# OPTIMIZING EMOTIONAL ENGAGEMENT IN IMAGINAL EXPOSURE FOR POSTTRAUMATIC STRESS DISORDER

By

ERIN G. CLIFTON

Submitted in partial fulfillment of the requirements

for the degree of Doctor of Philosophy

Department of Psychological Sciences

CASE WESTERN RESERVE UNIVERSITY

January, 2017

## CASE WESTERN RESERVE UNIVERSITY

## SCHOOL OF GRADUATE STUDIES

We hereby approve the thesis/dissertation of

Erin G. Clifton

candidate for the degree of Doctor of Philosophy \*.

Committee Chair

Norah Feeny, Ph.D.

Committee Member

Arin Connell, Ph.D.

Committee Member

Amy Przeworski

**Committee Member** 

Edwin Shirley

Date of Defense

June 1, 2015

\*We also certify that written approval has been obtained

for any proprietary material contained therein.

## **Table of Contents**

Acknowledgements	6
Abstract	7
Introduction	9
About PE: Imaginal Exposure and Emotional Engagement	10
Emotional Engagement and Treatment Outcome	11
Predictors of Emotional Engagement Trajectory and Outcome	14
Study Aims	18
Method	20
Participants	17
Measures	18
Procedure	21
Data Analytic Plan	26
Results	26
Discussion	36
Tables and Figures	47
References	58

## List of Tables

Table 1. Sample Characteristics	.47
Table 2. Average Emotional Engagement Across Time During PE	.48
Table 3. Average Correlations among Pre, Peak, and End SUDs Across Sessions 3-10	49
Table 4. Pre to Peak Emotional Engagement Parameter Estimates, Errors, t-Tests, and p         Values	)- 50
Table 5. Pre-treatment Predictor Variables By Emotional Engagement Trajectory         Groups	52
Table 6. Post-treatment Variables By Emotional Engagement Group	53
Table 7. Time Lagged Regressions of Emotional Engagement and PTSD Symptoms	55
Table 8. Time Lagged Regressions of Emotional Engagement and PTSD Symptoms By         Trajectory Groups	, 56

# List of Figures

Figure 1. Emotional Engagement Trajectory Groups Characterized by Pre and Peak	
SUDs	51
Figure 2. PTSD Severity at Pre- and Post-treatment By Emotional Engagement	
Trajectory Group	54
5 5 1	

#### Acknowledgements

Preparation of this manuscript was supported by grants to Drs. Zoellner and Feeny from the National Institute of Mental Health (R01 MH066347, R01 MH066348). The investigative team on the grants included: Peter Roy-Byrne, MD, Matig Mavissakalian, MD, Jason Doctor, Ph.D., Joshua McDavid, MD, and Nora McNamara, MD. I also acknowledge the support of The William T. Dahms, M.D. Clinical Research Unit, funded under the Cleveland Clinical and Translational Science Award (UL1 RR024989). Thank you to Norah Feeny, Ph.D., for serving as the chair of my Dissertation committee and for your invaluable help and guidance throughout the dissertation process and time at Case Western Reserve University. Thank you to Arin Connell, Ph.D., Amy Przeworski, Ph.D, and Edwin Shirley, Ph.D. for serving as members of my Dissertation committee. I greatly appreciate your support and feedback on this project.

## Optimizing Emotional Engagement in Imaginal Exposure for Posttraumatic Stress Disorder

Abstract

## By

## ERIN G. CLIFTON

Overview: Prolonged Exposure (PE) therapy is an effective treatment for PTSD (e.g., Powers, Halpern, Ferenschak, Gillihan, & Foa, 2010) and considered a first line treatment (IOM, 2008). However, we do not have a clear understanding of the mechanisms underlying symptom change in order to optimize treatment benefits. Emotional engagement in the form of fear activation during imaginal exposure has been shown to be related to better PTSD treatment outcome (Foa, et al., 1995; Jaycox, Foa, & Morral, 1998) yet little is known regarding optimal patterns in emotional engagement across sessions and individual factors that may influence trajectories. Method: 116 individuals (75.9% female; 65.5% Caucasian) with a primary diagnosis of PTSD received up to 10 weekly sessions of PE as part of an NIMH-funded clinical trial. Self-reported PTSD symptoms (PSS-SR) and pre, peak, and end subjective ratings of distress were assessed at each imaginal exposure session. Latent class growth modeling was used to examine trajectories of emotional engagement over time and individual characteristics were examined as potential predictors of emotional engagement trajectories and PTSD treatment outcome. We also examined whether emotional engagement predicted next session change in PTSD symptoms. *Results*: Trajectory analyses indicated three distinct, clinically meaningful, trajectories of change in emotional engagement that showed a

small relationship to PTSD treatment outcome. Time lagged regression models indicated significant relationships between pre, peak, and end distress and change in PTSD severity in the following session but only for those members of a trajectory described by consistently high engagement and modest habituation of distress across sessions. *Conclusions:* These findings highlight emotional engagement as a process that varies considerably among clients within and across sessions and are not supportive of the notion that reduction in engagement between sessions is a necessary mechanism of therapeutic change.

## Optimizing Emotional Engagement in Imaginal Exposure for Posttraumatic Stress Disorder

Prolonged exposure (PE) therapy is an effective treatment for posttraumatic stress disorder (PTSD; e.g., IOM, 2008; Powers, Halpern, Ferenschak, Gillihan, & Foa, 2010) and is well tolerated (Foa, Zoellner, Feeny, Hembree, & Alvarez-Conrad, 2002; Jayawickreme et al., 2014). Yet, there is considerable individual variation in response to treatment with some achieving greater symptom improvement than others (e.g., Foa et al., 1999, 2005; Resick et al., 2002; Schnurr et al., 2007). Psychotherapy process research is a way to augment evidence-based practice by examining how change unfolds over the course of treatment and how outcomes vary among clients with different change patterns (e.g., Laurenceau, Hayes, & Feldman, 2007). Generally, this may involve examination of the shape of change, individual characteristics that impact treatment trajectory, the relationship between client and therapist, and specific mechanisms of the treatment that may impact outcome (Laurenceau et al., 2007). Research has only begun to explore treatment trajectories (e.g., Doane, Feeny, & Zoellner, 2010; Keller, Feeny, Zoellner, 2014; Nishith, Resick, & Griffin, 2002) and putative mechanisms (e.g., Bluett, Zoellner, & Feeny, 2014; Zalta et al., 2014) leading to symptom reduction in PE, with many processes of change yet to be examined more fully. One theorized process of change in PE is emotional engagement with the traumatic memory, which is suggested to facilitate emotional processing and eventual recovery (Foa & Kozak, 1986). Little research has examined emotional engagement as a process of change within PE, nor whether client characteristics play a role in how emotional engagement unfolds over the course of treatment. An important next step in understanding how PE exerts its robust effects is to examine individual variables, such as level of emotional engagement that can be

optimized within PE, in order to facilitate greater recovery from PTSD.

#### **About PE: Imaginal Exposure and Emotional Engagement**

Generally, PE involves four main components: 1) psychoeducation, 2) breathing retraining, 3) repeatedly revisiting the memory of the trauma (i.e., imaginal exposure), and 4) confronting avoided situations and reminders (i.e., *in vivo* exposure). Emotional processing theory (Foa & Cahill, 2001; Foa & Kozak, 1986) suggests that chronic PTSD develops from cognitive and behavioral avoidance that maintains erroneous perceptions about the world as completely dangerous and oneself as totally incompetent. According to this model, recovery from PTSD involves changes in the trauma memory along with a reduction in trauma-related fear. Modifying the trauma memory involves activation of the fear structure surrounding the memory (i.e., emotional engagement) and incorporation of information that disconfirms inaccurate or pathological fear responding, through repeated exposures. The exposures facilitate new learning and resultant changes to the trauma memory, by incorporating information about safety and personal mastery and promoting extinction of fear responses (Foa, et al., 2007; Foa et al., 2006). Successful emotional processing is theorized to lead to a decrease in distress to trauma-related cues within and across sessions (Foa & Rothbaum, 1998).

Imaginal exposure (IE) is a central component of PE that involves prolonged and repeated, systematic recounting of a specific trauma memory. The standard procedures for IE are designed to promote activation of trauma-related emotions (i.e. fear, anger, guilt, shame) by having clients close their eyes, vividly imagine the memory as if it were happening right now, and use present tense when relaying the narrative, including thoughts, feelings, physical sensations, and behaviors experienced during the trauma (Foa, Hembree, & Rothbaum, 2007). The clinician is instructed to monitor the client's distress level throughout and if necessary prompt the client to give more detail in order to facilitate the therapeutic process. The distress, fear, and other negative emotions experienced during the exposure correspond to the level of emotional engagement with the traumatic memory (Foa & Kozak, 1986).

Emotional engagement is operationalized as a subjective rating of distress or disturbance (i.e., SUDs), elicited at regular intervals throughout the imaginal exposure. The assessment of emotional engagement throughout the session can be thought of as a clinical tool used to gauge and monitor the fear or distress response during imaginal exposure. The aim is for "optimal" emotional engagement to the trauma memory, meaning that there should be "enough" engagement to activate the fear structure but not "too much" that learning does not take place. These are only rough guidelines as to what patterns in emotional engagement the clinician should aim for to foster therapeutic change. Having a better understanding of what constitutes common or optimal trajectories of emotional engagement within and across sessions could be incredibly helpful in assessing clients' distress and gauging the clinical value of encouraging people to become therapeutically "distressed" within session.

#### **Emotional Engagement and Treatment Outcome**

Despite the theoretical centrality of emotional engagement, few studies have directly examined patterns of emotional engagement over time and the relationship to PTSD treatment outcome. Early research has established an association between higher emotional engagement and better treatment outcome for anxiety disorders (e.g., Borkovec & Sides, 1979; Jansson, Öst, & Jerremalm, 1987; Kozak, Foa, & Steketee, 1988) and PTSD (Foa, Riggs, Massie, and Yarczower, 1995). Several additional studies have shown that greater reductions in mean and peak SUDS between the first and last imaginal exposure sessions were associated with greater PTSD symptom reduction at posttreatment (Bluett et al., 2014; Gallagher & Resick, 2012; Rauch, Foa, Furr, & Filip, 2004).

The first study to examine the influence of emotional engagement across time in PTSD treatment used cluster analysis to detect the presence of three distinct patterns of mean emotional response to imaginal exposure therapy: 1) high initial emotional engagement and a gradual decrease in anxiety over sessions, 2) high initial emotional engagement and low habituation to anxiety over sessions, and 3) moderate initial engagement and low habituation (Jaycox, Foa, & Morral, 1998). Although clients in all three groups benefitted from treatment, individuals with high emotional engagement followed by habituation of anxiety over sessions were eight times more likely to meet their stringent criteria for good end-state functioning. In a subsequent study examining fear activation and habituation patterns as early process predictors of response to IE (van Minnen & Hagenaars, 2002), results showed that an increase in subjective distress over the course of the first imaginal exposure session was more likely for those who improved with treatment versus those who did not improve. However, this study also found that higher distress at the start of the first IE was related to treatment non-improvement (van Minnen & Hagenaars, 2002).

Patterns and predictors of subjective distress have also been examined in the anxiety disorder literature at large. In a sample of 99 anxiety-disordered youth, results indicated that participants' peak distress/anxiety and magnitude of change in distress/anxiety significantly increased between sessions and higher self-reported pretreatment anxiety predicted greater change in distress/anxiety within the first exposure session (Benjamin et al., 2010). Another study showed that across three exposures for anxiety, a greater rise in subjective distress within session and reduction in distress by the end of session was related to better treatment outcome (Norton, Hayes-Skelton, & Skenk, 2011).

Taken together, these studies show that particular patterns in emotional engagement, such as high initial emotional engagement and gradual decreases in distress over time, have been related to better PTSD treatment outcome. However, individual variation in patterns of change in distress over time complicates the current understanding of the relationship between distress ratings and PTSD symptom change. Indeed, recent work has also shown that those who do not show a pattern of fear reduction over the course of treatment still show significant reduction in PTSD symptoms (Bluett et al., 2014). Research methods using mean measurements of distress over time or limiting examination of distress to the first few exposure sessions, prohibits the ability to examine *individual* patterns of change session by session.

The availability of more sophisticated statistical techniques allow for more indepth understanding of trajectories of change that may impact an individual's response to treatment. For example, a recent study used Hierarchical Linear Modeling (HLM) to examine between and within session subjective distress ratings in 14 individuals with chronic PTSD to determine the importance of habituation of distress to treatment outcome (Sripada & Rauch, 2015). Results suggested that high treatment responders showed greater between-session reduction in distress than low responders but responderstatus was not differentiated by within-session habituation nor any difference in overall SUDS level (Sripada & Rauch, 2015). This study was able to take into account numerous distress ratings both within and across sessions; however, fitting a linear model might have also obscured more interesting variations in trajectories of distress across time.

Change in therapy unfolds in a variety of ways; change over time can be continuous and linear (e.g. distress decreasing at a gradual rate across time), or change can be discontinuous and nonlinear (e.g. distress suddenly decreasing, increasing, or staying the same; Hayes et al., 2007). Thus, it is possible that based on underlying characteristics at the individual level, the pattern of emotional engagement across time may vary and differentially affect PTSD treatment outcome. Indeed, among those receiving cognitive therapy for depression, individuals fitting distinct patterns of change during treatment had better outcomes than those who did not fit a specific trajectory (Vittengl et al., 2013). Understanding engagement trajectories and their relation to improvement in treatment will bring us closer to knowing what is "optimal" during imaginal exposure. Previous research has examined trajectories of response to treatment for PTSD (e.g., Stein et al., 2012), but only looking at differences in PTSD symptoms that indicate response or non-response to treatment. No study to date has examined trajectories of emotional engagement, specifically, as a way a tracking change in PTSD symptoms session by session in treatment. What remains to be examined is whether there are specific sessions during PE in which fear activation needs to occur and how much engagement is necessary for optimal PTSD symptom change.

#### **Predictors of Emotional Engagement Trajectory and Outcome**

Unique client and therapist characteristics have the potential to impact treatment

trajectories (e.g., Laurenceau et al., 2007). As such, there are likely to be certain characteristics that influence an individual's level of emotional engagement at a specific point or trajectory across time.

**Anxiety sensitivity.** One such factor is an individual's level of anxiety sensitivity, referring to fears of anxiety symptoms that are based on beliefs that these symptoms have harmful consequences (Taylor, 1999). Anxiety sensitivity has been shown to be a risk factor for PTSD (Asmundson, Coons, Taylor, & Katz, 2002). Specifically, individuals with high anxiety sensitivity may interpret PTSD-related symptoms as harmful, leading to anxiety about such sensations. In turn, this secondary anxiety may exacerbate PTSD symptoms (Lang, Kennedy, & Stein, 2002). Heightened levels of anxiety sensitivity have been associated with PTSD severity (e.g. Lang et al., 2002) and decreases in anxiety sensitivity have been associated with PTSD symptom improvement (Fedoroff, Taylor, Asmundson, & Koch, 2000). In a study of 138 active-duty police officers, anxiety sensitivity somatic concerns were significant predictors of PTSD severity (Asmundson & Stapleton, 2008). Similarly, in a prospective study of PTSD symptoms in a non-clinical sample of over 400 young adults, anxiety sensitivity was predictive of PTSD symptoms over an 18 month period (Feldner et al., 2008). Further, in a study of 51 trauma survivors, those who met screening criteria for acute stress disorder had higher anxiety sensitivity relative to their counterparts (Bryant & Panasetis, 2001). These studies illustrate the potentially important relationship between anxiety sensitivity and PTSD; however, this relationship has yet to be studied in the context of emotional engagement.

Anxiety sensitivity is conceptualized as involving three factors: physical concerns, psychological concerns and social concerns (Stewart, Taylor, & Baker, 1997).

15

Many anxiety symptoms are experienced when emotionally engaging with the traumatic memory, such as physical symptoms like heart racing, sweating, feeling nauseous and short of breath and psychological symptoms, like feeling emotionally upset and distressed. It is conceivable that individuals with higher anxiety sensitivity have more trouble engaging emotionally with the traumatic memory during imaginal exposure because they interpret the distress, anxiety, and elicited physical symptoms as harmful/dangerous, leading to anxiety about such sensations during imaginal. Therefore, level of anxiety sensitivity may also impact an individual's emotional engagement trajectory over time. The relationship between anxiety sensitivity and emotional engagement during IE has yet to be explored in a sample of individuals with PTSD. Thus, we will examine whether individuals' pre-treatment anxiety sensitivity influences their trajectory of emotional engagement over the course of treatment.

**Trauma type.** The kind of trauma experienced may relate to one's ability to emotionally engage in and benefit from imaginal exposure. Childhood sexual abuse (CSA) for example has been associated with greater difficulty in the areas of affect regulation and interpersonal relationships (Cloitre, Scarvalone, & Difede, 1997). Affect dysregulation has been purported to be a symptom of complex PTSD, which is thought to be more common among CSA survivors and more difficult to treat than standard PTSD (e.g. Van der Kolk, 2002). Some theorize that because of these additional difficulties managing emotions and relationships, CSA survivors with a complex presentation may have a more difficult time handling standard exposure therapy for PTSD and need additional or phased treatment (e.g., Cloitre et al., 2002). Conversely, there is strong evidence that adults with a childhood abuse history can achieve significant improvements in PE (e.g. Jerud, Zoellner, Pruitt, & Feeny, Resick et al., 2002, 2003, 2014), yet there are treatment guidelines published purporting the necessity of additional treatment for those with histories of CSA (ISTSS, 2012). Information about how a major component of PE, such as IE, may or may not differ for clients based on trauma type would add to the literature informing such guidelines and policies. No previous study has examined whether emotional engagement would proceed similarly for those who have experienced a CSA versus those who have experienced other traumas. An individual's emotional engagement trajectory may be influenced by one's ability to regulate distressing emotions in session and examining differences in engagement trajectories between those with and without a CSA history will help to uncover key differences in these two groups.

Therapist experience level. Therapists' level of experience in providing exposure therapy could also impact their clients' trajectory of emotional engagement. Novice therapists may have less experience dealing with avoidance during imaginal exposures or may feel less comfortable with exposure procedures. A meta-analysis of 15 psychotherapy outcome studies examined therapist factors, including the average level of therapist experience and use of a treatment manual, in order to better understand how the therapist could account for statistically significant differences in treatment efficacy (Crits-Christoph & Mintz, 1991). Results indicated that inexperienced therapists and those not using a treatment manual were associated with more variation in treatment outcome compared to more experienced therapists who saw less variability in their clients' outcomes (Crits-Christoph & Mintz, 1991). In an examination of therapist effects in a large outpatient clinic treating range of mood and anxiety disorders, results suggested that therapist experience level per se did not impact client outcome, but that there were significant differences among therapists in the speed of symptom change and overall amount of change from pre to post-treatment (Okiishi et al., 2006).

On the other hand, another study found no effect of therapist experience level on the psychotherapeutic treatment of depression (Elkin, Falconnier, Martinovich, & Mahoney, 2006). Studies have demonstrated that the outcomes produced by trainees typically do not differ from that of professional mental health providers in general mental health clinics (Beutler, 1997; Beutler et al., 2004; Okiishi et al., 2006). In the only study of therapist effects for PTSD treatment, results indicated that therapists accounted for approximately 12% of the variance in cognitive processing therapy outcomes for PTSD severity, a percentage exceeding that of other naturalistic studies purporting minimal therapist effect on outcome (Laska, et al., 2013). A supervisor, blind to the results, was asked to retrospectively rate each therapist in terms of perceived effectiveness based on supervision interactions. Interestingly, the supervisor believed the ability to address avoidance was related to level of experience as addressing avoidance behavior, a key component of PTSD treatment, can be difficult to address. Thus, as a way to explore the effect of therapist experience level on the provision of imaginal exposure, we examined whether having a Master's versus a Doctoral level therapist was predictive of emotional engagement trajectory across treatment.

#### **Study Aims**

Emotional engagement is theorized to be crucial during imaginal exposure in order for emotional processing of the traumatic memory and resultant recovery from PTSD to occur. Yet, we still know relatively little about common patterns of emotional engagement and whether optimal patterns exist that are differentially related to PTSD

symptom reduction across time. Thus, the current study sought to (1) identify patterns of emotional engagement across treatment sessions among individuals receiving exposure therapy for PTSD, (2) examine individual characteristics (e.g., level of anxiety sensitivity, trauma type, and therapist experience level) that could influence emotional engagement trajectory, and (3) examine the role of emotional engagement in PTSD symptom reduction. First, we examined trajectories of emotional engagement across sessions 3-10 of PE. Using latent class growth modeling (LCGM; e.g. Jung & Wickrama, 2008, Nagin, 2005), we modeled pre (anticipatory) and peak SUDs across these sessions, assigning individuals to trajectory groups based on best probability of group fit. It was hypothesized, based on limited previous research on patterns of emotional engagement (e.g. Jaycox et al., 1998), that at least three trajectory groups would best fit the data, with varied levels of anticipatory and peak emotional engagement (i.e., pre and peak SUDs) and decreased distress across sessions. Second, we examined three potential pretreatment predictors of emotional engagement trajectory: anxiety sensitivity, trauma type (CSA versus non-CSA), and therapist experience level (PhD versus MA). We hypothesized that higher anxiety sensitivity, a history of childhood sexual abuse, and having a less-experienced therapist would be associated with different engagement trajectories across time and less reduction in PTSD symptoms upon treatment completion. Third, we examined emotional engagement trajectory groups as a predictor of PTSD outcome variables (i.e., PTSD severity, responder status, and good end-state functioning) in order to assess for "optimal" trajectories. In line with emotional processing theory, we hypothesized that higher pre and peak levels of emotional engagement that gradually decrease across sessions would be associated with better

treatment outcomes. Finally, we explored session-by-session pre, peak, and end emotional engagement as predictors of subsequent session PTSD symptom change. Based on emotional processing theory (Foa & Kozak, 1986) and the established importance of emotional engagement (e.g. Jaycox et al., 1998), it was hypothesized that a high level of pre and peak, and a lower level of end emotional engagement would lead to a reduction in PTSD symptoms at the subsequent session. The present study has important clinical relevance, providing insight to clinicians on *when* emotional engagement is crucial for change in PTSD symptoms as well as the factors that influence patterns of emotional engagement across treatment.

#### Method

#### **Participants**

The sample consisted of 116 male (24.1%, n = 28) and female (75.9%, n = 88) trauma survivors with a primary diagnosis of chronic PTSD who received PE as part of a doubly randomized preference trial examining choice of PE versus sertraline. Participants' ages ranged from 20 to 62 years with an average age of 36.60 (*SD* = 11.30) years. The sample was 65.5% Caucasian, with the remaining 34.5% identifying with other backgrounds and 64% (n = 74) did not have a college degree. When reporting the traumatic event that bothered them the most, 30.2% identified an adult sexual assault, 20.7% non-sexual assault, 19.2% childhood sexual assault, 6.0% death or suicide of a loved one, 13.8% a serious accident and 2.8% combat. On average, it had been 12.02 (*SD* = 12.24) years since experiencing the trauma associated with their current PTSD diagnosis. See Table 1 for sample characteristics.

Participants were recruited via community referrals, fliers, and media

advertisements in two large metropolitan areas. Inclusion and exclusion criteria for the larger treatment outcome study were minimal and dictated by responsible clinical practice. Inclusion criteria were a primary DSM-IV diagnosis of current, chronic PTSD and the ages 18 through 65 years. Exclusion criteria included a current diagnosis of schizophrenia or delusional disorder, medically unstable bipolar disorder, depression with psychotic features or severe enough to require immediate psychiatric treatment, alcohol or substance dependence within three months prior to assessment, or an ongoing intimate relationship with the perpetrator (in assault cases).

#### **Interview Measures**

Interview measures were completed by independent evaluators who received standardized training on the administration of the PTSD Symptom Scale-Interview Version (PSS-I; Foa, Riggs, Dancu, & Rothbaum, 1993) and Structured Clinical Interview for the DSM-IV (SCID-IV; First, Spitzer, Gibbon, & Williams, 1995). All independent evaluators were required to meet an 80% reliability criterion for each interview measure. All interviewers were trained mental health professional ranging from Master's level clinicians to Ph.D. level psychologists.

**PTSD Severity.** Current PTSD diagnosis and severity was assessed using the PTSD Symptom Scale-Interview (PSS-I; Foa, Riggs, Dancu, & Rothbaum, 1993), a 17-item interview measure that uses DSM-IV symptom criteria. Each item is rated on a four-point Likert scale ranging from 0 to 3 based on frequency and/or severity, with higher levels indicating greater PTSD severity. PTSD diagnosis was attained if at least one re-experiencing, three avoidance, and two arousal items were endorsed. The PSS-I demonstrates good validity and reliability, including good convergent validity (sensitivity

= 88%; specificity = 96%), an inter-rater reliability for PTSD diagnosis of k = .91, and an intraclass correlation for overall severity of r = .97 (Foa et al., 1993).

**Comorbidity and Differential Diagnosis.** The Structured Clinical Interview for DSM-IV (SCID-IV; First, Spitzer, Gibbon, & Williams, 1995) is a semi-structured interview used to determine if other Axis I disorders were primary. This measure was used to determine if the client has a history of MDD. The SCID-IV demonstrates good inter-rater reliability and validity (Skre, Onstad, Torgersen, & Kringlen, 1991).

**Trauma History.** A 12-item semi-structured interview, adapted from the Trauma History Questionnaire (THQ; Green, 1996) and included in previous studies (e.g., Foa et al., 2005), was used to query participants on whether they had ever witnessed or experienced a number of potentially traumatic events including natural disasters, sexual assault, combat, physical illness, and childhood sexual or physical assault. For this study, this measure was used to assess the experience of CSA. CSA was defined as at least one experience, including the primary trauma, prior to age 13, in which someone five or more years older than them had sexual contact with them (i.e., hand to genital or genital to genital contact between someone else and the participant's sexual organs or the participant and someone else's sexual organs).

**Therapist Experience.** The experience level of the therapists was a dichotomous variable determined by therapist degree (Master's or Doctoral level).

#### **Self-Report Measures**

**PTSD Severity.** The PTSD Symptom Scale-Self Report (PSS-SR; Foa, Riggs, Dancu, & Rothbaum, 1993) was completed at the beginning of each therapy session to assess the participant's level of PTSD symptoms over the past week. The PSS-SR is a

17-item version of the Posttraumatic Stress Diagnostic Scale (PDS; Foa et al., 1997). The measure assesses the severity of DSM-IV PTSD symptoms and is used only when primary PTSD diagnostic status has previously been determined. Each symptom is rated on a four-point Likert scale from 0 (*not at all*) to 3 (*very much*), with higher scores indicating more severe PTSD symptoms. The measure has been demonstrated to have high internal consistency ( $\alpha = .91$ ), excellent interrater reliability for PTSD diagnosis ( $\kappa = .91$ ) and overall severity (r = .97), and good test-retest reliability for the total score (r = .83) (Foa et al., 1993).

Anxiety Sensitivity. The Anxiety Sensitivity Index (ASI; Reiss, Peterson, Gursky, & McNally, 1986) was completed prior to beginning treatment and at posttreatment to assess sensitivity to anxiety symptoms. The ASI is a 16-item self-report measure on which participants indicate on a 5-point Likert-type scale (0 = very little to 4 = very much) the degree they fear anxiety symptoms. This measure has good test-retest reliability (Rodriguez, Bruce, Pagano, Spencer, & Keller, 2004) and high internal consistency (Reiss et al, 1986).

**Emotional Engagement.** Emotional engagement was measured using the subjective units of distress scale (SUDs; Wolpe & Lazarus, 1966), where 100 represents the worst anxiety ever felt or could be imagined and 0 represents feeling completely calm and relaxed. During imaginal exposure sessions, the therapist elicited state ratings of distress (SUDs) from the participant every 5 minutes throughout the length of the exposure. The present study utilized pre (initial or anticipatory anxiety) and peak (highest) distress ratings from session 3 through 10 for trajectory analyses in order to separate individuals' anticipatory distress from their highest rating of distress during the

exposure. Pre, peak, and end distress ratings were utilized for session by session analyses to measure distress within *and* across sessions 3 through 10. In general, greater frequency, length, and intensity of exposure are associated with higher SUDs ratings (Kazdin & Wilcoxin, 1976). In addition, higher SUDs ratings are positively associated with measures of state anxiety (Kaplan, Smith, & Coons, 1995) as well as physiological arousal, such as heart rate, peripheral vasoconstriction and digit temperature (Thayer, Papsdorf, Davis, & Vallecorsa, 1984) suggesting good convergent validity. SUDs ratings have been used in previous studies to measure level of emotional engagement or fear activation (e.g., Bluett et al., 2014; Foa et al., 1995, Jaycox et al., 1998; Rauch et al., 2004; Sripada & Rauch, 2015).

#### Procedure

The data for this paper came from a NIMH-funded treatment study for chronic PTSD. Initial eligibility was determined through a semi-structured phone screen, and potentially eligible participants were scheduled for an intake evaluation.

Assessment. Participants provided written informed consent during an initial intake interview with an independent evaluator. After informed consent procedures, independent evaluators blind to the treatment condition conducted structured intake interviews. Independent evaluators were trained to an 80% standard of reliability on interview measures prior to conducting interviews and participated in routine reliability checks. Both demographic and diagnostic information was obtained. Primary diagnosis of chronic PTSD was determined via the PSS-I and comorbid major depressive disorder and other Axis I disorders was determined via the SCID-IV. Following the intake evaluation, if eligible, participants came in for a randomization appointment in which their treatment

condition was determined. Participants also completed a battery of pre-treatment selfreport measures including measures assessing anxiety sensitivity (ASI) and severity of PTSD (PSS-SR).

**Treatment.** PE was conducted based on a treatment manual (Foa, Hembree, & Dancu, 2002) by Master's and Doctoral level therapists. PE consists of 10 weekly, 90-120 minute sessions and includes psychoeducation about common reactions to trauma, breathing retraining, *in vivo* exposure (beginning in session 2), imaginal exposure (beginning in session 3), processing of imaginal exposure, and assigned homework. Imaginal exposure occurs in sessions 3 through 10.

During imaginal exposure, participants were instructed to close their eyes, visualize the trauma, and recount the trauma aloud in the present tense for approximately 30-45 min. According to PE protocol, the therapist is to allow the client to determine the pace and level of detail described during this first exposure but in subsequent sessions is to help the client to emotionally engage if needed by eliciting more detail about their traumatic experience. Subjective ratings of distress (SUDs) were elicited every 5 minutes throughout the imaginal exposures.

PE was concluded after session 10. Independent evaluators remaining blind to the treatment condition conducted structured post-treatment interviews including interview measures of PTSD severity (PSS-I) and differential diagnosis (SCID-IV), and again participants completed a battery of self-report measures including measures assessing anxiety sensitivity (ASI) and severity of PTSD (PSS-SR).

On average, PE participants (N = 116) completed a mean of 7.54 (SD = 3.58, Range = 0 – 10) sessions. All participants who completed at least 3 sessions, 1 of which included imaginal exposure (N = 96) were included in analyses.<sup>1</sup> Imputations were utilized for post-treatment PTSD severity as 7.3% (n = 7) of the sample did not complete the post-treatment evaluation. Previous researchers have suggested that examining imputed data, rather than using a treatment completer sample, is preferred because it results in improved validity of results and reduces the waste of resources caused by missing data (Sterne et al., 2009, IOM, 2008). Data for PSS-I at post-treatment were imputed using SPSS Multiple Imputation procedures.

Analyses examining emotional engagement trajectories utilized the SAS procedure TRAJ (Jones, Nagin, & Roeder, 2001) which summarizes the distribution of individual differences in change over time within the data by testing a finite set of unique polynomial functions each corresponding to a discrete trajectory (Nagin, 2005). Emotional engagement trajectory predictor and treatment outcome analyses were conducted using ANCOVA and Chi-square procedures in SPSS. All time-lagged (session by session) regression analyses were tested in PROC Mixed with restricted maximum likelihood in SAS 9.2. A Toeplitz covariance structure was utilized for all session by session analyses in order to address the issue of covariation among repeated measures.

#### Results

#### **Sample Description**

In general, this sample of individuals with chronic PTSD (N = 96) showed

<sup>&</sup>lt;sup>1</sup> Independent-samples t-test were conducted to determine if there were any pre-treatment differences between those who dropped out prior to session 3 (N = 20) and those who did not drop-out prior to session 3 (N = 96). No differences were found on PTSD severity, t(23.17) = .25, p = .81 or anxiety sensitivity (ASI) t(114) = 1.69, p = .09.

moderate to severe levels of PTSD symptoms (PSS-I: M = 29.32, SD = 6.42, Range = 15 - 45) and moderate levels of anxiety sensitivity (ASI: M = 45.30, SD = 12.81, Range = 21 - 74). Further, 41.7% (n = 40) of the sample experienced a CSA at some point in their lifetime. Sixty-three and a half percent (n = 61) of the sample had a Master's level therapist and 36.5% (n = 35) had a Doctoral level therapist.

Mean levels of pre, peak, and end emotional engagement and IE duration are shown in Table 2. Descriptively, all SUDs ratings gradually decreased over the course of treatment. Pre SUDs started at a moderate intensity (M = 55.73; SD = 24.38) in session 3 and then decreased to a mild intensity (M = 30.32; SD = 20.15) by session 10. Peak SUDs started at a high intensity (M = 81.85; SD = 16.84) in session 3 and then decreased to a moderate intensity (M = 52.91; SD = 24.64) by session 10. End SUDs started at a moderate intensity (M = 60.48; SD = 22.86) in session 3 and then decreased to a lower moderate intensity (M = 40.34; SD = 24.22) by session 10. Duration of IE also decreased gradually from approximately 48 minutes in session 3 to 30 minutes in session 10. A gradual decrease in overall SUDs and duration of IE is typical of PE procedures (Foa et al., 2007).

We also examined the concurrent association among pre, peak, and end SUDs scores across sessions 3 through 10. As summarized in Table 3, among pre, peak and end SUDs, all correlations were large and significant at every session (p < .05).

#### **Trajectories of Pre and Peak Emotional Engagement Across PE Sessions.**

Latent Class Growth Modeling analyses (LCGM) were conducted to identify distinct subgroups of individuals following a similar pattern of change over time on pre and peak emotional engagement. The magnitude and direction of change can vary freely across trajectories so a set of model parameters (i.e., intercept and slope) is estimated for each trajectory (e.g., Nagin, 2005). LCGM provides estimated group membership probabilities calculated for each trajectory and corresponds to the aggregate size of each trajectory or the number of participants belonging to a given trajectory. Ideally, each trajectory should hold an approximate group membership probability of at least five percent (Nagin, 2005). It should also be noted that performing LCGM with smaller sample sizes, i.e. sample size less than 100, limits the power of the analysis and the number of classifiable trajectories (Nagin, 2005). In such instances, it is acceptable to adopt a more liberal significance criterion (e.g., p < .10; Tabachnick & Fidell, 2007), however, we determined to use the more conservative p < .05 to determine significance since our sample was fairly close to 100.

We chose to use pre and peak SUDs within the same trajectory model because simply using a change score (e.g., peak minus pre) would not allow us to delineate between those who start highly engaged and then decrease by half versus those who start moderately engaged and decrease to zero (e.g., 100-50 vs 50-0), as they would have the same change score. Previous research has found an association between higher pre SUDs in the first IE session and non-improvement in PE (van Minnen & Hagenaars, 2002), thus we thought it important to better understand the impact of pre SUDs across all treatment sessions.

We evaluated trajectory models of pre and peak SUDs ratings from sessions 3-10 with 1 to 5 subgroups: intercept only (no change), linear (straight line trajectory), quadratic (one curve or bend in the trajectory), and cubic (two curves or bends in the trajectory), favoring models with lower BIC values (Jones & Nagin, 2007). To determine

the best fit for *number* of groups, a recommended strategy is to estimate a series of models with progressively greater numbers of trajectory classes and compare fit indices until a minimum fit value is found (Jones, Nagin & Roeder, 2001). It was determined that a model with 3 separate groups (BIC = -5575.63) best fit the data and was better than the 1-group (BIC = -5690.26) and 2-group (BIC = -5583.88) solutions. The 4-group solution did not improve model fit (BIC = -5579.49). Individuals grouped by growth modeling are more similar in trajectory to one another than they are to individuals in different groups (e.g., Jung & Wickrama, 2008). To determine the *shape* of groups over time, we then systematically tested models fits until a minimum BIC value is found. It was determined that 3 linear groups best fit the data (BIC = -5556.71). See Table 2 for model statistics. Both Group 1 and Group 3 (see Figure 1) showed only modest change in SUDs across time. Group 1 (n = 39), low distress and low change (LOW), displayed generally lower pre SUDs and showed a moderate spike in peak SUDs during each session. Group 3 (n =43), high distress and low change (HIGH), had moderately high pre SUDs, had the highest peak SUDs of all three groups, and similar to Group 1, displayed a modest decreases in SUDs across time. Group 2 (n = 14), high distress and gradual decline to low distress (DECLINE), was the smallest group and individuals tended to start session 3 with higher pre and peak SUDs with a steady decrease in pre and peak SUDs across treatment sessions. Notably, all of the pre SUDs for the HIGH group were consistently higher than all of the *peak* scores from the LOW group. Results from this model suggest the presence of three linear groups in which the trajectory of emotional engagement across time distinguishes group membership.

Pre-treatment predictors of emotional engagement trajectory groups. We

used ANCOVA and chi-square tests of independence analyses in order to examine the relationship between individual characteristics and emotional engagement trajectory. In examining differences among the groups on anxiety sensitivity at pre-treatment, the predicted main effect of emotional engagement group when controlling for pre-treatment PTSD severity was not significant, F(2, 92) = .26, p = .77,  $\eta p 2 = .006$ , suggesting that groups were not differentiated by pre-treatment level of anxiety sensitivity. See Table 5 for anxiety sensitivity means by group.

In examining differences among groups on CSA status, a chi-square test for independence indicated no significant association between emotional engagement trajectory group and having a history of CSA,  $\chi^2$  (2, n = 96) = .02, p = .99, phi = .01, suggesting that groups were not differentiated by trauma type.

In examining differences among groups on therapist experience level, a chisquare test for independence indicated a significant association between emotional engagement trajectory group and therapist experience level,  $\chi^2$  (2, n = 96) = 7.77, p < .05, phi = .28, suggesting that groups were differentiated by proportion of Master's to Doctoral level therapists. There was a higher proportion of Master's level therapists to Doctoral level therapists within the DECLINE group (92.9%, n = 13 vs 7.1%, n = 1).

# Emotional engagement trajectory groups as predictor of PTSD outcome variables.

In examining differences among groups on PTSD severity at treatment outcome, the predicted main effect of emotional engagement group when controlling for pre-treatment PTSD severity trended toward significance, F(2, 92) = 2.75, p = .069,  $\eta p 2 = .056$ , suggesting that groups differed based on PTSD severity at outcome. See Figure 1 for

depiction of groups' mean levels of PTSD severity at pre- and post-treatment. Individuals in the DECLINE group had significantly lower PSS-I scores at outcome than those in the HIGH and LOW groups.

We tested differences among groups on other measures of treatment outcome, namely responder status and end-state functioning. An individual was determined a treatment responder if their post-treatment PSS-I score was < 24 and they met criteria for adequate global level of functioning. An individual met end-state functioning criteria if they met for non-clinical severity across multiple indices of PTSD, depression, and anxiety (e.g., Feeny, Zoellner, Mavissakalian, & Roy-Byrne, 2009). Chi-square tests for independence indicated no significant association between emotional engagement trajectory group and responder status,  $\chi^2$  (2, n = 89) = .34, p = .85, phi = .06, and no significant association between emotional engagement trajectory group and good endstate functioning,  $\chi^2$  (2, n = 89) = .64, p = .73, phi = .09. These results suggest that although emotional engagement trajectory groups were differentiated by PTSD severity at treatment outcome, groups were not differentiated by responder status or end-state functioning. According to mean post-treatment PSS-I scores, individuals from all three groups benefitted from PE.

Session-by-session changes: emotional engagement as a predictor of PTSD symptom reduction. The final goal of the proposed study was to explore the relationship between emotional engagement (i.e., pre, peak, and end SUDs) and PTSD symptom reduction. The main goal of this set of analyses was to examine whether session by session changes in emotional engagement predicted changes in subsequent session PTSD symptoms. We utilized time-lagged regression models to test the relationship between emotional engagement and PTSD symptom change. This statistical model allows for an examination of potential causal relationship between two variables, examining the strength of the relationship between a predictor at Time 1, and a dependent variable at Time 2, while controlling for the autocorrelation with that predictor at Time 1. Our dataset included PSS-SR scores from sessions 3-10 and pre, peak, and end SUDs from sessions 3-10.

We conducted three sets of analyses with PTSD severity (at session k+1) as the dependent variable and emotional engagement (reported during session k) variables as the predictor: (1) pre SUDs predicting next-session PSS-SR, (2) peak SUDs predicting next-session PSS-SR and, (3) end SUDs predicting next-session PSS-SR. In all three sets of analyses, duration of IE was used as a control variable as it can vary from individual to individual and session to session. See Table 2 for mean duration of imaginal in minutes for each session.

As shown in Table 7, the cross-lagged effect of pre SUDs level on subsequent PSS-SR score was negligible to small and not significant, suggesting that intensity of beginning SUDs level was not driving or impacting subsequent changes in PSS-SR scores when controlling for duration of exposure (r = .01). The effect of peak SUDs level on subsequent PSS-SR score was negligible to small and not significant, suggesting that intensity of peak SUDs were not driving or impacting subsequent changes in PSS-SR scores when controlling for duration of exposure (r = .03). Similarly, the effect of end SUDs level on subsequent PSS-SR score was negligible to small and not significant, suggesting that intensity of end SUDs were not driving or impacting subsequent changes in PSS-SR scores when controlling for duration of exposure (r = .03). Similarly, the effect of end SUDs level on subsequent PSS-SR score was negligible to small and not significant, suggesting that intensity of end SUDs were not driving or impacting subsequent changes in PSS-SR scores when controlling for duration of exposure (r = .03). Overall, these

results suggest that pre, peak, and end SUDs do not impact PTSD symptoms in the next session when controlling for duration of IE.

Session-by-session changes: emotional engagement as a predictor of PTSD symptom reduction with differences by trajectory group. All three models suggested that emotional engagement (i.e., pre, peak, and end SUDs) did not impact PTSD symptom change in the following session, however (as shown in Table 2 and Figure 2), pre, peak, and end SUDs scores changed substantially over time and in different ways depending on group so it is possible that engagement trajectory membership informs the nature of the relationship between SUDs and next session PTSD symptom change. Thus, we determined it important to explore the role of group membership (HIGH, LOW, or DECLINE) on the relationship between pre, peak and end SUDs and PTSD symptom change. As a preliminary step, we tested whether groups differed in their relationship to PTSD symptom change in the model when controlling for exposure duration, which was significant, F(2, 87) = 3.00, p = .05. Then, we examined interaction contrasts to determine where the differences lied between groups when controlling for exposure duration. Analyses revealed the DECLINE group was significantly different from the LOW group (F(1, 87) = 5.60, p = .02), and the DECLINE group was significantly different from the HIGH group (F(1, 87) = 4.34, p = .04). LOW was not significantly different from HIGH (F(1, 87) = .12, p = .73). These results suggest a significant relationship between next session PTSD symptom change and group membership, with noted differences between the group with reduced SUDs over time (DECLINE) versus the groups where only minimal reduction of SUDs was present (LOW and HIGH).

Given the significance of emotional engagement trajectory group on PTSD

symptom change, we conducted follow up analyses examining the pre, peak, and end SUDs models moderated by group membership. First, we tested the relationship between **pre** SUDs and PSS-SR change moderated by group, controlling for exposure duration. The cross-lagged effect of pre SUDs level on subsequent PSS-SR score, when controlling for duration trended toward significance (F(2, 499) = 2.40, p = .09), with contrasts showing that the main difference was between the DECLINE group and the HIGH group (F(1, 499) = 3.79, p = .05) with differences trending significance between the LOW and DECLINE groups (F(1, 499) = 3.21, p = .07), suggesting that higher intensity of pre SUDs was impacting lowered PSS-SR scores depending on group. However, specific group effects were not significant for LOW (F(1, 205) = 0.01, p = .92, r = .07), DECLINE (F(1, 90) = 2.40, p = .12, r = .16, or HIGH (F(1, 200) = 1.07, p = .30, r = .01),suggesting that the nature of the relationship between pre SUDs and PTSD symptom change in the next session differs as a function of group. However, specific group differences were difficult to detect as they were not adequately powered due to the small size of the DECLINE group.

Second, we tested the relationship between **peak** SUDs and PSS-SR change moderated by SUDs trajectory group, controlling for duration. The cross-lagged effect of peak SUDs level on subsequent PSS-SR score, when controlling for duration was significant (F(2, 501) = 4.35, p = .01), with contrasts showing that the main difference was between LOW and HIGH (F(1, 501) = 8.10, p < .01) with a trend toward a significant difference between LOW and DECLINE (F(1, 501) = 3.49, p = .06), suggesting that intensity of peak SUDs was impacting subsequent changes in PSS-SR scores depending on group. Specifically for the HIGH group, peak SUDs was robustly related to higher PSS-SR next session (F(1, 201) = 8.24, p < .01, r = .20), suggesting that higher intensity of peak SUDs was driving or impacting subsequent higher PTSD symptom scores in the next session when controlling for duration. This same effect was not significant for the LOW group (F(1, 205) = 0.20, p = .65, r = .06) or the DECLINE group (F(1, 91) = 0.35, p = .55, r = .03). Thus, there appears to be a significant relationship between higher peak engagement and higher PTSD symptoms in the next session, but only for those members of the HIGH emotional engagement group.

Third, we tested the relationship between **end** SUDs and PSS-SR change moderated by group, controlling for exposure duration. The cross-lagged effect of end SUDs level on subsequent PSS-SR score, when controlling for duration was significant (F(2, 501) = 5.79, p < .01), with contrasts showing that the main differences were between LOW and DECLINE (F(1, 501) = 4.73, p = .03) and LOW and HIGH (F(1, 501) = 11.39, p < .01), suggesting that intensity of end SUDs impacted subsequent changes in PSS-SR scores depending on group. Specifically for HIGH, end SUDs was robustly related to PSS-SR next session (F(1, 201) = 8.56, p < .10, r = .20) suggesting that higher intensity of end SUDs was driving or impacting subsequent higher PSS-SR scores in the next session when controlling for duration. This same effect was not significant for LOW (F(1, 205) = 2.19, p = .14, r = .10) or DECLINE (F(1, 91) = 0.30, p = .59, r = .06). This suggests a significant relationship between higher end engagement and higher PTSD symptoms in the next session, but only for those members of the HIGH emotional engagement group.

Finally, because pre, peak, and end SUDs do not occur as separate processes and are often highly related and overlap with one another, it was also important to examine

them simultaneously. In order to get a comprehensive understanding of the role of pre, peak, and end SUDs within the same model, we tested the relationship between peak SUDs and PSS-SR change moderated by group interaction while controlling for current PSS-SR, duration of IE, and pre and end SUDs level. The cross-lagged effect of peak SUDs level on subsequent PSS-SR score, when controlling for current PSS-SR, duration of IE, and pre and end SUDs level was significant (F(2, 497) = 4.26, p = .01) suggesting that intensity of peak SUDs was impacting subsequent changes in PSS-SR scores depending on group membership. Interaction contrasts showed significant differences between the LOW and HIGH groups (F(1, 497) = 7.98, p < .01) and less robustly between LOW and DECLINE (F(1, 497) = 3.44, p = .06). Group differences are shown in Table 8. For HIGH, higher pre SUDs was related to having lower PSS-SR scores in the following session (p = .01, r = .17), higher peak SUDs was related to having higher PSS-SR scores in the following session (p < .05, r = .15), and higher end SUDs was related to having higher PSS-SR scores in the following session (p < .05, r = .16). LOW and DECLINE did not show significant effects of pre, peak, or end SUDs on next session PTSD symptoms. These results indicate that for individuals with a HIGH engagement trajectory, having higher pre SUDs, but lower peak and end SUDs is related to lower severity of PTSD symptoms in the following session.

#### Discussion

Emotional engagement is a theoretically central mechanism of exposure therapy (e.g. Foa & Kozak, 1986; Foa et al., 2007) yet, we still do not fully understand how to best "optimize" patterns of engagement over the course of treatment nor how such patterns differ according to individual characteristics. In this study, we examined both

trajectories of pre and peak emotional engagement and session-by-session effects of emotional engagement on PTSD symptom change over the course of exposure therapy. Results suggest a number of insights into understanding emotional engagement as a process in exposure therapy. First, this study provides evidence for three distinct, clinically meaningful, trajectories of change in emotional engagement from session 3 to 10 of PE. Second, while all three groups improve, the group with moderate starting (or anticipatory) engagement, high peak levels of engagement and a gradual linear decrease in these levels, which we term DECLINE has the lowest PTSD severity at the end of treatment. Third, we have shown that within a specific emotional engagement trajectory distinguished by consistently high emotional engagement, HIGH, there are significant relationships between pre, peak, and end distress ratings and change in PTSD severity in the following session. These findings highlight emotional engagement as a process that varies considerably among clients within and across sessions and are not supportive of the notion that reduction in engagement between sessions is a necessary mechanism of therapeutic change (Foa & Kozak, 1986; Rachman, 1980).

**Trajectories.** Individuals varied considerably in how they engaged with the trauma memory over the course of treatment. Three distinct trajectories of engagement patterns, including pre and peak emotional engagement across sessions, emerged. Two groups, LOW and HIGH, showed modest linear decreases in anticipatory (pre) and peak engagement across treatment sessions, and one group, DECLINE, showed a gradual linear decrease in both anticipatory and peak engagement across sessions. These groups are not dissimilar from the three clusters generated by Jaycox et al. (1998), which consisted of high engagement and habituation, high engagement and no habituation, and

low engagement and no habituation. However, this was the first study to examine anticipatory and peak distress ratings as separate entities within one model across eight exposure sessions. Distinguishing between individuals' starting points of distress each session and the highest point reached allowed for a more fine-grained analysis of how emotional engagement changes over time. Differences emerged among the three groups in terms of the level of distress they experienced at pre and peak throughout exposures, with the largest groups, LOW and HIGH, having very little overlap. This could mean that emotional engagement is not a process to be "optimized" but a procedure to be identified and customized for each individual client.

Theoretically, emotional engagement encourages emotional processing of the trauma memory by bringing emotions like anger, guilt, shame, sadness, and fear to the surface in-session in a process that helps the client learn to tolerate and gradually decrease such emotions (e.g. Foa & Kozak). However, these results, in line with previous research in PTSD (Bluett et al., 2014; Jaycox, et al., 1998) and the anxiety disorders at large (e.g. Lang & Craske, 2000; Meuret, Seidel, Rosenfield, Hofmann, & Rosenfield, 2012) suggests that emotional engagement is not a "one-size fits all" procedure. For example, there are some individuals who have high levels of anticipatory anxiety prior to imaginal exposure and others who show only minimal anticipatory distress. Further, there are some individuals who show decreases in their distress response (i.e., engagement), while others maintain distress *but* are able to tolerate it and improve their PTSD. Clinically, this suggests the possibility of multiple options in how clinicians frame treatment for individuals based on their pattern of engagement over time, such that some may benefit from extra "pushing" while others need only slight encouragement.

These emotional engagement trajectories both complement and contradict what has been presented as crucial components of exposure therapy according to emotional processing theory, i.e., the necessity of high emotional engagement and between and within session habituation of distress. The characteristics of those in the DECLINE group, starting at a high intensity of distress with a steady, gradual decrease to a mild intensity of distress by session 10, appears to illustrate "traditional" emotional processing according to emotional processing theory (Foa & Kozak, 1989). This group shows high emotional engagement at the start and gradual between-session habituation of fear and distress. Individuals in LOW show a consistently lower intensity of distress, with peak ratings never even reaching the moderate range of engagement. Individuals in the HIGH trajectory show a consistently high intensity of distress with pre and peak ratings never lower than the moderate range of engagement. Standard PE protocol encourages providers to aim for high emotional engagement and gradual decreases in distress within and across sessions (Foa et al., 2007); however, consistent with Bluett et al.'s (2014) findings, this trajectory (DECLINE) was not common in our sample (15%). Indeed, most individuals fell into the groups characterized by only marginal decreases in distress and opposing starting points (85%). This is important in terms of how PE providers conceptualize the course of their clients' treatment and how emotional engagement should change over time, such that normalizing the client's pattern of change over time may be a more helpful task than pushing for maximum level of engagement.

**Predictors.** High anxiety sensitivity and history of CSA were not found to predict emotional engagement trajectory, and in extension, whether individuals were more likely to see a reduction in their distress. Although anxiety sensitivity has been shown to be related to PTSD symptoms (e.g., Asmundson & Stapleton, 2008), it was not found to be a predictive of how emotional engagement unfolded over time. Perhaps, anxiety sensitivity is not the characteristic that impacts one's anticipatory level of distress, as hypothesized. There may be other signifiers of this relationship, such the ability to handle distress (e.g., distress tolerance, Bluett et al., 2014) or the ability to regulate emotion (Frewen & Lanius, 2006) that impact anticipatory distress level across treatment. However, further research is necessary to better understand the nature of the relationship between individual characteristics that determine anticipatory and peak engagement and their change (or lack of change) during therapy.

Furthermore, a history of CSA was not found to be predictive of emotional engagement trajectory. Those with CSA history were not differentiated from the clients without such history in our analyses. However, there is a growing body of research that shows that those with history of CSA and/or complex PTSD do well in standard exposure therapy (e.g., Jerud, Zoellner, Pruitt, & Feeny, 2014; Resick et al., 2002; 2003, 2014). In fact, it has been suggested that exposure therapy may improve emotion regulation by promoting inhibitory learning and encouraging distress tolerance skills (e.g., Craske et al., 2008). This study is further evidence that those with history of CSA proceed similarly through PE to those of other trauma types.

In terms of how therapist experience plays a role in emotional engagement, the DECLINE trajectory, which showed the lowest PTSD severity at outcome, was characterized by a higher proportion of Master's level therapists to Doctoral level therapists. This was the smallest group (n = 14), so it is unclear whether this finding is generalizable. Yet, it may be that Master's level therapists were generally more adherent

to the PE protocol. Previous research has found a positive relationship between therapist competence, including adherence, and depression treatment outcomes (Strunk et al., 2010; Webb, DeRubeis, & Barber, 2010). Although groups did not differ on PTSD severity at pre-treatment, it may also be that individuals within the DECLINE group were more "ready" to change and thus got more out of treatment than others independent of therapist experience level. Indeed, process research has begun to explore the variability among clients in the degree to which the quality of therapy provided to them will affect their outcomes and how "pliant" they are to psychotherapy (DeRubeis, Gelfand, German, Fournier, & Forand, 2014). Further research is necessary to explore each of these individual characteristics as they relate to the exposure therapy process.

**Outcome.** In partial support of our hypothesis that higher anticipatory and peak engagement that gradually decreases across sessions would be associated with better treatment outcomes, those in the DECLINE group had the lowest PTSD severity post treatment. However, all three groups showed substantial improvement in PTSD severity and did not differ on likelihood to achieve good end state functioning or remission. Specifically, in the consistently high engagement trajectory (HIGH) 52.6% met criterion for good end state functioning and 92.3% were classified as treatment responders. This is in contrast to previous research showing a relationship between non-improvement in treatment and higher levels of pre SUDs at the start of PE (van Minnen & Hagenaars, 2002). *Neither* higher nor lower emotional engagement at the start of treatment was found to be predictive of later non-improvement. It seems there are multiple pathways of engagement that can lead to sufficient relief of PTSD symptoms. Perhaps this is evidence for *multiple* "optimal" trajectories of emotional engagement.

Previous research on patterns of emotional engagement has shown that PE is a robust treatment for chronic PTSD regardless of change in emotional engagement (Jaycox et al., 1998). Indeed, the majority of our sample inhabited two trajectory groups that did not show large decreases in distress across sessions but still improved their PTSD symptoms significantly. Research has shown between-session habituation of distress not required for good PE outcome (Bluett et al., 2014; Jaycox et al., 1998; Rauch et al., 2004; van Minnen & Hagenaars, 2002). This may mean that reduction in engagement/distress between sessions is a not a necessary mechanism of therapeutic change as originally hypothesized (e.g. Foa & Kozak), but perhaps a pattern that distinguishes certain individuals that may especially benefit from exposure therapy based on their readiness for therapeutic change (DeRubeis et al., 2014). Indeed, those who are able to achieve a significant reduction in distress saw even greater reduction in PTSD symptoms and may be a distinctive group. Further research is needed in order to understand treatment readiness factors as related to mechanisms of change, including emotional engagement, as being more eager or "ready" to change may relate to individual differences in the treatment process.

Session by Session. Emotional engagement was found to impact next session PTSD severity, but only for those individuals in the HIGH emotional engagement trajectory. For the HIGH group at the trajectory level, pre and peak distress were consistently high with little decline in subjective distress across sessions. At the session by session level, higher anticipatory distress and lower peak and end distress were related to lower PTSD symptom ratings in the following session. This same relationship was not evident in the LOW and DECLINE groups. It may be that individuals in the HIGH group were generally more reactive, perhaps a knowable pre-treatment trait, and were in need of at least slight within-session habituation to achieve their best possible outcome. Withinsession habituation is generally accepted as welcome but unnecessary for good treatment outcome (e.g., Mueret et al., 2012; van Minnen & Foa, 2006; van Minnen & Hagenaars, 2002). However, this study may be the first evidence that a decrease in distress within session may be optimal for specific individuals.

Clinically, PE providers can use these trajectories to conceptualize their clients' paths of emotional engagement during treatment. For example, taking notice of whether or not a client is achieving some form of habituation, either within-session for those characterized by the HIGH group or between-session for those characterized by the DECLINE group. This could be useful in moderating the experience for the client and alleviating worry about having to push them to their maximum distress, especially if they are starting the exposure with high anticipatory distress. The PE provider can reinforce to the client that it is ok to have distress and that they are learning to tolerate it or conversely, normalize the experience of having moderate distress.

It should be reassuring that clinicians need not necessarily worry if their clients are not showing decreased distress at later stages of treatment, or the opposite, if they are only showing low to moderate intensity of distress. Clinically, these results may imply that for some, pushing for maximum fear activation is not necessary and, for individuals characterized by high anticipatory and peak distress, may actually lead to *less* change in PTSD symptoms in the following session when pushed to high peak and end distress levels. Other mechanisms of change have been suggested to impact the course of exposure therapy such as cognitive change (Zalta et al., 2014) and distress tolerance (Bluett et al., 2014; Craske et al., 2008). Perhaps there are individual differences in the most beneficial mechanisms of change in exposure therapy. Further research matching individual characteristics to specific mechanisms of change would provide the best chance to optimize exposure therapy for each client.

**Limitations.** Our results should be interpreted with several limitations in mind. First, SUDs are an imperfect measure of emotional engagement, as self-reported fear response can differ from physiological arousal for some individuals dependent on fear context (Lang, Levin, Miller, & Kozak, 1983; Lang & Craske, 2000). Fear activation in the form of physiological arousal has been suggested as critical to successful exposure therapy and a marker for emotional engagement (Foa et al., 1995; Norton, Hayes-Skelton, & Klenck, 2011). However, SUDs ratings are commonly used in research (e.g., Jaycox et al., 1998; Sripada & Rauch, 2015) and clinically useful as they are face-valid, easy to understand and to capture during exposure. Future research should examine SUDs across sessions accompanied by physiological measures of anxiety during exposure as this may give additional (or different) predictive power than subjective ratings alone (Griffin, Nishith, Resick, & Yehuda, 1997). Second, this study only examined the course of change in emotional engagement as related to imaginal exposure. Another essential component of PE is *in vivo* exposures, in which clients approach feared situations as homework assignments between sessions. Learning to tolerate distress and anxiety related to *in vivo* exposures may generalize and impact the course to of emotional engagement as well. On the other hand, imaginal exposures provide a standardized exposure to study across time, and in vivo homework can vary substantially among clients making it hard it capture change in distress systematically. As a final limitation,

there are other statistical programs available for estimation of latent classes (e.g., Mplus) and the outcome of latent class analyses may differ according to the specified estimation parameters. The TRAJ procedure we utilized does not include growth factor variances within trajectory classes while MPlus does consider such variance. This may affect the trajectory group membership of a few cases; however it is unlikely that including such variation would affect the overall outcome and inferences of the analyses when following previously set guidelines (Jones & Nagin, 2007).

Results of this study begin to unpack the course of emotional engagement over time and provide three distinct trajectories that are related differentially to PTSD severity following treatment. The DECLINE trajectory, characterized by initially high anticipatory and peak distress that both gradually decline to low distress, showed the lowest PTSD severity post treatment. It is important to note however, that all three patterns of engagement, HIGH, LOW and DECLINE, showed substantial improvement in PTSD and do not differ in their likelihood to respond to treatment or reach god end state functioning. Currently, there is debate over the necessity of between-session habituation of distress over the course of PE (e.g. Bluett et al., 2014, Sripada & Rauch, 2015). However, rather than asserting the necessity of one pattern of change as superior or inferior, these results suggest the presence of various patterns of emotional engagement and that "all roads" lead to success on average. It becomes the clinician's job to help each client get the most out of treatment regardless of pattern on engagement. In our HIGH group, for example, it seems that at least a small decrease in distress withinsession is needed in order to see the optimal outcome. Overall, this study points to emotional engagement as a transactional process that is an important marker of

therapeutic change influenced by individual differences in how therapy proceeds across treatment.

## Sample Characteristics

Demographic Variable	%	
Gender		
Female	75.9	
Primary Trauma		
Adult Sexual Assault	30.2	
Childhood Sexual Assault	19.2	
Adult nonsexual assault	20.7	
Accident (motor vehicle)	13.8	
Childhood nonsexual assault	7.8	
Other (e.g., death/violence to a loved	6.0	
one)		
Combat/war	2.8	
Education level		
Not college educated	64	
Ethnicity		
Caucasian	65.5	
Other	34.5	

Session	Pre SUDs	Peak SUDs	End SUDs	Duration of IE (minutes)	
3 ( <i>n</i> = 95)	55.73(24.38)	81.85(16.84)	60.48(22.86)	48.16(12.11)	
4 ( <i>n</i> = 89)	49.18(22.80)	74.85(19.34)	56.13(22.82)	42.94(9.86)	
5 ( <i>n</i> = 83)	44.75(21.76)	71.54(18.69)	57.07(21.79)	42.27(10.48)	
6 ( <i>n</i> = 76)	42.93(24.52)	67.36(21.30)	52.80(24.16)	39.08(11.51)	
7 ( <i>n</i> = 76)	42.03(19.23)	65.04(20.73)	51.24(25.10)	39.08(8.55)	
8 ( <i>n</i> = 75)	38.51(21.25)	63.52(22.04)	48.29(25.45)	38.13(9.36)	
9 ( <i>n</i> = 71)	33.87(19.85)	57.24(23.21)	44.10(23.76)	37.75(9.33)	
10 ( <i>n</i> = 68)	30.32(20.15)	52.91(24.64)	40.34(24.22)	30.37(7.65)	

Average Emotional Engagement Across Time During PE(N = 96; M(SD))

*Note.* SUDs collected every 5 minutes during IE. Pre SUDs = rating collected at start of IE; Peak SUDs = highest rating collected; End SUDs = rating collected at end of IE.

Average Correlations among Pre, Peak, and End SUDs Across Sessions
--

	1	2	3
1. Pre SUDs			
2. Peak SUDs	.59 <sup>(8/8)</sup>		
3. Post SUDs	.51 <sup>(8/8)</sup>	.76 <sup>(8/8)</sup>	

Note. Correlations reported are the average of the correlations at each session.

To compute averages, correlations were converted to z-scores. The z-scores reflecting associations of the same two constructs were averaged across sessions, and these averages were then converted back to the r-type effect sizes shown above. Significance tests were performed at each session. The fractions in superscript indicate at how many of the sessions the relationship was significant (p < .05).

Pre to Peak Emotional Engagement Parameter Estimates, Errors, t-Tests, and p-Values

(	(n)	=	96)
			/ //

Group	Parameter	Estimate	SE	t	p Value
1	Intercept	51.77	2.48	20.89	< .001
	Linear	-2.43	0.50	-4.91	<.001
2	Intercept	89.99	4.06	22.16	<.001
	Linear	-8.446	0.77	-11.03	<.001
3	Intercept	81.27	2.14	38.01	<.001
	Linear	-2.52	0.44	-5.78	<.001

Note. Model fit determined by Bayes Information Criterion (BIC), BIC= -5556.71



*Figure 1*. Emotional Engagement Trajectory Groups Characterized by Pre and Peak SUDs. PreG1 = pre SUDs for Group 1; pkGI = peak SUDs for Group 1, preG2 = pre SUDs for Group 2; pkG2 = peak SUDs for Group 2; preG3 = pre SUDs for Group 3; pkG3 = peak SUDs for Group 3.

			Anxiety <u>Sensitivity</u>		<u>CSA</u>	Novice <u>Therapist</u>
	n	Group Name	Mean	SD	%	%
1	39	Low distress, low change (LOW)	45.42	13.88	41.0	51.3
2	14	High distress, gradual decline to low distress (DECLINE)	47.22	11.11	42.9	92.9
3	43	High distress, low change (HIGH)	44.56	11.01	41.9	65.1
Total	96		45.30	12.18	41.7	63.5

## Pre-treatment Predictor Variables By Emotional Engagement Trajectory Groups

*Note.* Anxiety sensitivity measured at pre-treatment with Anxiety Sensitivity Index (ASI); CSA = child sexual assault, criteria met if client experienced in trauma history or as target trauma

			Responder	GESF
Group	n	Group Name	%	%
1	39	Low distress, low change (LOW)	88.9	45.7
2	14	High distress, gradual decline to low distress (DECLINE)	92.9	57.1
3	43	High distress, low change (HIGH)	92.3	52.6
Total	96		91.0	50.6

## Post-treatment Variables By Emotional Engagement Group

*Note*. Responder Status was met with non-clinical severity across multiple indices of PTSD, depression, and anxiety; GESF = good end state functioning, was met if PTSD Symptom Scale Interview (PSS-I) <24 and clinician indicated adequate global functioning; percentages indicate % of people within group that met criteria for responder status and GESF.



*Figure 2.* PTSD Severity at Pre- and Post-treatment By Emotional Engagement Trajectory Group. PSS-I = PTSD Symptom Scale-Interview

Test and variable $(N = 96)$	В	SE	t	р	r			
Predicting PSS-SR from Pre SUDs Controlling for IE Duration								
Intercept	-2.33	0.90	-2.57	.01	.26			
Lagged PSS-SR	0.88	0.02	43.47	<.0001	.89			
Duration	0.06	0.02	2.91	<.01	.13			
Pre SUDs	0.002	0.01	0.23	.82	.01			
Predicting PSS-SR from	Predicting PSS-SR from Peak SUDs Controlling for IF Duration							
Intercept	-2 49	0.94	-2.63	0.01	27			
Lagged DSS_SP	0.87	0.02	40.22	< 0001	.27			
Laggeu F 55-5K	0.07	0.02	40.22	<.0001	.07			
Duration	0.06	0.02	2.75	.01	.12			
Peak SUDs	0.01	0.01	0.70	.48	.03			
Predicting PSS-SR from	End SUDs Co	ontrolling fo	or IE Durati	on				
Intercept	-2.55	0.92	-2.78	<.01	.28			
Lagged PSS-SR	0.87	0.02	41.26	<.0001	.88			
Duration	0.06	0.02	2.91	<.01	.13			
End SUDs	0.01	0.01	1.14	.25	.05			

## Time Lagged Regressions of Emotional Engagement and PTSD Symptoms

*Note.* PSS-SR = PTSD Symptom Scale – Self Report;  $r = \mathbf{r}_{Y\lambda}$  where  $\mathbf{r}_{Y\lambda} = \sqrt{t^2 / (t^2 + df)}$ 

Time Lagged Regressions of Emotional Engagement and PTSD Symptoms By Trajectory

Groups

Test and variable $(N = 96)$	В	SE	t	р	r
Group 1					

Predicting PSS-SR from Peak SUDs Controlling for IE Duration, Pre SUDs, and End SUDs

Group 2					
End SUDs	-0.04	0.03	-1.50	.14	.10
Peak SUDs	0.02	0.03	0.61	.54	.04
Pre SUDs	-0.00	0.03	-0.03	.98	.00
Duration	0.06	0.04	1.35	.18	.09
Lagged PSS-SR	0.78	0.04	19.32	<.0001	.80
Intercept	0.97	1.68	0.58	.57	.09

Predicting PSS-SR from Peak SUDs Controlling for IE Duration, Pre SUDs, and End SUDs

Group 3					
End SUDs	0.01	0.03	0.22	.82	.02
Peak SUDs	-0.02	0.04	-0.49	.62	.05
Pre SUDs	0.04	0.03	1.57	.12	.17
Duration	0.04	0.05	0.73	.47	.08
Lagged PSS-SR	0.88	0.05	19.00	<.0001	.90
Intercept	-3.20	1.57	-2.04	0.06	.49

Predicting PSS-SR from Peak SUDs Controlling for IE Duration, Pre SUDs, and End SUDs

Intercept	-6.945	2.127	-3.26	<.01	.47
Lagged PSS-SR	0.857	0.03	27.79	<.0001	.89
Duration	0.05	0.03	1.62	.11	.11
Pre SUDs	-0.04	0.02	-2.47	.01	.17
Peak SUDs	0.07	0.03	2.12	<.05	.15
End SUDs	0.04	0.02	2.22	<.05	.16

*Note.* PSS-SR = PTSD Symptom Scale – Self Report;  $r = r_{Y\lambda}$  where  $r_{Y\lambda} = \sqrt{t^2 / (t^2 + df)}$ 

#### References

Asmundson, G. J. G., Coons, M. J., Taylor, S., & Katz, J. (2002). PTSD and the experience of pain: Research and clinical implications of shared vulnerability and mutual maintenance models. *Canadian Journal of Psychiatry*, 47, 930–937. Retrieved from <u>http://ww1.cpa-</u>

apc.org/Publications/Archives/CJP/2002/december/asmundson.asp

- Asmundson, G. J., & Stapleton, J. A. (2008). Associations between dimensions of anxiety sensitivity and PTSD symptom clusters in active-duty police officers. *Cognitive Behaviour Therapy*, 37(2), 66-75. doi: 10.1080/16506070801969005
- Benjamin, C. L., O'Neil, K. A., Crawley, S. A., & Beidas, R. S. (2010). Patterns and predictors of subjective units of distress in anxious youth. *Behavioural and Cognitive Psychotherapy*, 38, 497–504. doi:10.1017/S1352465810000287
- Beutler, L. (1997). The psychotherapist as a neglected variable in psychotherapy: An illustration by reference to the role of therapist experience and training. *Clinical Psychology: Science and Practice*, *4*, 44–52.doi:10.1111/j.1468-2850.1997.tb00098.x
- Beutler, L., Malik, M. L., Alimohamed, S., Harwood, T. M., Talebi, H., Noble, S., & Wong, E. (2004). Therapist variables. In M. J. Lambert (Ed.), *Bergin and Garfield's handbook of psychotherapy and behavior change* (5th ed., pp. 227–306). New York, NY: Wiley.
- Bluett, E. J., Zoellner, L. A., & Feeny, N. C. (2014). Does change in distress matter?
  Mechanisms of change in prolonged exposure for PTSD. *Journal of Behavior Therapy and Experimental Psychiatry*, 45(1), 97-104. doi:

10.1016/j.jbtep.2013.09.003

- Borkovec, T. D. & Sides, J. (1979). The contribution of relaxation and expectance to fear reduction via graded imaginal exposure to feared stimuli. *Behaviour Research and Therapy*, 17, 529–540. doi:10.1016/0005-7967(79)90096-2
- Bryant, R. A. & Panasetis, P. (2001). Panic symptoms during trauma and acute stress disorder. *Behaviour Research and Therapy*, 39, 961–966. doi:10.1016/S0005-7967(00)00086-3
- Cloitre, M., Scarvalone, P., & Difede, J. (1997). Posttraumatic stress disorder, self- and interpersonal dysfunction among sexually retraumatized women. *Journal of Traumatic Stress, 10*, 435–450. doi: 10.1002/jts.2490100309
- Cloitre, M., Stovall-McClough, C., Miranda, R., & Chemtob, C. M. (2004). Therapeutic alliance, negative mood regulation, and treatment outcome in child abuse-related posttraumatic stress disorder. *Journal of Consulting and Clinical Psychology*, 72, 411–416. doi:10.1037/0022-006X.72.3.411
- Cloitre, M., Courtois, C. A., Charuvastra, A. Carapezza, R. Stolbach, B. C., & Green, B.
  L. (2011). Treatment of complex PTSD: Results of the ISTSS expert clinician survey on best practices. *Journal of Traumatic Stress*, 24, 615-627. doi: 10.1002/jts.20697
- Craske, M. G., Kircanski, K., Zelikowsky, M., Mystkowski, J., Chowdhury, N., & Baker,
   A. (2008). Optimizing inhibitory learning during exposure therapy. *Behaviour Research and Therapy*, 46, 5-27. doi:10.1016/j.brat.2007.10.003
- Crits-Christoph, P., Baranackie, K., Kurcias, J., Beck, A., Carroll, K., Perry, K., Luborskya, L., McLellana, A., Woodya, G., Thompsond, L., Gallagherd, D., &

Zitrin, C. (1991). Meta-analysis of therapist effects in psychotherapy outcome studies. *Psychotherapy Research*, *1*(2), 81-91. doi:10.1080/10503309112331335511

DeRubeis, R. J., Gelfand, L. A., German, R. E., Fournier, J. C., & Forand, N. R. (2014).
Understanding processes of change: How some patients reveal more than others—and some groups of therapists less—about what matters in psychotherapy. *Psychotherapy Research*, 24(3), 419-428.
doi:10.1080/10503307.2013.838654

- Doane, L. S., Feeny, N. C., & Zoellner, L. A. (2010). A preliminary investigation of sudden gains in exposure therapy for PTSD. *Behaviour Research and Therapy*, 48(6), 555-560. doi: 10.1016/j.brat.2010.02.002
- Elkin, I., Falconnier, L., Martinovich, Z., & Mahoney, C. (2006). Therapist effects in the national institute of mental health treatment of depression collaborative research program. *Psychotherapy Research*, *16*(02), 144-160. doi:10.1080/10503300500268540

Fedoroff, I. C., Taylor, S., Asmundson, G. J. G., & Koch, W. J. (2000). Cognitive factors in traumatic stress reactions: Predicting PTSD symptoms from anxiety sensitivity and beliefs about harmful events. *Behavioral and Cognitive Psychotherapy*, 28, 5–15. Retrieved from <u>http://journals.cambridge.org/action/displayAbstract?fromPage=online&aid=547</u> 93&fileId=S135246580000023

Feeny, N. C., Zoellner, L. A., Mavissakalian, M. R., & Roy-Byrne, P. P. (2009). What would you choose? Sertraline or prolonged exposure in community and PTSD treatment seeking women. *Depression and Anxiety*, 26(8), 724-731. doi: 10.1002/da.20588

- Feldner, M.T., Zvolensky, M.J., Schmidt, N.B., & Smith, R.C. (2008). A prospective test of anxiety sensitivity as a moderator of the relation between gender and posttraumatic symptom maintenance among high anxiety sensitive young adults. *Depression and Anxiety*, 25, 190–199. doi: 10.1002/da.20281
- First, M. B., Spitzer, R. L., Gibbon M., & Williams, J. B. W. (2002). Structured clinical interview for DSM-IV-TR axis I disorders, research version, patient edition. (SCID-I/P). New York: Biometrics Research, New York State Psychiatric Institute.
- Foa, E.B. (1997). Psychological processes related to recovery from a trauma and an effective treatment for PTSD. *Annals of the New York Academy of Sciences*, 821, 410-424. doi: 10.1111/j.1749-6632.1997.tb48295.
- Foa, E. B., & Cahill, S. P. (2001). Psychological therapies: Emotional processing. In N.J.
  Smelser & P. B. Bates (Eds.), *International Encyclopedia of the Social and Behavioral Sciences* (pp. 12,363–12,369). Oxford, UK: Elsvier.
- Foa, E. B., Dancu, C. V., Hembree, E. A., Jaycox, L. H., Meadows, E. A., & Street, G. P. (1999). A comparison of exposure therapy, stress inoculation training, and their combination for reducing posttraumatic stress disorder in female assault victims. *Journal of Consulting and Clinical Psychology*, 67, 194–200. doi:10.1037/0022-006X.67.2.194

Foa, E. B., Hembree, E. A., Cahill, S. P., Rauch, S. A., Riggs, D. S., Feeny, N. C., & Yadin, E.

(2005). Prolonged exposure for PTSD with and without cognitive restructuring: Outcome

at academic and community clinics. *Journal of Consulting and Clinical Psychology*, *73*, 953-964. doi: 10.1037/0022-006X.73.5.953

- Foa, E. B., Hembree, E. A., & Dancu, C. V. (2002). Prolonged exposure (PE) manual: Revised version (Unpublished manuscript).
- Foa, E. B., Hembree, E. A., & Rothbaum, B. O. (2007). Prolonged exposure therapy for PTSD: Emotional processing of traumatic experiences: Therapist guide.
   Treatments that work. New York, NY US: Oxford University Press.
- Foa, E. B., Huppert, J. D., & Cahill, S. P. (2006). Emotional processing theory: an update. In B. O. Rothbaum (Ed.), *Pathological anxiety: emotional processing in etiology and treatment* (pp. 3-24): Guilford Press: New York, NY
- Foa, E. B. & Kozak, M. J. (1986). Emotional processing of fear: Exposure to corrective information. *Psychological Bulletin*, *99*, 20-35. doi: 10.1037/0033-2909.99.1.20
- Foa, E. B., Riggs, D. S., Dancu, C. V., & Rothbaum, B. O. (1993). Reliability and validity of a brief instrument for assessing post-traumatic stress disorder.
   *Journal of Traumatic Stress*, 6, 459–473. doi:10.1002/jts.2490060405
- Foa, E. B., Riggs, D. S., Massie, E. D., & Yarczower, M. (1995). The impact of fear activation and anger on the efficacy of exposure treatment for posttraumatic stress disorder. *Behavior Therapy*, 26, 487–499. doi: 10.1016/s0005-7894(05)80096-6
- Foa, E. B., & Rothbaum, B. O. (1998). Treating the trauma of rape: cognitive behavioral therapy for PTSD. New York: Guilford Press.

- Frewen, P. A., & Lanius, R. A. (2006). Toward a Psychobiology of Posttraumatic Self-Dysregulation. Annals of the New York Academy of Sciences, 1071(1), 110-124. doi:10.1196/annals.1364.010
- Gallagher, M. W., & Resick, P. A. (2012). Mechanisms of change in cognitive processing therapy and prolonged exposure therapy for PTSD: Preliminary evidence for the differential effects of hopelessness and habituation. *Cognitive Therapy and Research*, 36(6), 750-755. doi:10.1007/s10608-011-9423-6
- Green, B., (1996). Trauma History Questionnaire. In B. H. Stamm (Ed.), *Measurement of stress, trauma, and adaptation* (pp. 366-369). Lutherville, MD: Sidran Press.
- Griffin, M. G., Nishith, P., Resick, P. A., & Yehuda, R. (1997). Integrating objective indicators of treatment outcome in posttraumatic stress disorder. *Annals of the New York Academy of Sciences*, 821(1), 388-409. doi: 10.1111/j.1749-6632.1997.tb48294.x
- Hayes, A. M., Laurenceau, J. P., Feldman, G., Strauss, J. L., & Cardaciotto, L. (2007).
  Change is not always linear: The study of nonlinear and discontinuous patterns of change in psychotherapy. *Clinical Psychology Review*, 27(6), 715-723.
  doi:10.1016/j.cpr.2007.01.008
- Institute of Medicine. (2008). *Treatment of PTSD: An assessment of the evidence*. Washington, DC: National Academies Press.
- Cloitre, M., Courtois, C. A., Ford, J. D., Green, B. L., Alexander, P., Briere, J., Herman,J. L., Lanius, R., Stolbach, B. C., Spinazzola, J., Van der Kolk, B. A., & Van derHart, O. (2012). The ISTSS Expert Consensus Treatment Guidelines for Complex

PTSD in Adults. Retrieved from

http://www.istss.org/ISTSS\_Main/media/Documents/ComplexPTSD.pdf

- Jansson, L., Öst, L. G., & Jerremalm, A. (1987). Prognostic factors in the behavioral treatment of agoraphobia. *Behavioral Psychotherapy*, 15, 31–44. doi: 10.1017/S0141347300010612
- Jayawickreme, N., Cahill, S. P., Riggs, D. S., Rauch, S. A., Resick, P. A., Rothbaum, B.
  O., & Foa, E. B. (2014). Primum non nocere (first do no harm): Symptom worsening and improvement in female assault victims after prolonged exposure for PTSD. *Depression and Anxiety*, *31*(5), 412-419. doi: 10.1002/da.22225
- Jaycox, L. H., Foa, E. B., Morral, A. R. (1998). Influence of emotional engagement and habituation on exposure therapy for PTSD. *Journal of Consulting and Clinical Psychology*, 66, 185–192. doi: 10.1037//0022-006x.66.1.185
- Jerud, A. B., Zoellner, L. A., Pruitt, L. D., & Feeny, N. C. (2014). Changes in emotion regulation in adults with and without a history of childhood abuse following PTSD treatment. *Journal of Consulting and Clinical Psychology*, 82(4), 721-30. doi: 10.1037/a0036520
- Jones, B. L., & Nagin, D. S. (2007). Advances in group-based trajectory modeling and an SAS procedure for estimating them. *Sociological Methods & Research*, 35(4), 542-571. doi:10.1177/0049124106292364
- Jones, B. L., Nagin, D. S., & Roeder, K. (2001). A SAS procedure based on mixture models for estimating developmental trajectories. *Sociological Methods & Research*, 29(3), 374-393. doi: 10.1177/0049124101029003005

- Jung, T. & Wickrama, A. S. (2008). An introduction to latent class growth analysis and growth mixture modeling. *Social and Personality Psychology Compass*, 2(1), 302-317. doi:10.1111/j.1751-9004.2007.00054.x
- Kaplan, D. M., Smith, T., & Coons, J. (1995). A validity of the subjective units of discomfort (SUD) score. *Measurement and Evaluation in Counseling and Development*, 27, 195-199. Retrieved from <u>http://psycnet.apa.org/psycinfo/1995-31527-001</u>
- Kazdin, A. E., & Wilcoxin, L. A. (1976). Systematic desensitization and nonspecific treatment effects: A methodological evaluation. *Psychological Bulletin*, 83, 729-758. doi:10.1037/0033-2909.83.5.729
- Keller, S. M., Feeny, N. C., & Zoellner, L. A. (2014). Depression sudden gains and transient depression spikes during treatment for PTSD. *Journal of Consulting and Clinical Psychology*, 82, 102-11. doi: 10.1037/a0035286
- Kozak, M. J., Foa, E. B., & Steketee, G. (1988). Process and outcome of exposure treatment with obsessive-compulsives: Psychophysiological indicators of emotional processing. *Behavior Therapy*, 19, 157–169. doi:10.1016/S0005-7894(88)80039-X
- Lang, A. J., & Craske, M. G. (2000). Manipulations of exposure-based therapy to reduce return of fear: A replication. *Behaviour Research and Therapy*, 38, 1-12. doi:10.1016/S0005-7967(99)00031-5
- Lang, A. J., Kennedy, C. M., & Stein, M. B. (2002). Anxiety sensitivity and PTSD among female victims of intimate partner violence. *Depression and anxiety*, 16(2), 77-83. doi:10.1002/da.10062

- Lang, P. J., Levin, D. N., Miller, G. A., & Kozak, M. J. (1983). Fear behavior, fear imagery, and the psychophysiology of emotion: the problem of affective response integration. *Journal of Abnormal Psychology*, 92(3), 276-306. doi:0.1037/0021-843X.92.3.276
- Laska, K. M., Smith, T. L., Wislocki, A. P., Minami, T., & Wampold, B. E. (2013).
   Uniformity of evidence-based treatments in practice? Therapist effects in the delivery of cognitive processing therapy for PTSD. *Journal of Counseling Psychology*, *60*(1), 31-41. doi:10.1037/a0031294
- Laurenceau, J. P., Hayes, A. M., & Feldman, G. C. (2007). Some methodological and statistical issues in the study of change processes in psychotherapy. *Clinical Psychology Review*, 27, 682-695. doi:10.1016/j.cpr.2007.01.007
- Meuret, A. E., Seidel, A., Rosenfield, B., Hofmann, S. G., & Rosenfield, D. (2012). Does fear reactivity during exposure predict panic symptom reduction? *Journal of Consulting and Clinical Psychology*, 80(5), 773-785. doi:10.1037/a0028032

Nagin, D. (2005). Group-based modeling of development. Harvard University Press.

- Nishith, P., Resick, P. A., & Griffin, M. G. (2002). Pattern of change in prolonged exposure and cognitive-processing therapy for female rape victims with posttraumatic stress disorder. *Journal of Consulting and Clinical Psychology*, 70, 880–886. doi: 10.1037/0022-006X.70.4.880
- Norton, P. J., Hayes-Skelton, S. A., & Klenck, S. C. (2011). What happens in session does not stay in session: Changes within exposures predict subsequent improvement and dropout. *Journal of Anxiety Disorders*, 25(5), 654–660. doi: 10.1016/j.janxdis.2011.02.006

- Okiishi, J. C., Lambert, M. J., Egget, D., Nielsen, L., Dayton, D. D., & Vermeersch, D.
  A. (2006). An analysis of therapist treatment effects: Toward providing feedback to individual therapists on their clients psychotherapy outcome.
  Journal of Clinical Psychology, 62, 1157–1172. doi:10.1002/jclp.20272
- Powers, M. B., Halpern, J. M., Ferenschak, M. P., Gillihan, S. J., & Foa, E. B. (2010). A meta-analytic review of prolonged exposure for posttraumatic stress disorder. *Clinical Psychology Review*, *30*(6), 635-641. doi:10.1016/j.cpr.2010.04.007
- Rachman, S. (1980). Emotional processing. *Behaviour Research and Therapy*, *14*, 349–355. doi:10.1016/0005-7967(80)90069-8
- Rauch, S. M., Foa, E. B., Furr, J. M., & Filip, J. C. (2004). Imagery vividness and perceived anxious arousal in prolonged exposure treatment for PTSD. *Journal of Traumatic*

Stress, 17, 461-465. doi:10.1007/s10960-004-5794-8

- Reiss, S., Peterson, R. A., Gursky, D. M., & McNally, R. J. (1986). Anxiety sensitivity, anxiety frequency and the predictions of fearfulness. *Behaviour Research and Therapy*, 24, 1–8. doi:10.1016/0005-7967(86)90143-9
- Resick, P. A., Nishith, P., & Griffin, M. G. (2003). How well does cognitive-behavioral therapy treat symptoms of complex PTSD? An examination of child sexual abuse survivors within a clinical trial. *CNS spectrums*, 8(5), 340-355. doi:10.1017/S1092852900018605

Resick, P. A., Nishith, P., Weaver, T. L., Astin, M. C., & Feuer, C. A. (2002). A comparison of

cognitive-processing therapy with prolonged exposure and a waiting condition for the treatment of chronic posttraumatic stress disorder in female rape victims. *Journal of* 

Consulting and Clinical Psychology, 70(4), 867-879. doi: 10.1037/0022-

006X.70.4.867

- Resick, P. A., Suvak, M. K., & Wells, S.Y. (2014). The impact of childhood abuse among women with assault-related PTSD receiving short-term CBT. *Journal of Traumatic Stress*, 27, 558–567. doi: 10.1002/jts.21951
- Rodriguez, B. F., Bruce, S. E., Pagano, M. E., Spencer, M. A., & Keller, M. B. (2004).
  Factor structure and stability of the Anxiety Sensitivity Index in a longitudinal study of anxiety disorder patients. *Behaviour Research and Therapy*, 42, 79–91. doi:10.1016/S0005-7967(03)00074-3
- Schnurr, P. P., Friedman, M. J., Engel, C. C., Foa, E. B., Shea, M. T., Chow, B. K.,
  Resick, P.A., Thurston, V., Orsillo, S.M., Haug, R., Turner, C., & Bernardy, N.
  (2007). Cognitive behavioral therapy for posttraumatic stress disorder in women:
  A randomized controlled trial. *JAMA*, 297(8), 820–830.
  doi:10.1001/jama.297.8.820.
- Skre, I., Onstad, S., Torgersen, S. S., & Kringlen, E. E. (1991). High interrater reliability for the Structured Clinical Interview for DSM-III-R Axis I (SCID-I). *Acta Psychiatrica Scandinavica*, 84, 167-173. doi:10.1111/j.1600-0447.1991.tb03123.x
- Sripada, R.K. & Rauch, S.A.M. (2015). Between-session and within-session habituation in prolonged exposure therapy for posttraumatic stress disorder: A hierarchical

linear modeling approach. *Journal of Anxiety Disorders, 30*, 81-87. doi:10.1016/j.janxdis.2015.01.002

- Stein, N. R., Dickstein, B. D., Schuster, J., Litz, B. T., & Resick, P. A. (2012).
  Trajectories of response to treatment for posttraumatic stress disorder. *Behavior Therapy*, 43(4), 790-800. doi: 10.1016/j.beth.2012.04.003
- Sterne, J.A.C., White, I.R., Carlin, J.B., Spratt, M., Royston, P., Kenward, M.G., Wood,
  A.M., & Carpenter, J.R. (2009). Multiple imputation for missing data in
  epidemiological and clinical research: potential and pitfalls. *BMJ*, *338*.
  doi:10.1136/bmj.b2393
- Stewart, S. H., Taylor, S., & Baker, J. M. (1997). Gender differences in dimensions of anxiety sensitivity. *Journal of Anxiety Disorders*, 11(2), 179-200. doi:10.1016/S0887-6185(97)00005-4
- Strunk, D. R., Brotman, M. A., DeRubeis, R. J., & Hollon, S. D. (2010). Therapist competence in cognitive therapy for depression: predicting subsequent symptom change. *Journal of Consulting and Clinical Psychology*, 78(3), 429-437. doi:10.1037/a0019631
- Tabachnick, B. G., & Fidell, L. S. (2007). Multivariate analysis of variance and covariance. Using Multivariate Statistics, 3, 402-407.
- Taylor, S. (1999). Anxiety sensitivity: Theory, research, and treatment of the fear of anxiety. Hillsdale, NJ: Erlbaum.
- Thayer, B. A., Papsdorf, J. D., Davis, R., & Vallecorsa, S. (1984). Automatic correlates of the subjective anxiety scale. *Journal of Behavior Therapy and Experimental Psychiatry*, 15, 3-7.

- van der Kolk, B. A. (2002). Assessment and treatment of complex PTSD. In R. Yehuda
  (Ed.), *Treating trauma survivors with PTSD* (pp.127-156). Washington DC:
  American Psychiatric Publishing, Inc.
- van Minnen, A., & Foa, E. B. (2006). The effect of imaginal exposure length on outcome of treatment for PTSD. *Journal of Traumatic Stress*, 19(4), 427-438.
  doi:10.1002/jts.20146van
- van Minnen, A., & Hagenaars, M. (2002). Fear activation and habituation patterns as early process predictors of response to prolonged exposure treatment in PTSD. *Journal of Traumatic Stress*, 15(5), 359-367. doi:10.1023/A:1020177023209
- Vittengl, J. R., Clark, L. A., Thase, M. E., & Jarrett, R. B. (2013). Nomothetic and idiographic symptom change trajectories in acute-phase cognitive therapy for recurrent depression. Journal of consulting and clinical psychology, 81(4), 615-626. doi:10.1037/a0032879
- Webb, C. A., DeRubeis, R. J., & Barber, J. P. (2010). Therapist adherence/competence and treatment outcome: A meta-analytic review. *Journal of Consulting and Clinical Psychology*, 78(2), 200-211. doi:10.1037/a0018912
- Wolpe, J., & Lazarus, A. A. (1966). Behavior therapy techniques. New York, NY: Pergamon.
- Zalta, A. K., Gillihan, S. J., Fisher, A. J., Mintz, J., McLean, C. P., Yehuda, R., & Foa, E.
  B. (2013). Change in negative cognitions associated with PTSD predicts symptom reduction in prolonged exposure. *Journal of Consulting and Clinical Psychology*, 82(1), 171-175. doi: 10.1037/a0034735