure 1. Flowchart search and selection. CPT = cognitive processing therapy; PTSD = posttraumatic stress disorder; NCs = trauma-related negative cognitions.

SECTION III
Study II

The Role of Negative Cognitions in Mediating PTSD and Depression Symptom Improvements During and After Cognitive Processing Therapy for Military Sexual Trauma-Related PTSD

Abstract

Reductions in trauma-related negative cognitions (NCs) over the course of Cognitive Processing Therapy (CPT) are associated with decreased PTSD and depression symptom severity; however, researchers have yet to examine this relationship in veterans with military sexual trauma (MST)-related posttraumatic stress disorder (PTSD). Data from a larger parent randomized clinical trial examining the effectiveness of CPT for MST-related PTSD were utilized. After accounting for poor CPT treatment fidelity, data from 9 male and 23 female veterans with MST-related PTSD were included in analyses. Cross-lagged panel analyses were conducted, with changes in NC scores entered as predictors of changes in PTSD and depression symptom severity scores measured over the course of treatment and 6 month follow-up. Changes in NCs about self-blame were the only significant predictor of changes in PTSD symptom severity over the course of treatment and follow-up. Changes in PTSD symptom severity did not predict subsequent change in NCs. A bidirectional relationship between changes in NCs about self-blame and depression symptom severity was found. Results support that reductions in NCs about self-blame may be a key mechanism of change during CPT for MST-related PTSD.

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INTRODUCTION

MST is an event experienced by approximately 24% of female and 1% of male veterans (Military Sexual Trauma Support Team, 2013). Survivors of MST are more likely to meet criteria for posttraumatic stress disorder (PTSD) than civilian survivors of sexual trauma (child or adult; Himmelfarb, Yaeger, & Mintz, 2006; Surís, Lind, Kashner, Borman, & Petty, 2004) or veteran survivors of other military-related traumas (e.g., combat-related trauma) (Kang, Dalager, Mahan, & Ishii, 2005; Yaeger, Himmelfarb, Cammack, & Mintz, 2006). In addition to PTSD, Hankin et al. (1999) reported that female veterans with a history of MST were three times more likely to meet screening criteria for depression when compared to veterans with no history of MST.

To treat military-related PTSD, the Veterans Health Administration has disseminated effective evidence-based treatments (Karlin & Agarwal, 2013; Karlin & Cross, 2014). One of these treatments, Cognitive Processing Therapy (CPT), was identified as having one of the strongest effect size among all pharmacological and psychological PTSD treatments (Watts et al., 2013); however, further understanding of the mechanisms of change inherent in CPT remain necessary.

One theorized mechanism of change in CPT is cognitive restructuring (CR) (Resick et al., 2008). CR is the process by which assimilated and over-accommodated trauma-related negative cognitions (NCs) are identified and addressed over the course of psychotherapy. Although NCs are associated with both PTSD and depression (Foa, Ehlers, Clark, Tolin, & Orsillo, 1999; Holliday, Link-Malcolm, Morris, & Surís, 2014; Moser, Hajcak, Simons, & Foa, 2007; Shahar,

Noyman, Schnidel-Allon, & Gilboa-Schechtman, 2013), their role in predicting subsequent reductions in psychiatric symptoms of PTSD and depression during CPT for MST-related PTSD is unknown.

Holliday et al. (2014) has already noted that CPT results in significant reductions in NCs in veterans with MST-related PTSD. Additionally, reductions in NCs are predictive of subsequent PTSD and depression symptom severity reduction (Dondanville et al., 2016; Iverson, King, Cunningham, & Resick, 2016; Schumm, Dickstein, Walter, Owens, & Chard, 2015); however, previous analyses were conducted on veteran samples with a myriad of index traumas (i.e., combat, physical assault, childhood, MST) or civilian survivors of sexual trauma. Although veterans with MST-related PTSD do experience therapeutic gain from CPT (Surís, Link-Malcolm, Chard, Ahn, and North, 2013), when compared to other clinical PTSD populations who received CPT, veterans with MST-related PTSD did not improve as quickly and had lower overall effect sizes. Therefore, identifying beneficial mechanisms of change in CPT in veterans with MST-related PTSD has the potential to increase treatment effectiveness.

Previous studies examining the role of NCs in CPT treatment only conducted pre- and post-treatment analyses, failing to track the continued predictive effect of NCs at follow-up appointments. This study will add to the research base by including post-treatment follow-up data, providing further insight into continued change in NCs and symptom severity up to 6 months post-treatment. This study will also focus on a male and female veteran sample who received CPT for MST-related PTSD.

METHOD

Participants

Data from a previously published randomized clinical trial (RCT) examining the effectiveness of CPT in veterans with MST-related PTSD (see Surís et al., 2013) were used for the current study. During participation, veterans were randomized to receive either CPT or a non-trauma-focused comparison condition (Present Centered Therapy [PCT]). Because the purpose of the current study is to examine the role of NCs during and after CPT, only data from veterans randomized to CPT (n = 72) will be analyzed. Due to poor treatment fidelity (*see* Holliday et al., 2013; Holder, Holliday, Williams, Mullen, & Surís, under review), 40 veterans were not included in statistical analyses, resulting in a final sample of 32 (n = 23 female; n = 9 male) veterans. Sociodemographic information for the sample can be found in Table 1.

Measures

The Posttraumatic Cognitions Inventory (PTCI) (Foa et al., 1999) was used to assess NCs, the PTSD Checklist-Military (PCL-M) (Weathers, Litz, Herman, Huska, & Keane, 1993) was used to assess self-reported PTSD symptom severity, the Clinician Administered PTSD Scale (CAPS) was used to confirm MST-related PTSD diagnosis and to assess clinician-rated PTSD symptom severity, and the Quick Inventory of Depressive Symptomatology- Self Report (QIDS) was used to assesses depression symptom severity (Rush et al., 2003). A sociodemographic questionnaire was also administered to assess age, gender, education, and racial-ethnic self-identification.

The PTCI is a self-report measure with 36 items assessing the degree to which a participant agrees with each statement from 1 (“totally disagree”) to 7 (“totally agree”). The PTCI sums for a score of Total NCs as well as scores on three subscales: (1) NCs about self, (2) NCs about the world, and (3) NCs about self-blame. The PTCI has good internal consistency (PTCI total score, Cronbach’s a = 0.97; NCs about self, Cronbach’s a = 0.97; NCs about the world, Cronbach’s a = 0.88; self-blame, Cronbach’s a = 0.86) and test–retest reliability (PTCI total score, p = 0.74; NCs about self, p = 0.75; NCs about the world, p = 0.89; self-blame, p = 0.89) (Foa et al., 1999). As previously reported by Holliday et al. (2014), baseline internal consistency for the PTCI was strong in this sample (PTCI, Cronbach's a = 0.94; PTCI subscale NCs about self, Cronbach's a = 0.94; PTCI subscale NCs about the world, Cronbach's a = 0.91; PTCI subscale self-blame, Cronbach's a = 0.78). The PTCI subscales also have strong convergent validity with similar NC measures on the Personal Beliefs and Reactions Scale (PBRS) (Foa et al., 1999; Mechanic & Resick, 1993). In particular, the NCs about self subscale was significantly related to the self-scale of the PBRS (P = .85), the NCs about the world subscale was significantly related to the others (P = .64) and safety (P = 0.65) scales of the PBRS, and the self- blame subscale was significantly related to the self-blame (P = .50) scale of the PBRS. Additionally, the PTCI total score was significantly related to the self (P = .74) and others (P = .72) subscales of the PBRS.

The PCL-M is a commonly administered self-report measure of (American Psychiatric Association, 2000) PTSD symptom severity. For the

purpose of this study, the PCL-M was anchored specifically to the veteran's MST. The PCL-M is a 17-item self-report measure of PTSD symptom severity over the past month, with each item scored from 1 ("Not at all") to 5 ("Extremely"). Items on the PCL-M are summed to generate a total score ranging from 17-85, with higher scores indicating greater PTSD symptom severity. The PCL-M has strong test–retest reliability (r = 0.96) (Blanchard, Jones-Alexander, Buckley, & Foreneris, 1996) and concurrent validity to measures of PTSD including the Mississippi Scale for Combat PTSD (r = 0.93) (Blanchard et al., 1996; Keane, Caddell, & Taylor, 1988) and the Clinician Administered PTSD Scale (CAPS) (r = 0.93) (Blake et al., 1995; Blanchard et al., 1996).

The CAPS is one of the "gold-standard" psychodiagnostic assessments of DSM-IV PTSD criteria (APA, 2000; Blake et al., 1995). Similar to the PCL-M, in this study, the CAPS was anchored to the veteran's MST. The CAPS is a 30-item semi-structured interview used to assess the frequency and intensity of PTSD symptoms over the past month. Items on the CAPS are summed to generate a total score ranging from 0-136, with higher scores indicating greater PTSD symptom severity. The CAPS has strong inter-rater reliability (κ = 0.95–1.00) and strong concurrent validity to other measures of PTSD including the PCL-M (r = 0.93) and Mississippi Scale for Combat-related PTSD (r = 0.70, r = 0.81) (Blake et al., 1995; Weathers, Keane, & Davidson, 2001). Although the PCL-M and the CAPS correlate highly, both measures were administered to gather both clinician-rated and patient self-report data.

The Quick Inventory of Depressive Symptomatology- Self Report (QIDS) is a 16-item self-report measure that assesses current depression symptom severity (Rush et al., 2003). Items for the QIDS are based on the nine DSM-IV (APA, 2000) depressive symptoms and are temporally tied to the past 7 days. The measure yields a total score of 0 to 27, with higher scores indicating greater depression symptom severity. Overall, the QIDS has strong psychochometric properties including concurrent validity to other measures of depression (e.g., the Hamilton Rating Scale of Depression 17-, 21-, and 24-item versions; r = .68-.96) as well as strong internal consistency (Cronbach's α = .69-.89) (Cameron et al., 2013; Hamilton, 1960; Reilly, MacGillivray, Reid, & Cameron, 2015; Rush et al., 2003; Rush et al., 2004). Moreover, the QIDS has been validated as a measure of depression symptom severity in clinical populations with MST-related PTSD (Surís, Holder, Holliday, & Clem, 2016).

Procedure

Following the baseline assessment that included administration of the CAPS, PTCI, PCL-M, QIDS, and a sociodemographics form, eligible veterans were randomized into either CPT or PCT. Veterans receiving CPT received a total of 12, 1-hour psychotherapy sessions. Veterans were administered the PTCI, PCL-M, CAPS and QIDS four subsequent times (1 week post-treatment, 2 months post-treatment, 4 months post-treatment, and 6 months post-treatment).

ANALYTIC PLAN

Hierarchical linear modeling (HLM) was conducted using SPSS version 22.0 (IBM Corp., 2013). This analytic approach was selected due to its ability to

handle smaller sample sizes as well as missing data (e.g., treatment attrition; which is common in PTSD psychotherapy RCTs; *see* Imel, Laska, Jakupcak, & Simpson, 2013) more effectively than a standard repeated measure analysis of variance (Edwards, 2000; Krueger & Tian, 2004).

Four cross-lagged panel analyses were conducted for each of the outcome measures (CAPS, PCL, and QIDS). In each analysis, the temporal precedence between change in NCs (i.e., self, blame, self-blame, or total score) and change in PTSD (i.e., CAPS or PCL score) or depression (i.e., QIDS score) symptom severity were modeled based on the methodology by Schumm et al. (2015) and Burns, Kubilus, Bruehl, Haarden, and Lofland (2003). Change scores were determined by calculating the difference between the current and subsequent time point (e.g., difference in CAPS score at baseline and 1 week post-treatment). PCL, CAPS, QIDS, and PTCI change scores at each time point can be found in Table 2.

Each analysis accounted for autocorrelational effects as well as the effect of time. To calculate the most parsimonious time growth curve, unconditional growth curves were calculated for PTSD and depression symptom severity as well as NCs. Linear, quadratic, cubic, and logarithmic growth curves were tested, with logarithmic growth being the most parsimonious curve for all variables as per the guidelines of McCoach (2010).

Due to the small sample size, a restricted maximum likelihood approach was used for each model. Additionally, an unstructured covariance matrix for the errors of repeated assessments was used for all models because its deviance

statistic was the smallest of various covariance structures examined, including autoregressive, compound symmetry, and Toeplitz covariance structures (Singer & Willet, 2003). All statistical tests used a standard significance level of $\alpha = .05$.

RESULTS

PCL

After accounting for auto-correlational effects and time, changes in NCs about self-blame positively predicted and temporally preceded changes in PCL scores over the course of treatment and follow-up, $b = 4.12$, $t(30.83) = 3.40$ [1.21], $p = .002$. Changes in NCs about self, the world, and PTCI total score did not significantly predict or precede changes in PCL scores ($p > .05$). Additionally, cross-lagged paths did not indicate that changes in PCL scores significantly predicted or preceded changes in NCs ($p > .05$). Please refer to Figure 1 for cross-lagged PCL models.

CAPS

Similar to PCL models, after accounting for auto-correlational effects and time, changes in NCs about self-blame positively predicted and temporally preceded changes in CAPS scores over the course of treatment follow-up, $b = 3.34$, $t(25.47) = 2.36$ [1.42], $p = .026$. Additionally, changes in NCs about self, the world, and PTCI total score did not significantly predict or precede changes in PCL scores ($p > .05$). Cross-lagged paths also did not indicate that changes in CAPS scores significantly predicted or preceded changes in NCs ($p > .05$). Please refer to Figure 2 for cross-lagged CAPS models.

QIDS

After accounting for auto-correlational effects and time, changes in NCs about self-blame positively predicted and temporally preceded subsequent changes in QIDS scores over the course of treatment follow-up, $b = 1.24$, $t(37.22) = 3.32$ [.37], $p = .002$. Changes in NCs about self, the world, and PTCI total score were not found to significantly predict or precede changes in QIDS scores ($p > .05$). Cross-lagged paths indicated that changes in QIDS scores significantly positively predicted and preceded subsequent changes in both NCs about self, $b = .08$, $t(27.69) = 3.02$ [.03], $p = .005$, and NCs about self-blame, $b = .07$, $t(44.71) = 2.63$ [.03], $p = .012$; however, QIDS did not significantly predict or precede changes in NCs about the world or PTCI total score ($p > .05$). Please refer to Figure 3 for cross-lagged QIDS models.

DISCUSSION

Consistent with previous research (Schumm et al., 2015), changes in NCs about self-blame preceded changes in both patient- and clinician-rated PTSD symptom reductions measured at post-treatment and follow-up. This relationship was uni-directional with changes in PTSD not resulting in subsequent decreases in NCs about self-blame. Interestingly, within this sample, NCs about self and the world did not significantly precede or predict PTSD symptom change.

In contrast to previous research, changes in NCs about self did not precede changes in depression during and after CPT (Schumm et al., 2015). Although changes in NCs about self-blame during and after CPT predicted changes in QIDS scores in this sample, this relationship was determined to be bi-directional. Further, changes in depression symptom severity uni-directionally preceded and

predicted changes in NCs about self. Therefore, it is difficult to determine a causal relationship during and after CPT between NCs and depression. It is possible that improvement in other variables (e.g., esteem) which were not accounted for in the current study may be preceding change in both depression and NCs. Further research with additional predictors of change is needed to better understand the relationship between NCs and depression during and after CPT treatment of MST-related PTSD.

Although CPT is an effective EBT for MST-related PTSD, effect sizes for CPT were smaller than in other clinical populations (Surís et al., 2013). To optimize treatment for MST-related PTSD, it is important to identify the mechanism by which PTSD symptom severity is reduced. This study provides initial evidence that reductions in NCs about self- blame may be one mechanism of change in this population. Treatments that emphasize reductions in NCs about self-blame may be clinically indicated to address PTSD symptomatology in veterans with MST-related PTSD.

Despite the strength of these findings, this study was not without limitations. A sizable portion of the sample were excluded due to low CPT therapist fidelity. This resulted in a small sample that may have biased statistical results (Maas & Hox, 2005). Further, based on the small sample, additional mediators of response could not be added to the models, limiting the statistical contribution of other potential predictors. The sample was also treatment seeking as well as predominantly female, White or Black, and non-Hispanic. Therefore, the generalizability of these findings is limited. Future research should replicate

these findings in a larger, more diverse sample, accounting for additional potential predictors of therapeutic change.

The current study is the first to examine the relationship between changes in NCs to PTSD and depression in veterans with MST-related PTSD receiving CPT. Interventions (e.g., CPT) that target and reduce NCs about self-blame, may be optimal for treating MST-related PTSD. Current theory that CPT reduces depression symptom severity by first addressing NCs were not supported in this sample.

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Table 1

Sample Sociodemographic Information

Variable	*M*	*SD*
Age	43.19	10.12
Education	14.59	1.98
	n	%
Gender		
Male	9	29.13
Female	23	71.86
Racial-ethnic self-identification		
White, non-Hispanic	13	40.63
Black, non-Hispanic	11	34.38
White, Hispanic	2	6.25
Black, Hispanic	1	3.13
American Indian or Alaskan Native	1	3.13
Native Hawaiian or other Pacific Islander	1	3.13
Other	3	9.38

Note. $N = 32$

Table 2

PCL, CAPS, QIDS, and PTCI Change Scores

Variable	T1		T2		T3		T4	
	M	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
PCL	16.63	11.41	2.79	9.62	-1.25	11.43	1.95	7.27
CAPS	25.71	24.81	3.48	15.07	2.52	15.89	1.14	15.60
QIDS	4.38	3.76	.10	3.90	.10	3.43	.00	3.13
NCs about self	1.16	1.06	.27	1.11	-.14	.66	.03	.91
NCs about the world	.80	.97	.12	1.27	.18	1.21	-.27	1.07
NCs about self-blame	1.23	1.50	.20	.98	-.12	.65	.17	.78
PTCI total score	36.19	31.68	7.52	33.52	-2.29	20.19	-.33	25.78

Note. CAPS = Clinician-Administered PTSD Scale; NCs = trauma-related negative cognitions; PCL = PTSD Checklist; PTCI = Posttraumatic Cognitions Inventory; QIDS = Quick Inventory of Depressive Symptomatology; T1 = change from baseline to 1 week post-treatment; T2 = change from 1 week post-treatment to 2 months post-treatment; T3 = change from 2 months post-treatment to 4 months post-treatment; T4 = change from 4 months post-treatment to 6 months post-treatment.

a

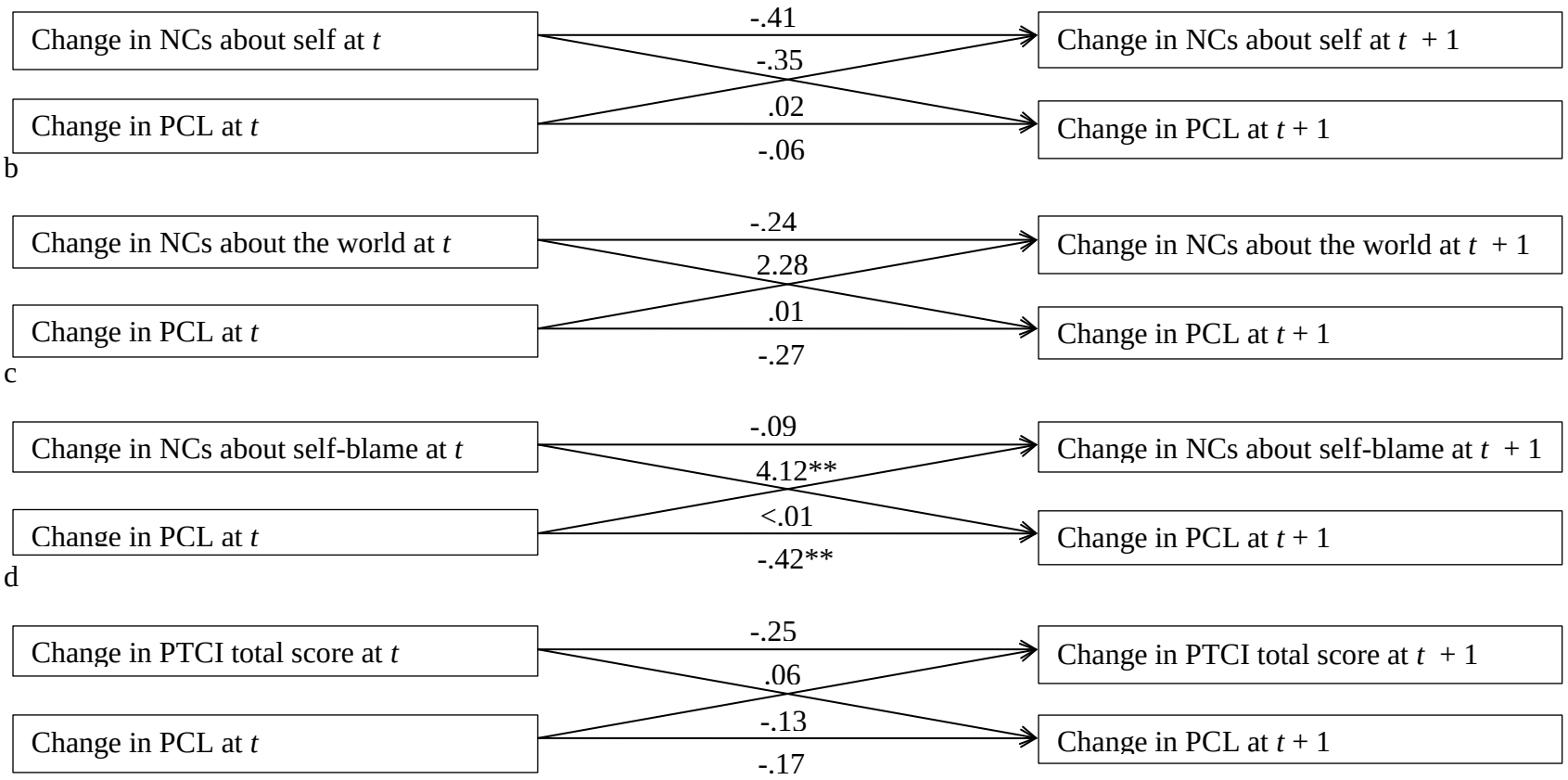

Figure 1. Cross-lagged panel models examining the temporal precedence between (a) change in trauma-related negative cognitions (NCs) about self and change in PTSD Checklist (PCL) scores, (b) change in NCs about the world

and change in PCL scores, (c) change in NCs about self-blame and change in PCL scores, and (d) change in PTCI total score and change in PCL scores. * $p < .05$ ** $p < .01$

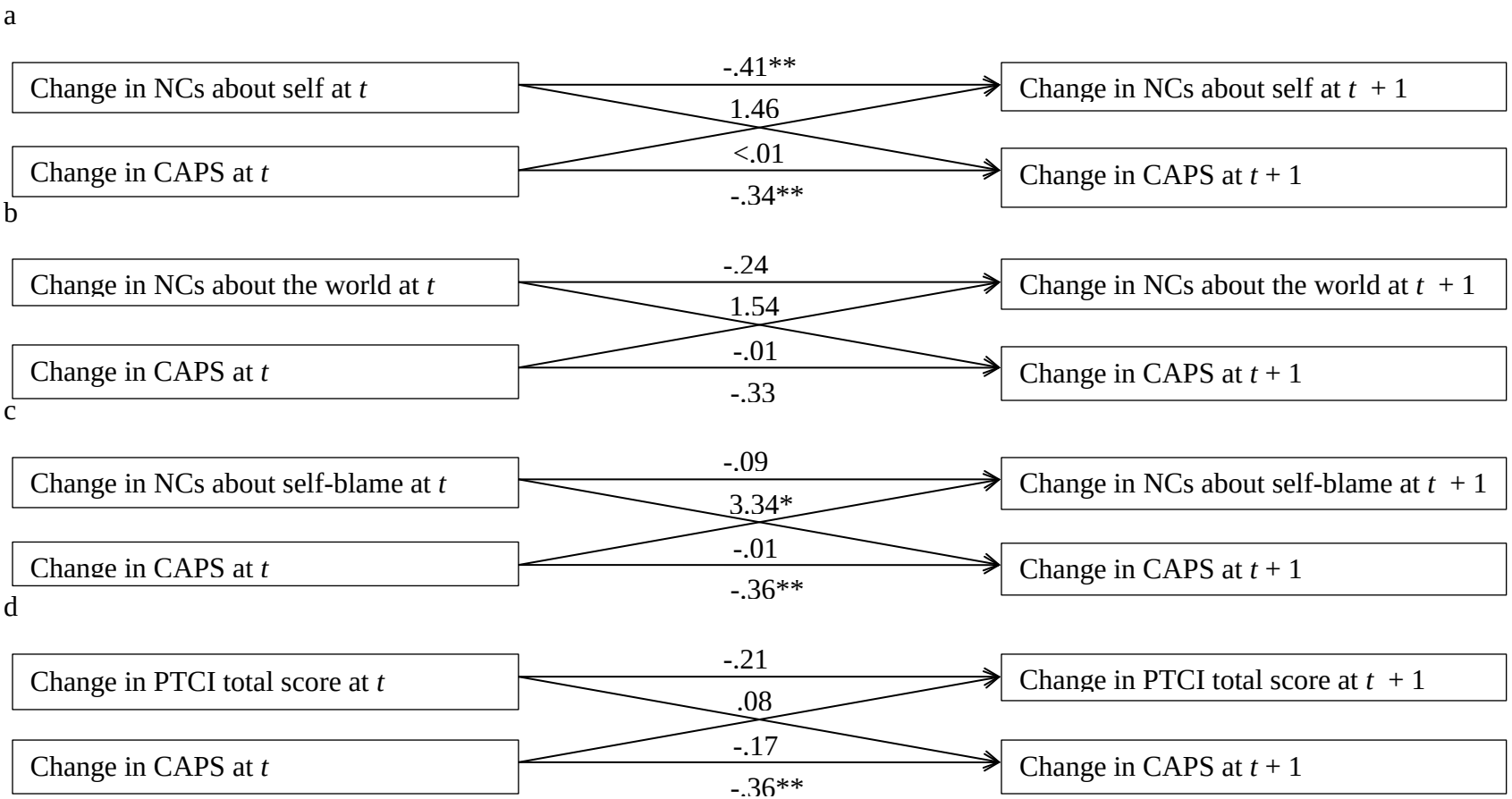

Figure 2. Cross-lagged panel models examining the temporal precedence between (a) change in trauma-related negative cognitions (NCs) about self and change in Clinician-Administered PTSD Scale (CAPS) scores, (b) change in

NCs about the world and change in CAPS scores, (c) change in NCs about self-blame and change in CAPS scores, and (d) change in PTCI total score and change in CAPS scores. * $p < .05$ ** $p < .01$

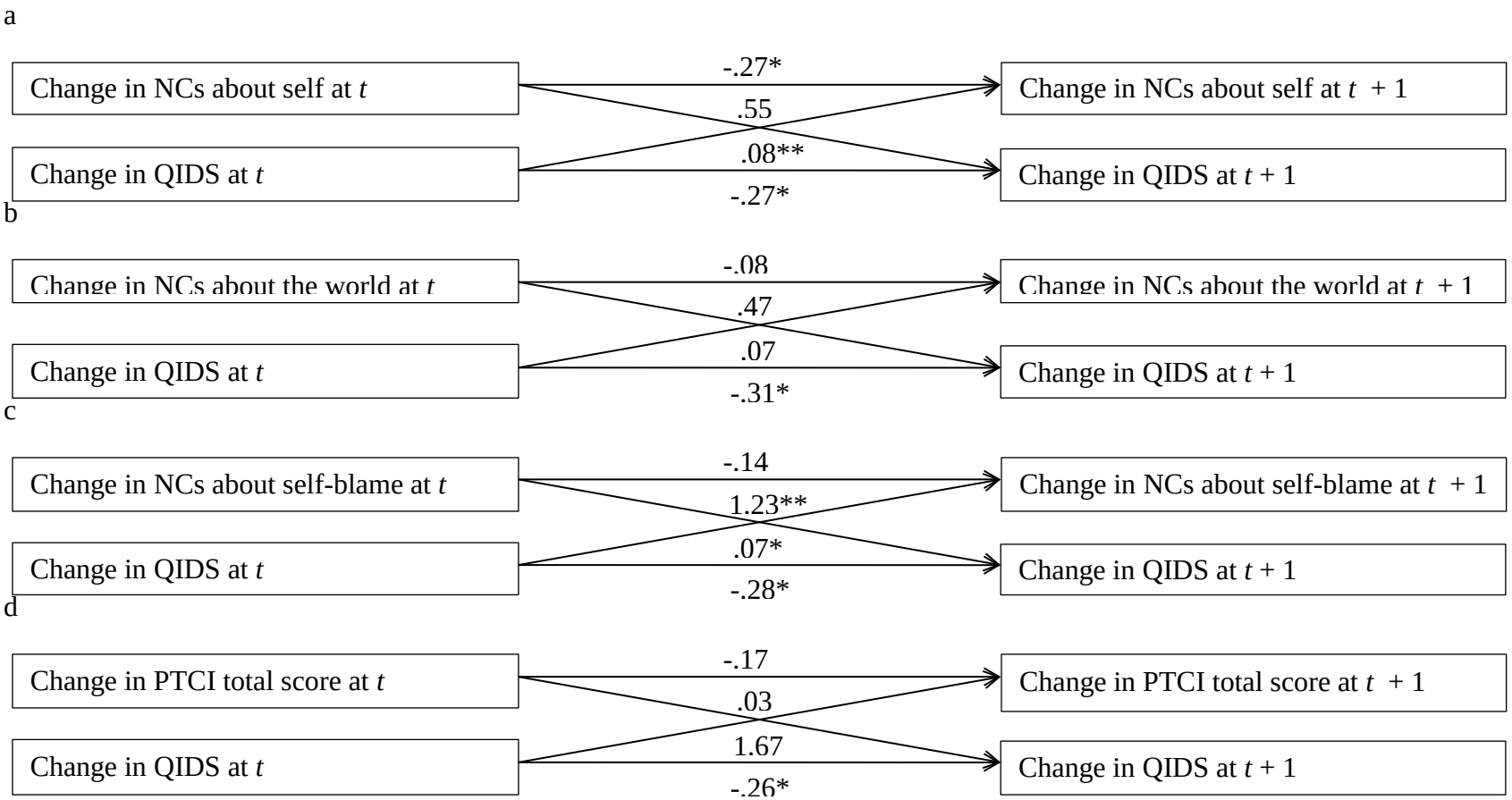

Figure 3. Cross-lagged panel models examining the temporal precedence between (a) change in trauma-related negative cognitions (NCs) about self and change in Quick Inventory of Depressive Symptomatology (QIDS) scores, (b)

change in NCs about the world and change in QIDS scores, (c) change in NCs about self-blame and change in QIDS scores, and (d) change in PTCI total score and change in QIDS scores. * $p < .05$ ** $p < .01$

SECTION IV
Integrated Conclusions

A considerable number of veterans continue to seek treatment for military-related PTSD. To meet the needs of these veterans, the VA has disseminated evidence-based EBTs for PTSD, including CPT (Karlin & Cross, 2014; Karlin et al., 2010). Although the efficacy of these interventions is well-established, the mechanisms by which these treatments reduce psychiatric symptomatology remains understudied.

The purpose of these studies was to better understand the changes in NCs following CPT. Multiple studies have examined the effect of psychotherapy on NCs (*see* Diehle et al., 2014); however, an overall effect size for CPT based on stringent research methodology (e.g., confirmed PTSD diagnosis, psychometrically valid measurement of NCs) had not been established. Further, NCs have been both theoretically posited and statistically shown to drive subsequent reductions in psychiatric symptomatology following CPT (Dondanville et al., 2016; Iverson et al., 2016; LoSavio et al., 2017; Schumm et al., 2015). Despite this research, the role of NCs during CPT for MST-related PTSD, a clinical population with lower overall treatment effect sizes (Surís et al., 2013), was not well-understood. By understanding mechanisms of change for established PTSD interventions, researchers can better tailor treatments to maximize therapeutic response.

The first study was a single-arm meta-analysis which analyzed the effectiveness of CPT in reducing NCs from pre- to post-treatment. The aim of this study was to determine an average effect size for CPT in reducing NCs across currently published clinical trials. The main hypothesis of this study was upheld, with CPT having a large effect in reducing NCs from pre- to post-treatment. These findings supported theory-driven models of CPT which propose that CPT identifies, targets, and addresses dysfunctional trauma-related belief systems (Resick & Schnicke, 1992).

The second study was an investigation in the predictive role of NCs in reducing PTSD and depressive symptom severity over the course of CPT for MST-related PTSD. The aim of the study was to identify which NCs predicted therapeutic response. Within this sample, only NCs about self-blame predicted subsequent reductions in PTSD. The relationship between NCs and depression was more complex, with results identifying a bi-directional relationship between NCs about self-blame and reductions in depression predicting subsequent decreases in NCs about self. These findings suggest that targeting NCs about self-blame during treatment of MST-related PTSD is important. Further, a possible mechanism of change in PTSD symptom severity during CPT may be reductions in NCs about self-blame.

The initial study provided evidence that CPT is an effective intervention at reducing NCs over the course of treatment. Building upon this, the second study

identified the role of reductions in NCs in predicting subsequent psychiatric symptom severity change. Taken together, these studies suggest that decreases in NCs are an important mechanism of PTSD symptom reduction during CPT, and that CPT is highly effective at targeting and reducing NCs.

Limitations and Future Directions

While these studies are important contributions to the existing research-base, several limitations should be noted. The first study had considerable heterogeneity between included studies and failed to account for the role of potential moderators of response. The second study had a small sample size and also did not account for other potential predictors of therapeutic change. Publication of additional CPT trials will allow for more robust meta-analyses including a multi-arm meta-analysis with meta-regression analyses. Additionally, further research to better understand the relationship between depression and NCs during CPT for veterans with MST-related PTSD is needed.

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APPENDIX A

Aims and Hypotheses

Overall Aim: Investigate the relationship between CPT and NCs in terms of efficacy of CPT in addressing NCs as well as effect of NCs on treatment effectiveness.

Study 1

Aim 1: Determine an effect size for CPT in reducing NCs across multiple peer-reviewed studies.

Hypothesis 1: CPT will generate a moderate to large effect size in the reduction of NCs post-treatment.

Study 2

Aim 1: Determine the causal role of NCs in reducing PTSD symptom severity during and after CPT for MST-related PTSD.

Hypothesis 1a: Changes in total PTCI score will temporally precede and positively predict changes in CAPS scores over the course of treatment and follow-up.

Hypothesis 1b: Changes in NCs about self scores will temporally precede and positively predict changes in CAPS scores over the course of treatment and follow-up.

Hypothesis 1c: Changes in NCs about the world scores will temporally precede and positively predict changes in CAPS scores over the course of treatment and follow-up.

Hypothesis 1d: Changes in NCs about self-blame scores will temporally precede and positively predict changes in CAPS scores over the course of treatment and follow-up.

Hypothesis 1e: Changes in total PTCI score will temporally precede and positively predict changes in PCL scores over the course of treatment and follow-up.

Hypothesis 1f: Changes in NCs about self scores will temporally precede and positively predict changes in PCL scores over the course of treatment and follow-up.

Hypothesis 1g: Changes in NCs about the world scores will temporally precede and positively predict changes in PCL scores over the course of treatment and follow-up.

Hypothesis 1h: Changes in NCs about self-blame scores will temporally precede and positively predict changes in PCL scores over the course of treatment and follow-up.

Aim 2: Determine the causal role of NCs in reducing depressive symptom severity during and after CPT for MST-related PTSD.

Hypothesis 2a: Changes in total PTCI score will temporally precede and positively predict changes in QIDS scores over the course of treatment and follow-up.

Hypothesis 2b: Changes in NCs about self scores will temporally precede and positively predict changes in QIDS scores over the course of treatment and follow-up.

Hypothesis 2c: Changes in NCs about the world scores will temporally precede and positively predict changes in QIDS scores over the course of treatment and follow-up.

Hypothesis 2d: Changes in NCs about self-blame scores will temporally precede and positively predict changes in QIDS scores over the course of treatment and follow-up.