

Identifying Predictors of Long-Term Treatment Outcomes using Narratives from Written Exposure Therapy and Cognitive Processing Therapy for PTSD

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Abstract

Objective: Cognitive processing therapy (CPT), a 12-session, gold-standard treatment for posttraumatic stress disorder (PTSD), and written exposure therapy (WET), a brief, 5-session treatment, have similar treatment efficacy. The aim of the current study is to identify predictors of long-term treatment outcomes of WET and CPT using clients' written narratives. **Method:** Narratives from both treatments were coded with the CHANGE coding system to identify predictors of long-term PTSD symptom outcomes. Participants were 113 adults with PTSD randomly assigned to receive WET ($n = 60$) or CPT ($n = 53$). **Results:** In WET, higher average levels of accommodated (balanced, healthy) beliefs predicted lower PTSD symptoms at the 60-week endpoint, as well as a decrease in symptoms over the follow-up symptom slope. In CPT, higher average negative emotions and positive view of self predicted better 60-week PTSD symptom outcomes, as did lower hopelessness, which also predicted a decrease in PTSD symptoms over the follow-up period. **Conclusions:** Even without direct cognitive change techniques, adaptive processing of traumatic experiences occurred in WET and predicted PTSD long-term symptom improvement. Both emotional engagement and cognitive change might help to sustain treatment gains in CPT.

Keywords: Written Exposure Therapy, Cognitive Processing Therapy, PTSD, trauma, therapy process

Clinical impact statement:

This study advances the idea that fostering healthy beliefs and adaptive processing (accommodation) are important contributors to better long-term PTSD symptom outcomes in WET. Additionally, it highlights the importance of emotional engagement in CPT and identifies specific cognitive variables that might help sustain treatment gains. These findings suggest that integrating and addressing these cognitive and emotional factors during therapy sessions might enhance the efficacy of WET and CPT, potentially reducing the likelihood of relapse.

Identifying Predictors of Long-Term Treatment Outcomes using Narratives from Written Exposure Therapy and Cognitive Processing Therapy for PTSD

Posttraumatic stress disorder (PTSD) is a mental health condition that can be effectively addressed through trauma-focused cognitive behavioral psychotherapy (Cusack et al., 2016). Treatments that are strongly recommended in the clinical practice guidelines of the American Psychological Association (2017) include cognitive processing therapy (CPT; Resick et al., 2016; Resick et al., 2024) and prolonged exposure (PE; Foa et al., 2019). The most recent 2023 guidelines of Departments of Defense (DoD) and Veterans' Affairs (VA) also recommend these treatments, as well as a written exposure therapy (WET; Sloan & Marx, 2019), a brief narrative-based treatment.

Long-term treatment outcomes of PTSD treatments over follow-up periods of six months to five years are encouraging, but relapse rates are still a concern across the best available treatments (Kline et al., 2018). One study that followed participants randomized to CPT or PE for 5-10 years after treatment reported relapse rates of 22% for CPT participants and 18% for PE participants (Resick et al., 2012).

Clinical trials suggest that WET (Sloan & Marx, 2019) is a promising treatment for PTSD that includes only five sessions and requires minimal therapist training (Worley et al., 2022). WET was designed specifically to increase treatment accessibility (Sloan et al., 2011), so it is important to understand how this brief treatment has its effects relative to gold-standard treatments such as CPT. The current study focuses on identifying predictors of long-term outcomes in a sample of civilians and veterans 60 weeks after initiating either CPT or WET in a recently completed noninferiority randomized controlled trial (RCT; Sloan et al., 2018; Thompson-Hollands et al., 2018).

Initial trials of WET report outcomes that are comparable to those in CPT. In the first noninferiority RCT (Sloan et al., 2018), WET produced noninferior PTSD symptom outcomes at the 12-week and final 60-week assessments (Thompson-Hollands et al., 2018). The within-condition effect sizes of PTSD symptom improvement at posttreatment and over the 60-week follow-up period were moderate to large (WET: $d = 0.51 - 1.23$, CPT: $d = 1.13 - 1.38$) and the between-condition effect sizes were small ($d = 0.13 - 0.29$), suggesting that the treatments had similar effects (Sloan et al., 2018; Thompson-Hollands et al., 2018). However, the relapse rates at 60 weeks were 32% in WET and 26% in

CPT, which highlights the importance of studying how these treatments might have their long-term effects (Thompson-Hollands et al., 2018). A recent noninferiority RCT comparing WET to CPT in a sample of active-duty US military service members again reported noninferiority of WET to CPT (Sloan et al., 2022) at 10-, 20-, and 30-week follow-up assessments. The within-treatment effect sizes were moderate for WET ($d = 0.52 - 0.58$) and moderate to large for CPT ($d = 0.67 - 0.95$). Between-condition effects sizes were again small ($d=0.03-0.22$).

Processes of Change in CPT and WET

The outcome findings for CPT and WET raise intriguing questions about how these two treatments, which differ in length, structure, and content, have their short- and long-term effects (Gallagher et al., 2015). The relapse rates in these and other treatments for PTSD also suggest that we do not yet fully understand the factors associated with maintenance of gains after treatment ends (Holmes et al., 2019). Some research has been published on the process of therapeutic change in CPT, but little is known about how WET has its effects, and even less is known about its long-term effects.

Cognitive Processing Therapy

CPT (Resick et al., 2016; Resick et al., 2024) is a 12-session therapy in which clients learn to challenge inaccurate trauma-related beliefs using real-world practice opportunities and in-session and between-session worksheets. CPT is predominantly informed by cognitive theory (Beck, 1979) and aims to change maladaptive trauma-related cognitions. Prior studies of CPT have investigated changes in trauma-related cognitions and found that decreases in overaccommodated beliefs (overgeneralized, exaggerated beliefs such as, “Nobody can be trusted”) and increases in accommodated beliefs (balanced, healthy beliefs such as, “I cannot be 100% safe, but that does not mean I am never safe”) predicted improvement in PTSD symptoms at posttreatment (e.g., Dondanville et al., 2016; Iverson et al., 2015; Scher et al., 2017) and at long-term follow-up, 5-10 years after treatment (e.g., Dondanville et al., 2016; Iverson et al., 2015). In another study from the Sloan et al. (2018) trial comparing CPT and WET, self-reported negative trauma-related beliefs measured weekly correlated and changed in parallel with, PTSD symptoms in CPT but did not precede symptom change (Lee et al., 2021). A similar study assessing PTSD symptoms and negative post-trauma cognitions among veterans completing a 3-week CPT-based

intensive treatment also found that changes in negative post-trauma cognitions were associated with, but did not temporally precede, changes in PTSD symptoms (Held et al., 2022).

Using data from the same RCT and the observational coding system used in the current study, Alpert et al. (2023) found that higher levels of both overgeneralized and accommodated beliefs expressed in client narratives (including impact statements and trauma accounts) across the course of CPT predicted better PTSD posttreatment outcomes. The authors suggest that accommodated beliefs might emerge in the context of examining overgeneralized beliefs that are targeted in CPT sessions. Assimilated beliefs did not predict posttreatment outcome in this trial. In addition, more avoidance was associated with worse posttreatment outcomes. Another variable assessed was the extent of negative emotion in the narratives, which might reflect emotional engagement. Although more negative emotion was not a significant predictor of outcome in CPT in this trial, it did predict less dropout in CPT (Alpert et al., 2020) and sudden gains (early symptom reduction) in both CPT and WET (Sloan et al., 2022).

Additional studies on CPT have reported that self-reported changes in beliefs in specific content areas (e.g., self-blame, sense of control, self-esteem, hope) predict PTSD symptom reduction at posttreatment (Dillon et al., 2020; Gallagher & Resick, 2012; Holliday et al., 2018; Zalta, 2015). One study conducted a cross-lagged panel analysis to examine temporal changes in cognitions related to self-perception (e.g., self-blame and negative beliefs about self) in CPT and found that changes in self-perception predicted, and temporally preceded, midtreatment to posttreatment changes in PTSD symptoms (Schumm et al., 2015). Additionally, previous findings suggest that within-treatment changes in hopelessness in CPT predicted PTSD symptom reduction at the end of treatment (Gallagher & Resick, 2012). More hope might also predict better long-term outcomes, as it can increase motivation and positive expectations after treatment has concluded.

Although most research on the process of change in CPT has focused on predictors of posttreatment outcome, these findings also highlight candidate predictors of long-term PTSD outcomes. These include overaccommodated (overgeneralized) beliefs, accommodated beliefs, positive view of self, hope, avoidance, and engagement of negative emotions.

Written Exposure Therapy

WET is an exposure-focused intervention that is based on emotional processing theory (Foa et al., 2006; Sloan et al., 2012). The WET protocol also builds on Pennebaker's pioneering research on expressive writing, which has demonstrated that writing about a traumatic experience for a specified amount of time over consecutive sessions is associated with decreases in posttraumatic stress symptoms (Pennebaker & Beall, 1986; Sloan & Marx, 2004). Clinically significant symptom improvements only occur in this writing paradigm with the expression of both emotion and meaning-making (Sloan et al., 2005; Sloan & Kring, 2007). WET is hypothesized to facilitate symptom reduction through written exposure to the trauma memory, which activates the memory and can facilitate processing of it. Indicators of emotional processing include activation of negative emotions and between-session decreases in negative emotions and trauma-related cognitions (Foa et al., 2006; Foa & McLean, 2016).

A few studies have identified predictors of posttreatment PTSD outcomes in WET. Wisco et al. (2016) found that both fear activation (measured by peak heart rate during the first session) and between-session decreases in self-reported arousal were associated with PTSD symptom decreases from pre- to posttreatment in WET in a community sample of adults with PTSD. In studies of narratives from the Sloan et al. (2018) trial, more negative emotion (calculated as an average across narratives and also measured as change from first to last impact statement) did not predict treatment outcome in WET (Alpert et al., 2023), but more negative emotion in the early narratives did predict sudden gains (improvements) in PTSD symptoms (Sloan et al., 2022). In WET, negative trauma-related beliefs changed in parallel with PTSD symptom reduction from baseline to 60-weeks post randomization, but as with CPT, this change did not precede symptom reduction (Lee et al., 2021). In another analysis of this clinical trial, Alpert et al. (2023) found that more accommodated beliefs averaged across narratives predicted better posttreatment outcomes in WET.

Overall, the few studies on the process of change in WET suggest that both negative trauma-related emotions and beliefs might contribute to therapeutic change at the end of treatment. Processes predicting long-term outcomes are less clear. Specific beliefs about the self and hope have also not been examined in WET, but given their role in PTSD and in CPT, they also may be important in promoting lasting change in WET.

The Current Study

Identifying predictors of long-term treatment outcomes is a crucial next step in process research on WET and CPT, as the findings can help inform relapse prevention efforts. The focus of the current study was to identify predictors of long-term treatment outcomes in WET and CPT by coding written narratives from a noninferiority RCT that compared these two treatments (Sloan et al., 2018). We used an observational coding system (CHANGE; Hayes, Feldman, & Goldfried, 2007) of variables that facilitate and inhibit therapeutic change to examine predictors of PTSD symptoms at the 60-week post-randomization assessment, as well as the slope of symptoms over the follow-up period. Recent meta-analyses examining the long-term efficacy of psychotherapies for PTSD indicate that the processes of change associated with long-term response, although underexplored, appear to mirror those processes that predict short-term outcomes (Kline et al., 2018; Weber et al., 2021). Therefore, we included significant predictors of short-term outcomes from this trial: overgeneralized beliefs, accommodated beliefs, avoidance, negative emotion (Alpert et al., 2023). We also examined two specific beliefs from the CHANGE – positive view of self and hopelessness – as predictors of long-term outcomes, rather than including assimilation, which is a more general process that did not predict post-treatment PTSD outcome in this trial (Alpert et al., 2023). Positive view of self and hope may more directly capture clients' expectations for themselves and their future after therapy. The CHANGE variables were analyzed as average scores for each variable across each individual's available narratives. Due to the differences in treatment length, structure, and prompts, predictors of outcome were examined separately in the WET and CPT conditions. This is consistent with prior examinations of PTSD symptom change in this clinical trial (Alpert et al., 2023; Lee et al., 2021).

Although Alpert et al. (2023) found that overgeneralized beliefs, avoidance, and negative emotion did not predict posttreatment outcome in WET, we investigated the role of these variables in long-term outcomes, given that they are central targets in most PTSD treatments and could influence symptoms over the follow-up period, without the support and structure of therapy. Despite WET's brief and self-guided nature, it is hypothesized that WET facilitates processes that are similar to those in other trauma-focused treatments (Sloan et al., 2013). Therefore, we predicted that lower average levels of

avoidance and hopelessness and higher levels of negative emotion, accommodated beliefs, overgeneralized beliefs, and positive view of self would predict better PTSD symptom outcomes over the 60-week follow-up phase in both treatments.

Method

Data Source

Data and narratives were drawn from a randomized noninferiority trial of WET and CPT, which has been described in detail elsewhere (see Sloan et al., 2018 and Thompson-Hollands et al., 2018 for details on trial outcomes, study procedures, and the CONSORT diagram). In brief, the trial was conducted at the VA Boston Healthcare System. Data were collected with approval from both the VA Boston and Boston University institutional review boards. Sloan and colleagues (2018) found that PTSD symptom improvement in WET was noninferior to CPT across assessments, and both treatments produced significant changes in PTSD symptoms. Within-condition effect sizes were large in both conditions for the 12-week through 36-week assessments and medium for both conditions at the 60-week assessment. There were no significant differences between conditions at any of the follow-up assessments (24, 36, 60 weeks) or in the follow-up slope factors (WET: week 6 to week 60; CPT: week 12 to week 60; Lee et al., 2021; Sloan et al., 2018; Thompson-Hollands et al., 2018). Treatment dropout rate was 39.7% in CPT and 6.3% in WET. This difference in dropout contributed to missing data in CPT. Narratives written during the WET sessions and for homework between CPT sessions were archived and then coded for the present study.

Participants

Participants in the original trial were 126 treatment-seeking adults with a primary DSM-5 diagnosis of PTSD, who were randomized to WET (63; 50.0%) or CPT (63; 50.0%). They were recruited from the greater Boston community via flyers, advertisements, and referrals from healthcare providers. Participants were included if they met DSM-5 criteria for PTSD based on the Clinician-Administered PTSD Scale for DSM-5 (CAPS-5; Weathers et al., 2018), experienced the index trauma at least 3 months prior, and were on a stable pharmacotherapy regimen for at least 4 weeks. Exclusion criteria were current substance dependence, psychotic symptoms, unstable bipolar disorder, severe

cognitive impairment, current involvement in an abusive relationship if the index trauma was intimate partner violence, and high risk for suicide. Participants included 60 women (47.6%) and 66 men (52.4%) with an average age of 43.9 years old ($SD = 14.6$). Sixty-nine participants (54.8%) reported their race as White, 43 (34.1%) as African American or Black, 4 (3.2%) as American Indian or Alaska Native, 2 (1.6%) as Asian, and 7 (5.6%) as Other. Twelve (9.5%) reported their ethnicity as Hispanic or Latino and 114 (90.5%) as Not Hispanic or Latino. Thirty-three (26.2%) were military veterans. The current sample included the 113 participants (WET $n = 60$; CPT $n = 53$) who completed at least one written narrative. On average, 4.86 ($SD = 0.62$) of five narratives were completed in the WET arm (range = 1.00 to 5.00) and 2.94 ($SD = 1.10$) of four narratives were completed in CPT arm (range = 1.00 to 4.00).

Procedures

After enrollment, participants were randomly assigned to receive WET or CPT. Participants were assessed for PTSD symptom severity using the CAPS-5 at pretreatment and at 6, 12, 24, 36, and 60 weeks post-randomization. The 6-week assessment was considered posttreatment for WET, and the 12-week assessment was considered posttreatment for CPT (Sloan et al., 2018). Across both treatments, the 60-week assessment point was used as the long-term treatment outcome for the present study.

Treatments

Cognitive Processing Therapy (CPT)

CPT (Resick et al., 2016; Resick et al., 2024) is a trauma-focused therapy that includes 12, one-hour sessions. The first session includes psychoeducation about common reactions to trauma and PTSD, followed by the treatment rationale. Subsequent sessions focus on: 1) information-gathering and identifying stuck points, 2) using Socratic questioning to challenge and decrease clients' negative beliefs and increase accommodated beliefs, and 3) helping clients resolve stuck points and process emotions. In CPT with written accounts, clients are asked to write narratives as homework after sessions one, three, four, and 11. The narratives written after the first and eleventh sessions are impact statements in which participants describe the reasons why they believe the traumatic event happened and the consequences of the trauma in terms of their beliefs about themselves, others, and the world. The second and third narratives are trauma accounts in which participants recount their traumatic event in as much detail as

possible. The version of CPT used in this trial was the protocol that includes written accounts. This is an optional component in more recent versions of CPT (Resick et al., 2016; Resick et al., 2024).

Written Exposure Therapy (WET)

WET (Sloan & Marx, 2019) consists of five, one-hour sessions in which clients are instructed to write for 30 minutes each session about a specific traumatic event with a focus on details of the thoughts and feelings that occurred during the event. The first session begins with psychoeducation about PTSD followed by the treatment rationale. Clients are provided instructions for writing about their trauma event and then complete the 30-minute writing task. The therapist checks in with the client about their experience writing about the event. The subsequent four sessions begin with feedback from the therapist regarding the prior written narrative, followed by instructions for the narrative to be written in the session. There are no assignments between sessions, other than instructions to not to avoid thoughts or feelings about the trauma memory, if such thoughts and feelings arise. In the first and second sessions, participants are prompted to write about their traumatic event in as much detail as possible (e.g., sensory details, thoughts, feelings). In the third and fourth sessions, participants are instructed to write about the most distressing part of the experience and discuss the trauma's impact on their lives, including their worldview and relationships with others. In the fifth and final session, clients are asked to write about the traumatic event's current impact on their lives, and how they will move forward after treatment.

Therapists

Therapists were 10 doctoral-level clinicians who completed a two-day training workshop. All therapists provided both WET and CPT. Therapists were trained and supervised by the developers of each treatment (WET, Denise Sloan, Ph.D.; CPT, Patricia Resick, Ph.D.). A random 20% of sessions were rated for fidelity, including adherence and competence rated on a 7-point scale from 1 (*poor*) to 7 (*excellent*). Ratings were high for adherence (WET $M = 5.81$; CPT $M = 5.71$) and competence (WET $M = 6.10$; CPT $M = 5.91$), and no ratings were below 4.00 (*satisfactory*).

Measures

Clinician-Administered PTSD Scale for DSM-5 (CAPS-5)

The CAPS-5 was administered at pretreatment and at 6, 12, 24, 36, and 60 weeks after the first treatment session. The CAPS-5 is a gold-standard diagnostic interview with good reliability and validity (Weather et al., 2018). Each PTSD symptom is rated on a five-point scale from 0 (*absent*) to 4 (*extreme/incapacitating*), and there are 20 symptom-focused questions. Total scores range from 0-80. Inter-rater reliability in this trial was very good ($\kappa = .85$). The CAPS-5 total score served as the primary outcome measure of PTSD severity in the parent trial (Sloan et al., 2018).

CHANGE

The CHANGE is an observational coding system designed to assess inhibitors and facilitators of therapeutic change (Hayes, Feldman, & Goldfried, 2007). The variables selected for a given study are based on theory and the study hypotheses. The CHANGE was used to code all written narratives in both treatments. The CHANGE has been used to identify predictors of outcome in treatments for youth and adult PTSD (e.g., Alpert et al., 2023; Alpert et al., 2020; Alpert et al., 2021), exposure-based cognitive therapy for depression (Hayes et al., 2005; Hayes, Feldman, Beavers et al., 2007), and treatment-resistant depression (Abel et al., 2016). Each CHANGE variable is rated from 0 (*absent to very*) to 3 (*high*). Codes are not mutually exclusive and can co-occur.

Ten undergraduate and graduate students coded the narratives from the Sloan et al. (2018) trial. Coders were trained to use the CHANGE and then coded with experienced coders until they reached good agreement (intraclass correlations (ICCs) $\geq .80$). Two coders rated each narrative, and weekly consensus meetings were held to prevent rater drift and reach consensus on discrepancies of two or more points on the 0-3 scale. Consensus ratings replaced discrepant codes, and then the two coders' ratings were averaged. Coders were masked to study hypotheses, treatment condition, and session number.

Narratives included both impact statements and trauma accounts from CPT and all available narratives from WET, which also focused on trauma accounts and impact. For each narrative, variables were coded to reflect participant's responses to their traumatic experiences. We included CHANGE variables that have been examined as predictors of PTSD symptoms at posttreatment in this trial (Alpert et al., 2023). We also added two content areas: positive view of self and hopelessness. To capture participants' maladaptive trauma-related responses, each narrative was coded for *overgeneralized*

beliefs, avoidance, and hopelessness. To capture positive trauma-related responses, each narrative was coded for *accommodated beliefs* and *positive view of self*. Finally, *negative emotion* (e.g., fear, guilt, shame, anger) was coded to capture emotional activation. Table S1 presents descriptions of the variables, examples of narrative content that were coded highly, and ICCs for each code. Inter-rater agreement was good to excellent (Cicchetti, 1994) for all variables (ICCs range: .76-.92).

Data Analytic Approach

Linear multiple regressions were conducted in IBM SPSS 26 with ordinary least squares estimator to examine predictors of PTSD symptoms at the 60-week assessment. PTSD symptoms at pretreatment, average word count across all narratives, number of narratives completed (narrative count), and the CHANGE variables were entered simultaneously as predictors of outcome. Word count and narrative count were included because it is possible that simply writing more and completing more narratives provided more opportunity for improvement. We examined average levels of each CHANGE coding variable across narratives to make use of all available data. Separate analyses were conducted for the WET and CPT arms due to differences in treatment structure, duration, and narrative directions (consistent with Alpert et al., 2023; Lee et al., 2021). Effect sizes were determined using the magnitude of the standardized coefficients (0.10-0.29 = small, 0.30-0.49 = medium, 0.50 or greater = large; Cohen, 1988; Nieminen, 2022).

In addition, PTSD symptoms at pretreatment, average word count, narrative count, and the averaged CHANGE variables were entered simultaneously as predictors of the slope of change in PTSD symptoms on the CAPS-5 over the follow-up period (6 to 60 weeks in WET, 12 to 60 weeks in CPT), using latent growth curve (LGC) modeling in Mplus (Muthén & Muthén, 2012) with maximum likelihood estimation. In a previous study using the same clinical trial data, Lee et al. (2021) reported a significant linear decrease in the slope of PTSD symptoms from baseline to the 60-week assessment in both WET and CPT. In the present study, we used LGC modeling to examine the predictors of PTSD symptom change over only the follow-up period since the end of treatment. A linear time variable was created to capture the slope of change from 6 to 60 weeks after the first session in WET and 12 to 60 weeks after the first session for CPT.

Results

Descriptive Analyses and Intercorrelations

Means and standard deviations of the study variables are presented in Table S2. Intercorrelations among the study variables, including predictor and outcome variables, are presented in Table S3.

CHANGE Predictors of PTSD Symptoms at the 60-week Assessment

Table S4 presents results of the linear regression model examining pretreatment PTSD symptoms, average word count, narrative count, and average levels of the CHANGE variables across all narratives entered simultaneously as predictors of PTSD symptoms at the 60-week assessment. The total variance explained by the model was 47% in CPT $F(9, 41) = 4.01, p < .001$ and 35% in WET $F(9, 45) = 2.71, p = 0.01$. In WET, higher average levels of accommodated beliefs predicted lower PTSD symptoms at 60 weeks with a large effect size ($\beta = -.56$), whereas the other CHANGE variables did not predict outcome. In CPT, higher pretreatment PTSD symptoms ($\beta = .45$), higher average levels of negative emotions ($\beta = -.34$) and positive view of self ($\beta = -.31$), and lower average levels of hopelessness ($\beta = .49$) predicted lower PTSD symptoms at 60 weeks, all with medium effect sizes. Average levels of overgeneralized beliefs, accommodated beliefs, and avoidance did not predict outcome.

CHANGE Predictors of Follow-up Slope of PTSD Symptoms

Univariate LGC analysis was used to estimate the slope of change for the CAPS-5 total scores over the follow-up period. The model for the slope from the 6- to 60-week assessment in WET provided an adequate fit to the data (Y-B $\chi^2 = 17.83, df = 10, p = .06, CFI = .96, RMSEA = .11, 90\% CI [.00, .20]$). The model for the slope from 12 to 60 weeks in CPT fit less well; the chi-square fit statistic was significant, but the CFI and RMSEA were within acceptable ranges (Y-B $\chi^2 = 13.32, df = 5, p = .02, CFI = .95, RMSEA = .17, 90\% CI [.06, .29]$). Analyses indicated a significant fixed effect of linear decrease in CAPS-5 scores in both WET ($B = -1.84, SE = 0.37, t = -5.01, p < .000$) and CPT ($B = -1.66, SE = 0.52, t = -3.18, p = .001$).

Table S5 presents the regression model examining CHANGE variables as predictors of the slope of PTSD symptoms in WET and CPT, including pretreatment PTSD symptoms, average word count,

and narrative count in the model. All variables were entered simultaneously. In WET, higher average levels of accommodated beliefs predicted a decrease in the slope of PTSD symptoms ($B = -3.17$, $SE = 1.24$, $(\beta = -.76)$, $t = -2.56$, $p = .011$). In CPT, higher average levels of hopelessness predicted an increase in the slope of PTSD symptoms over the follow-up phase ($B = 2.92$, $SE = 1.34$, $(\beta = .92)$, $t = 2.17$, $p = .030$). Both of these were large effects. None of the other CHANGE variables significantly predicted the follow-up slope in CPT or WET.

Discussion

The current study examined predictors of long-term PTSD outcome in WET (Sloan & Marx, 2019) and CPT (Resick et al., 2016; Resick et al., 2024) using client narratives from a randomized controlled noninferiority trial (Sloan et al., 2018). In WET, higher levels of accommodated beliefs predicted better long-term treatment outcome at 60 weeks post-randomization and a steeper slope of PTSD symptom improvement over the follow-up period. In CPT, higher levels of negative emotion and positive view of self, as well as lower levels of hopelessness, predicted better long-term treatment outcome at 60 weeks, and less hopelessness also predicted continued symptom change over the follow-up period (slope). Together, these findings underscore the power of narrative writing (Kircanski et al., 2012) in two PTSD treatments: one including only written exposure (WET), and one including both written and in-session verbal processing (CPT).

Even with minimal therapist involvement in WET and little explicit cognitive focus, more expression of healthy, balanced (accommodated) beliefs, averaged across narratives, emerged as a key predictor of both measures of PTSD symptoms over the follow-up period (60-week assessment and slope). These findings extend Alpert et al.'s (2023) report that expressing more accommodated beliefs in WET narratives predicted PTSD symptom improvement at posttreatment in this trial. Previous literature highlights the importance of cognitive change, even in PTSD treatments that do not explicitly include cognitive change techniques, such as prolonged exposure (e.g., Zalta, 2015). Our findings also build on Lee and colleagues' (2021) report of concurrent session-by-session associations between a general self-report measure of cognitive change (Posttraumatic Cognitions Inventory; Foa et al., 1999) and PTSD symptom change over the course of WET and CPT in this trial. Our results suggest that the expression

of accommodated beliefs might play a more crucial role in long-term PTSD symptoms in WET than maladaptive factors, such as overgeneralized beliefs and avoidance, which did not predict long-term outcomes.

Although accommodated beliefs predicted symptom improvement in WET at posttreatment (Alpert et al., 2023) and follow-up in this trial, the more specific cognitions, positive view of self and hopelessness, did not. These variables were included as exploratory because they are common targets in trauma-focused treatments (e.g., Dondanville et al., 2016; Iverson et al., 2015), but no previous studies have examined these variables as predictors of outcome in WET. In addition, the narrative prompts for WET do not include specific reference to views of self and one's future, whereas these beliefs are explicitly targeted in CPT narratives and therapy sessions.

Contrary to hypotheses for CPT, accommodated beliefs averaged across narratives did not predict PTSD symptoms on either measure of outcome over the follow-up period. This finding is unexpected, given that a central task of CPT is to help clients arrive at healthier beliefs about their traumatic experiences (Resick et al., 2016; Resick et al., 2024). Previous research on CPT has reported that more accommodated beliefs (Alpert et al., 2023, using this sample) and change in accommodated beliefs (Dondanville et al., 2016; Iverson et al., 2015) predict more improvement in PTSD symptoms at posttreatment, but these studies did not examine long-term outcomes.

However, more specific cognitions (more positive view of self and lower levels of hopelessness) did predict lower 60-week PTSD scores in CPT in this trial. CPT specifically targets negative trauma-related beliefs about the self and hope both in sessions and in the impact statements. CPT focuses on themes such as trust, power, control, and esteem and introduces skills that build sense of agency and self-efficacy, which might help to maintain treatment gains and facilitate continued improvement. Previous research has also reported that in CPT, changes in negative beliefs about the self predicted improvement in PTSD symptoms at posttreatment (Schumm et al., 2015). Our findings add that holding a more positive view of self, which is more than reducing a negative view of self, predicted long-term PTSD outcomes beyond the end of treatment. Future research might examine whether a more positive view of self can compete with or inhibit one's negative view of self to help prevent relapse, as suggested

by inhibitory retrieval principles (Craske et al., 2014; Craske et al., 2022). Notably, not all participants in this sample who were randomized to CPT completed four narratives. It is possible that those who completed more narratives, particularly the final impact statement, received more of CPT and therefore had more of an opportunity address issues related to their view of self. However, the number of narratives completed was not a significant predictor of 60-week PTSD symptom outcomes or the follow-up slope. Interestingly, a more positive view of self during CPT did not emerge as a key predictor of follow-up slope. This discrepancy highlights that positive view of self might carry over to the endpoint assessment at 60 weeks, but not influence the rate of month-to-month changes assessed by the slope.

The finding that less hopelessness predicted lower PTSD symptoms at both the 60-week assessment and follow-up slope was consistent with the study hypotheses, as well as with previous research identifying hope as a predictor of CPT outcome at posttreatment (Gallagher & Resick, 2012). A decrease in PTSD symptoms and an increase in one's self-efficacy and agency might contribute to a sense of hope and motivation for continued change. In addition, the focus on each of the themes in CPT (safety, trust, power/control, self-esteem, intimacy) can instill hope for the future. Likewise, reducing hopelessness might contribute to, or be influenced by, the strengthening of accommodated beliefs after treatment is completed. Therefore, hope seems an important treatment target in CPT that can predict long-term maintenance of treatment gains and perhaps continued change after CPT concludes.

Overgeneralized beliefs and avoidance were not significant predictors of long-term PTSD symptom outcome in WET or CPT. Alpert et al. (2023) found that neither variable predicted posttreatment PTSD symptoms in WET, but both overgeneralization and avoidance did in CPT. It might be particularly important to loosen overgeneralized beliefs and reduce avoidance before initial symptom reduction can occur, but then more adaptive and positive beliefs, such as accommodated beliefs, positive view of self, and hope, may play a more important role in the maintenance of treatment gains and continued improvement (Hayes & Andrews, 2020). These positive beliefs might also serve an inhibitory function (Craske et al., 2014; Hayes & Andrews, 2020; Resick et al., 2016) in that they can compete with the resurgence of maladaptive beliefs over the follow-up period.

We hypothesized that, in both treatments, more negative emotion described in the narratives would reflect the activation of and engagement with trauma memories, which is central to most psychotherapies for PTSD (Cooper et al., 2017; Mennin & Farach, 2007). For instance, there is some evidence that client-reported emotional activation early in trauma-focused treatments predicts better treatment outcomes (Asnaani et al., 2016). In the current trial, we found that higher average expression of negative emotions did predict better long-term treatment outcomes at the 60-week assessment in CPT, but not in WET. More negative emotion expressed in CPT may reflect the client's capacity to confront, rather than avoid, traumatic memories and authentically experience emotions. This expression of emotion, when paired with therapist-guided support and processing, could contribute to long-term improvement in PTSD symptoms. Of note, higher negative emotions in CPT did not emerge as a significant predictor of the slope over the follow-up period, suggesting that although more negative emotion predicted sudden gains (Sloan et al., 2022), less dropout (Alpert et al., 2020), and PTSD symptoms at the 60-week assessment in CPT, it did not contribute to continued month-to-month symptom improvement after treatment (follow-up slope).

A surprising finding was that greater expression of negative emotions in the WET narratives did not predict long-term outcome. This contradicts Wisco et al.'s (2016) report that in-session emotional activation (assessed physiologically) predicted better posttreatment outcomes. However, Lee et al. (2021) and Alpert et al. (2023) used self-report and observational ratings and did not find that negative emotions predicted PTSD symptom change in WET in this trial. It seems that the expression of negative emotions may be more important early in WET, as more negative emotions predicted sudden gains (Sloan et al., 2022), but not PTSD symptoms at posttreatment or follow-up.

Overall, the predictors of long-term outcome identified in written narratives in CPT and WET, even with different instructions, highlight the importance of exploring both beliefs and emotions in narrative writing, as reported in research on the Pennebaker writing paradigm (Sloan et al., 2005; Sloan & Kring, 2007). The present findings suggest that writing about trauma-related beliefs and emotions is not only related to symptom reduction during therapy (e.g., Cummings et al., 2014; Sloan et al., 2012), but also to long-term treatment outcomes. Further, accommodated beliefs are expressed in client

narratives in WET, even though it is a brief treatment with minimal therapist involvement and no explicit cognitive restructuring techniques, and more accommodation predicts both short-term (Alpert et al., 2023) and long-term PTSD symptom outcomes in WET. Although previous research (Alpert et al., 2023; Dondanville et al., 2016; Iverson et al., 2015) reported that accommodated beliefs predicted posttreatment outcome in CPT, a more cognitively-focused treatment, accommodated beliefs did not predict long-term outcomes in CPT in our study. Instead, we found that more specific cognitions (positive view of self, less hopelessness) predicted PTSD symptoms over the follow-up period. The expression of negative emotions seems most important early in WET, as more negative emotion predicted early symptom change (Sloan et al., 2022), but not PTSD symptoms at posttreatment (Alpert et al., 2023) or over the follow-up period. It is likely that emotional engagement plays a key, and perhaps under-recognized, role in CPT, as more expression of negative emotion in CPT narratives predicts less dropout (Alpert et al., 2020), higher likelihood of a sudden gain (Sloan et al., 2022), and now better long-term PTSD symptom outcomes.

Strengths and Limitations

This study included a diverse sample of both civilians and veterans. We used the CHANGE coding system to examine different types of cognitions, avoidance, and the expression of negative emotions in clients' written narratives. The CHANGE coding system provides several advantages. For example, it allowed for the study of archived narratives from the Sloan et al. (2018) noninferiority trial. It also provides ratings by independent coders on trauma-related cognitions and emotions that yield information beyond clients' reports of their own functioning.

Coding written narratives also introduces some limitations. Missing data due to treatment dropout or homework noncompliance in CPT could have created a sampling bias. Additionally, important processes that are not observable in written narratives might have been missed, such as nonverbal cues, therapeutic alliance, and avoidance in various forms, including not writing about certain memories or emotions or not writing narratives at all. CPT includes both narratives and therapy sessions, and narrative coding does not capture the additional in-session processes for the CPT arm. Future studies might use the CHANGE to code recordings of CPT sessions to capture more information and to

disentangle the effects of the narratives, the therapy sessions, and their interaction. Additionally, self-report measures could supplement the CHANGE codes to examine relationships among different measures of change processes.

Another limitation was that this study did not directly compare WET to CPT in the same analyses. Analyses were conducted separately for each treatment condition due to treatment differences in structure, duration, narrative timing, and narrative prompts. Therefore, it is not clear whether predictors of long-term outcomes are specific to WET or CPT, or if they apply more broadly to both treatments. However, the present findings do point to potentially important therapeutic targets that might improve long-term treatment outcomes in each treatment. Additionally, this study had a relatively small sample size ($n = 113$). It will be important to conduct similar analyses with a larger sample size. This is particularly important, given the number of study predictors, to enhance the robustness of the current findings.

The current study examined the CHANGE variables in the narratives on average, which makes use of all available narratives. However, because instructional prompts differ across sessions of WET and CPT and also between the two treatments, the prompts might be a confound. In addition, because of the higher dropout rate in the CPT condition (40%), a number of participants did not complete the last impact statement, resulting in fewer CPT narratives available for coding. However, number of narratives completed was not a significant predictor of 60-week outcomes or slope over the follow-up period. Future coding of CPT session recordings, rather than narratives, would allow for the examination of therapy variables regardless of homework compliance. Finally, the Sloan et al. (2018) trial did not reliably track whether participants received additional treatments, so we were unable to examine to what degree some of the maintained treatment gains might have been due to additional treatments.

It will be important for future studies to examine in-session predictors of therapy outcomes at the end of treatment and over follow-up periods with larger sample sizes of participants and more material to code. Another addition could be to examine within-person predictors of outcome, instead of focusing only on between-person analyses. Coding the content of sessions over the full course of treatment could also allow for more careful temporal sequencing of the predictors of treatment outcomes.

Conclusions

The current study made use of participants' written narratives to identify predictors of long-term outcomes in WET and CPT, contributing to the growing literature examining processes of change in these treatments. Our research adds to the literature by contributing to understanding how WET has its short- and long-term effects relative to CPT. To our knowledge, only two studies, both from the same clinical trial (Resick et al., 2012), have examined predictors of long-term treatment outcome in CPT (Dondanville et al., 2016; Iverson et al., 2015). There has only been one study to date that examined changes during the course of WET as predictors of long-term outcomes (Lee et al., 2021). A particularly noteworthy finding from our study is that developing accommodated beliefs seems central to PTSD symptom reduction in WET not only at posttreatment (Alpert et al., 2023), but also over the follow-up period, even with the brief duration of WET and minimal focus on cognitive change. Our findings also highlight the importance of emotional engagement in CPT, and we identify two specific cognitive variables, a positive view of self and less hopelessness, that may help sustain PTSD symptom improvement in CPT. By identifying predictors and processes of change in PTSD treatments, this and future studies can highlight key therapeutic targets and inform further treatment development.

WET has the potential to overcome barriers to care by making treatment particularly efficient, accessible, and transportable. Recent studies are expanding the delivery of WET to different samples and settings (e.g., Andrews et al., 2022; LoSavio et al., 2021; Marx et al., 2021), including those with PTSD and suicidal ideation in an inpatient setting (Tyler et al., 2022) and college-age students with PTSD symptoms in a student counseling center (Morissette et al., 2022). In addition, an ongoing trial of WET will evaluate the treatment when it is disseminated to primary care centers serving traumatized and low-income populations. This is exciting because it examines the generalizability of WET and delivers the treatment to those who may not otherwise have access to PTSD treatment. Overall, our finding that new, accommodated beliefs emerge and contribute to long-term outcomes in this brief, mostly self-guided treatment is compelling, given that WET can overcome barriers to care and demonstrates lower dropout and similar outcomes to CPT, a gold-standard treatment for PTSD (Sloan et al., 2018).

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