The Role of Cognitions in Imagery Rescripting for Posttraumatic Nightmares*

Mary E. Long,1 Joanne L. Davis,2 Justin R. Springer,1 Jon D. Elhai,3 Jamie L. Rhudy,2 Ellen J. Teng,1 and B. Christopher Frueh4

1Michael E. DeBakey Veterans Affairs Medical Center
2University of Tulsa
3University of Toledo
4University of Hawai‘i at Hilo

Despite growing support for the use of imagery rescripting to treat posttraumatic nightmares (PTNMs), its underlying mechanisms have not been examined. This secondary data analysis piloted the proposal that modification of posttraumatic cognitions is a mechanism of change when using a manualized PTNM imagery rescripting intervention. Significant linear reductions in posttraumatic cognitions were observed from baseline through 6-month follow-up evaluations. Change in total negative cognitions was significantly correlated with change in posttraumatic stress disorder symptoms. Initial amount of change in subscale scores also predicted the amount of distal change observed at the 6-month follow-up. These findings provide preliminary evidence that trauma-related cognitions may improve over time as a result of imagery rescripting. © 2011 Wiley Periodicals, Inc. J Clin Psychol 67:1008–1016, 2011.

Keywords: posttraumatic stress disorder; night terrors; outcome assessment

Sleep disturbances, such as posttraumatic nightmares (PTNMs), have been referred to as the hallmark of posttraumatic stress disorder (PTSD) because of the frequency with which traumatized individuals report them (Ross, Bull, Sullivan, & Carroff, 1989). There is a growing body of treatment outcome studies that suggests that PTNM interventions incorporating the technique imagery rescripting are effective in reducing the frequency of trauma-related nightmares and associated distress (Davis & Wright, 2007; Krakow et al., 2001). Only a few randomized controlled trials, however, have examined the effectiveness of imagery rescripting in treating PTNMs, and mechanisms of change have not be elucidated. The current secondary data analysis is the first study to our knowledge to empirically investigate potential underlying mechanisms of interventions targeting PTNMs and related distress that include imagery rescripting.

Approximately 70%–88% of all PTSD patients report sleep disturbances, of which 50%–88% report chronic PTNMs (Forbes, Creamer, & Biddle, 2001; Kilpatrick et al., 1998; Neylan et al., 1998). PTNMs and trauma-related sleep disturbances warrant special attention because they have been found to independently exacerbate daytime symptoms, contribute to poor PTSD clinical outcomes, and predict other distress outcomes, suggesting that PTNMs contribute to psychological distress above and beyond PTSD severity (Belleville, Guay, & Marchand, 2009; Davis, Byrd, Rhudy, & Wright, 2007; Germain, Buysse, & Nofzinger, 2008). Therapies that target PTNMs directly have reported more success in producing simultaneous improvement in PTNMs than those that treat the PTSD symptoms globally (Coalson, 1995; Davis & Wright, 2007; Halliday, 1987).

*This article was reviewed and accepted under the editorship of Beverly E. Thorn.
This work was supported in part by the Houston VA HSR&D Center of Excellence (HFP90-020) and the Office of Academic Affiliations, VA Special MIRECC Fellowship Program in Advanced Psychiatry and Psychology, Department of Veterans Affairs. The views expressed in this article are those of the author(s) and do not necessarily represent the views of the Department of Veterans Affairs.
Correspondence concerning this article should be addressed to: Mary E. Long, Houston Center for Quality of Care and Utilization Studies, Michael E. DeBakey Veterans Affairs Medical Center, 2002 Holcombe Blvd. (152), Houston, TX 77030; e-mail: melong6@gmail.com
Interventions using a treatment component called imagery rescripting have evidenced promising results in reducing both PTNMs and associated distress (Davis & Wright, 2007; Krakow et al., 2001). Imagery rescripting is an imagery technique in which a distressing trauma-related nightmare/image is modified during treatment, which is postulated to increase sense of mastery over the image and change associated negative thoughts, feelings, and/or behaviors (Germain et al., 2004). Variants of interventions using imagery rescripting, such as imagery rehearsal therapy (IRT), have been examined as a treatment for idiopathic nightmares since the late 1970’s (Marks, 1978), with IRT currently being the most commonly used nightmare treatment (Long & Quevillon, 2009). The majority of nightmare treatment studies, however, have been case studies, had methodological limitations, and did not assess for or report whether the nightmares were trauma-related (Long & Quevillon, 2009).

The only imagery rescripting treatment currently tailored to successfully treat civilian’s with PTSD and trauma-related nightmares is Davis and Wright’s exposure, relaxation, and rescripting therapy (ERRT, Davis, 2009). The multimodal ERRT intervention instructs participants in actively modifying sleep hygiene, learning relaxation techniques, exposing themselves to the content of the original nightmare (writing and discussing it and then examining trauma-related themes), and then rescripting the chosen nightmare. In several randomized controlled trials, ERRT and has evidenced significant decreases reported PTNM frequency and severity, decreased symptoms of depression and PTSD, and improved sleep quality and quantity.

Despite growing empirical support for the use of ERRT and other imagery rescripting therapies in treatment of PTNMs, there has not been an empirical isolation of their mechanisms of change. Altering of the pathophysiological mechanisms maintaining the nightmares through sleep hygiene practice, habituation, abreaction, mastery, and restoration of imagery control have all been proposed as processes that resulted in change (reviewed in Long & Quevillon, 2009). The majority of recent theories that have been postulated to explain the mechanisms of change of imagery techniques have been cognitive-behavioral.

Poor image control and distorted or negative images have long been related to anxiety disorders such as PTSD (Lang, 1977; Laor et al., 1998; Wild, Hackmann, & Clark, 2008). Cognitive-behavioral theorists have suggested that distorted and negative trauma-related images, as well as the perceived lack of control over the images, are problematic because the traumatized individual frequently believes the distorted images to be a true reflection of reality, resulting in chronic corroboration of negative beliefs, avoidance, and hyperarousal symptoms (Falsetti, Monnier, Davis, & Resnick, 2002; Wild et al., 2008; Witvliet, 1997). Traumatic imagery is often evoked through exposure to trauma-related memories or triggers, which then activates the information/fear networks containing negative, trauma-related schemas, emotions, behaviors and affective physiological states, resulting in chronic reinforcement of PTSD symptoms (Brett & Ostroff, 1985; Horowitz, 1983; Lang, 1977).

It has been proposed that processing or modifying the emotional traumatic image can be used therapeutically to access the fear network, subsequent to which exaggerated negative evaluations can be processed and the network modified (Foa & Kozak, 1986; Lang, 1977). Cognitive-behavioral theorists have proposed that the underlying mechanisms of change when using imagery techniques to treat PTNMs is the concurrent activation of imagery, sensory, and narrative based information in the trauma-fear network during exposure to the nightmare content (Germain et al., 2004; Krakow, 2004). It has been hypothesized that, during this activation, the process of rescripting traumatic imagery results in modification of trauma-related cognitions, and subsequently a reduction in PTSD and related distress (Long & Quevillon, 2009).

This article reports on a secondary data analysis of possible underlying mechanisms of an imagery intervention for the treatment of PTNMs. In the present study, we examined the hypotheses that treatment with ERRT, a multimodal intervention whose primary focus includes imagery rescripting, will result in a decrease in PTSD-related negative cognitions. Specifically, we predicted that Posttraumatic Cognitions Inventory (PTCI) scores (total and subscales) would decrease over each of the assessment points. We further hypothesized that reductions in these negative cognitions would be associated with reductions in PTSD symptoms.
In addition, because initial symptom changes have been found to be related to distal change in other cognitive-behavioral treatments, we examined whether initial reductions in PTCI scores were associated with the reduction in negative cognitions at the final follow-up assessment (Greenfield, Gunthert, & Haaga, 2011). A number of studies have supported the notion that initial rapidity of response to treatment is predictive of both total degree of recovery at cessation of treatment and resistance to relapse at extended follow-up (Ilardi & Craighead, 1999; Santor & Segal, 2001; Thase et al., 1992). For individuals who do not recover rapidly and/or completely, additional contiguous sessions and occasional booster sessions have been shown to convey meaningful benefit. These findings are consistent with the notion of a two-stage sequential treatment response. Individuals who are able to recruit previously established patterns of cognition and behavior that afford protection against depression (i.e., those who show a rapid “awakening” response) are able to recover both more rapidly and completely and maintain their recovery more effectively. Those who had not previously acquired these skills may need further training over a longer period to do so, with extra sessions providing further opportunity to learn new behaviors or solidify recently acquired behaviors through practice.

The parent study, from which the sample with PTCI data for this study were drawn, utilized a randomized controlled design to evaluate the effectiveness of the three-session ERRT model in alleviating psychological and physiological symptoms in participants with chronic PTNM (N = 40). Analyses of those that completed treatment suggested that they experienced significant improvements across a number psychological variables from baseline to posttreatment: depression, PTSD frequency, number of hours slept per night, fear of sleep, nights with nightmares per week, nights with more than one nightmare per week, nightmare severity, panic symptoms upon waking, global sleep quality, PTSD-related sleep quality, and past month Clinician-Administered PTSD Scale (CAPS) scores (Davis, Rhudy, Pruiksma, & Byrd, under review). A second article reports on physiological measures of nightmare-related fear that evidenced improvement over the course of the study (Rhudy et al., 2010). Please refer to the parent articles for a full description of the whole sample and procedures.

Method

Participants

Study participants were trauma-exposed persons from the community, who reported experiencing PTNM at least once per week for at least 3 months and were at least 18 years of age. Exclusion criteria included apparent psychosis, mental retardation, substance dependence, suicidal ideation, or recent parasuicidal behavior. Participants were recruited through radio ads, flyers, and referrals from therapists in the community.

Participants were randomized into either a treatment or waitlist control group. Four weeks after the initial assessment, and one week after the 3-session intervention for the treatment group, all participants were reassessed, with participants in the control condition then being offered treatment. For the purposes of this study, the treatment and delayed treatment control group participant scores were collapsed into one group, with scores available from four assessment points (baseline, 1-week posttreatment, and 3-month, and 6-month follow-ups). A subsample of the parent study’s participants (n = 19) completed the PTCI for at least three of the four evaluation assessment points and were included in this retrospective data analyses. Baseline demographics and average initial PTNM frequency, sleep quantity, and CAPS (Blake et al., 1995) scores are provided in Table 1.

Measures

The Posttraumatic Cognitions Inventory (PTCI; Foa, Ehlers, Clark, Tolin, & Orsillo, 1999) is used to measure three types of negative trauma-related cognitions: beliefs about self, world, and self-blame. The 36-items are in the form of a statement rated on a 1 (totally disagree) to 7
Likert-type scale. The PTCI has demonstrated good internal consistency (Cronbach’s alpha = .86–.97), test-retest reliability (Spearman correlations = .74–.89), and strong convergent validity. Support for the three subscales has been established, although their internal consistency and validity are not as strong as the PTCI Total score, particularly for the Self-Blame subscale (Beck et al., 2004).

The Modified PTSD Symptom Scale—Self Report (MPSS; Falsetti, Resnick, Resick, & Kilpatrick, 1993) was developed to assess both frequency and severity of the PTSD’s 17 symptoms in the current Diagnostic and Statistical Manual of Mental Disorders (DSM-IV-TR, American Psychiatric Association, 2000). The internal consistency of the full scale has been reported at levels of .96 and .97 in treatment and community samples, respectively (Falsetti et al., 1993). Convergent validity of the MPSS with Clinician Administered PTSD Scale (CAPS, Blake et al., 1995) has revealed excellent results. The total score for symptom frequency and severity was used in the current study.

The Clinician Administered PTSD Scale (CAPS; Blake et al., 1995) is a 30-item structured interview measuring the intensity and frequency of the 17 DSM-IV PTSD symptoms (American Psychiatric Association, 2000). The CAPS is considered the “gold standard” for assessing PTSD diagnoses with excellent psychometric properties and diagnostic utility (Weathers, Keane, & Davidson, 2001).
Procedure

Clinical Intervention. The multicomponent intervention assessed in the current study consisted of three sessions and homework activities. Specific techniques included psychoeducation related to the treatment rationale and the relationship between traumatic events and nightmares, modification of sleep hygiene, relaxation exercises, exposure to the original PTNM, and rescripting of the PTNM. The sessions were conducted weekly over a 3-week period in individual or group therapy format. Treatment sessions included a review of homework assignments related to the session module content.

Clinicians. Treating clinicians included master’s level or above therapists. The second author, who originated the intervention, oriented, trained, supervised, and reviewed audiotaped sessions of clinicians administering the intervention. Clinicians also met weekly during the treatment phase of the study to discuss progress and/or any problems with the treatment.

Analyses

All analyses were computed with SAS 9.2 for Windows. The Bonferroni method was used to reduce Type I error rates, resulting in a family-wise alpha rate of $\leq .017$.

Chi-squares and independent $t$ tests were conducted to evaluate differences between demographic and treatment variables (i.e., demographics, treatment type, clinicians) and outcome scores on the measures included in this study. No significant differences were found across any of the variables.

Growth Curve Modeling (GCM; Singer & Willett, 2003) via SAS 9.2 PROC MIXED was employed to describe the shape of growth across assessment periods for the PTCI total score as well as component PTCI scores. GCM analysis describes change, or trajectory, through two parameters: the intercept and the slope. The PTCI scores (PTCI-Total, PTCI-World, PTCI-Self, and PTCI-Self-Blame) were assessed at four time points (initial, post, 3-month follow-up, and 6-month follow-up). A group mean growth curve is first estimated for the entire sample such that the intercept (i.e., baseline) for the sample is fixed to the initial assessment. The slope is the average rate of growth between the assessment points. A least squares regression equation fits each participant’s longitudinal data at all assessment points to determine the growth curve. Post-hoc examination of quadratic and cubic trajectories for each of the variables was undertaken.

The growth curve modeling approach accounts for missing data; thus, all 19 participants were retained in GCM analyses. Four unconditional growth models (PTCI-Total, PTCI-World, PTCI-Self, and PTCI-Self-Blame) were generated to examine change in rate and shape. Because of the modest sample size and missing data, direct maximal likelihood (DML) estimation was used as a conservative approach to correct parameter standard errors and to address potential violations in the assumption of non-independence of observations (Singer & Willett, 2003).

To examine the hypothesized relationship between changes in PTSD symptoms and negative cognitions, we first calculated a Composite PTSD (MPSS-SR total score and CAPS total score), a methodology often used when working with smaller sample sizes. A small clinical sample such as the one in this study often necessitates some reduction in number of particularly similar variable contracts to increase validity. It has been recommended that two or more measures of the same construct that are highly correlated (as the MPSS and CAPS are in this study) be converted to standardized scores and then summed and averaged (Steketee & Chambless, 1991). We then calculated pre and post change scores for the composite PTSD measure and PTCI subscales. Because of the shortcomings of raw change scores, pre-6-month follow-up residualized gain scores for the PTCI and a composite PTSD self-report measure were calculated for the and PTCI total and component scores to control for bias in using raw change scores (Foa & Rauch, 2004; Steketee & Chambless, 1991). Pearson correlations were calculated between residualized gain scores of the Composite PTSD and PTCI.
Our final hypothesis was that participants who demonstrated the most initial change (i.e., initial-assessment to post-assessment) would demonstrate the greatest absolute change by the final assessment (i.e., post to 6-month follow-up). Residualized gain scores for initial and distal change were calculated from the regressions of pretreatment PTCI scores (total and subscale) and posttreatment and 6-month follow-up PTCI scores, respectively. Four separate linear regression analyses were then conducted to examine whether symptom reduction during treatment would predict overall symptom reduction at follow-up. Of the 19 participants, one participant was dropped from these analyses because that participant did not have data at all the three posttreatment assessment points used in these analyses.

Results

Pretreatment to Follow-Up Treatment Differences

Linear GCMs were estimated using PTCI scores (total scores and the three subscales) taken at initial, post, 3-month, and 6-month follow-ups. The intercepts are the PTCI scores at the first evaluation. The GCM analyses revealed that the PTCI-Total and Self-Blame scores decreased in a linear fashion over the assessment points. For PTCI-Total, the average intercept was 12.01 and the average linear slope, or growth rate, was −0.56. The average intercept for the Self-Blame subscale was 3.63 and the average linear slope was −0.21. The correlation between the PTCI-Total intercept and slope \((r = -0.77, p < 0.001)\) indicated that higher initial scores were associated with greater reductions; the correlation between intercept and Self-Blame slope was nonsignificant \((r = -0.19, p = 0.23)\). All participants, on average, decreased by a statistically significant 1.48 \((p < 0.001)\) points in their PTCI total score and 0.64 \((p = 0.004)\) points in their Self-Blame subscale scores over the course of the assessments. Average linear slopes for PTCI-Self \((p = 0.07)\) and World \((p = 0.36)\) were nonsignificant. The correlation between intercept and PTCI-Self was significant \((r = -0.82, p < 0.001)\); however, intercept and PTCI-World was nonsignificant \((r = -0.18, p = 0.24)\). Table 2 provides the parameter estimates and significance values for each analysis.

The Relationship of Change in PTSD and Negative Cognitions

As expected, change in total negative cognitions was significantly correlated with change in PTSD symptoms \((r = -0.49, p = 0.017)\). With respect to subscales, correlation between change in Composite PTSD symptoms and negative cognitions about self was also significant \((r = 0.58, p = 0.005)\), but Composite PTSD symptoms were not significantly correlated to negative cognitions about the world \((r = 0.25, p = 0.149)\) or self-blame \((r = 0.25, p = 0.148)\).

Table 2
Parameter Estimates for Growth Curve Models

<table>
<thead>
<tr>
<th>Predictor</th>
<th>Estimate</th>
<th>SE</th>
<th>t value</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>PTCI Total</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intercept</td>
<td>12.01</td>
<td>1.07</td>
<td>11.25</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Slope</td>
<td>−0.56</td>
<td>0.22</td>
<td>−2.56</td>
<td>0.01</td>
</tr>
<tr>
<td>PTCI Self</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intercept</td>
<td>3.39</td>
<td>0.41</td>
<td>8.22</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Slope</td>
<td>−0.16</td>
<td>0.08</td>
<td>−1.87</td>
<td>0.07</td>
</tr>
<tr>
<td>PTCI World</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intercept</td>
<td>4.69</td>
<td>0.40</td>
<td>11.84</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Slope</td>
<td>−0.07</td>
<td>0.08</td>
<td>−0.93</td>
<td>0.35</td>
</tr>
<tr>
<td>PTCI Self-Blame</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intercept</td>
<td>3.63</td>
<td>0.40</td>
<td>9.10</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Slope</td>
<td>−0.21</td>
<td>0.07</td>
<td>−3.06</td>
<td>0.004</td>
</tr>
</tbody>
</table>

*Note.* SE = standard error; PTCI = Posttraumatic Cognitions Inventory.
The Relationship of Initial Change to Distal Change

Residualized initial gain scores (i.e., pre and post) were used to predict residualized distal gain scores (i.e., post-6-month) in four separate regression models. A significant regression model was found for PTCI-Total ($b = -0.577, t = 4.11, p < .001$). The initial difference scores accounted for approximately 48% (adjusted $r^2 = 0.483$) of the total change from the post assessment to the 6-month assessment. A significant regression model was found for PTCI-World ($b = -0.721, t = -4.17, p < .001$). The initial difference scores accounted for 49% (adjusted $r^2 = 0.490$) of the total change from the postassessment to the 6-month assessment. Using bonferroni-corrected significance values, nonsignificant regression models were found for PTCI-Self ($b = -0.303, t = -1.272, p = .222$) and PTCI-Self-Blame ($b = -0.47, t = -2.15, p = .047$).

Discussion

Cognitive–behavioral theorists have hypothesized that imagery techniques may be therapeutic in treating PTNsMs, because techniques such as imagery rescripting function to access the fear network during exposure to the nightmare content (Germain et al., 2004; Krakow, 2004). It has been proposed that the activation of the fear network during imagery rescripting of PTNM subsequently results in the identification and modification of trauma-related distorted, negative beliefs, and an overall reduction in PTSD and related distress (Long & Quevillon, 2009).

Results from this secondary data analysis provide support that a cognitive-behavioral intervention that employs imagery techniques in the treatment of PTNM, ERRT, results in improvements in trauma-related negative cognitions over time. Significant linear reductions in posttraumatic cognitions were observed from baseline through 6-month follow-up evaluations, with change in total negative cognitions being significantly correlated with change in PTSD symptoms. Together with the previous findings from Davis and colleagues (Davis et al., under review; Davis & Wright, 2007; Rhudy, Davis, Williams, McCabe, & Byrd, 2008), these data add further support for the implementation of a cognitive-behavioral intervention including exposure and imagery rescripting, such as ERRT, as effective treatments for PTSD, PTNM, and related negative beliefs.

Our results also suggest that the ERRT reductions in trauma-related cognitions are associated with reductions in PTSD symptoms, with decrease in perception of incompetence (as measured by the PTCI Self construct) having the strongest relationship with PTSD symptom reduction. These findings provide preliminary evidence that one of the mechanisms of change of an imagery rescripting treatment is through the modification of maladaptive beliefs, particularly as it relates to thoughts and beliefs about one’s abilities and/or judgment; however, further research is needed to determine the direction of causality. Initial amount of change in subscale scores also predicted the amount of distal change observed at the 6-month follow-up. These findings provide preliminary evidence that trauma-related cognitions may improve over time as a result of imagery rescripting. This information may help identify which individuals are likely to relapse or experience the greatest benefit from treatment.

Despite its merits, this study has several limitations. First, the analyses were based on a relatively small sample due to not all participants having completed the PTCI at all of the evaluation points. The small sample may have resulted in the lack of significant findings across all PTSCI subscales during analyses. Another limitation is that the ERRT intervention comprises a number of components, including two imagery components, exposure and imagery rescripting, thus making it difficult to definitively isolate the mechanism of change or cause of the modification of beliefs. Despite demonstrating correlations between changes in PTSD symptoms and changes in negative cognitions, this does not necessarily rule out other hypothesized change mechanisms/explanations. Finally, the reported potential inconsistent psychometrics across the subscales may give rise to results for the Total score as being more reliable. Dismantling studies are needed, therefore, to explore which specific procedures contribute to the therapeutic gains and to explore the specifics of what imagery rescripting versus exposure therapy adds to the ERRT treatment package. Empirical studies comparing
ERRT to an effective PTSD treatment such as prolonged exposure will help to isolate the effective components, when these gains might accrue, and for whom they happen.

References


