PREDICTORS OF ANALOGUE INTRUSIVE THOUGHTS: A STRUCTURAL EQUATION MODEL

by

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Abstract

Structural equation modeling was used to examine the prediction of intrusive thoughts from the theoretically proposed pathways in the Ehlers and Clark model (Behav. Res. Ther., 38 (2000) 319), and to examine the interface of emotion and preexisting vulnerability factors with the cognitive processes considered central to the model. Using a prospective design, 148 undergraduate students viewed a distressing film and recorded their film-related intrusive thoughts over the following week. The results indicated that a preexisting emotional vulnerability factor (i.e., trait anxiety and depression), predicted dysfunctional processing (i.e., dissociation and data-driven processing). Furthermore, emotional reactivity and dysfunctional coping strategies (i.e., rumination, thought suppression, and the use of safety behaviours) directly predicted intrusive thoughts. The observed model was consistent with Ehlers and Clark's proposed model, placing it in a broader context. Implications for the interface of these factors are discussed.
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Dedication

My Husband

and Parents
Introduction

Posttraumatic stress disorder (PTSD) is a clinical reaction to a traumatic event. According to the Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition (DSM-IV) (American Psychiatric Association, 1994), PTSD involves three sets of symptoms: re-experiencing the event in the form of intrusive memories, nightmares or flashbacks; behavioral avoidance of trauma stimuli; and emotional numbing, and ongoing arousal. A key feature of PTSD is intrusive memories of the trauma. Early theories conceptualized such intrusive thoughts as an emotional memory phenomenon (for review see Witvliet, 1997). Drawing heavily from those theories, contemporary writers underscore the role of cognitive processes in the onset and maintenance of cognitive intrusions and other PTSD symptoms (Brewin, Dalgleish, & Joseph, 1996; Ehlers & Clark, 2000). Ehlers and Clark (2000), for example, proposed a model in which cognitive processing during the traumatic event, and the behavioural and cognitive responses adopted to reduce distress after the event, are crucial contributors to intrusions. The purpose of the current study was to examine the theoretically proposed pathways in the Ehlers and Clark model and to examine the interface of emotion and preexisting vulnerability factors with the cognitive processes considered central to the model.

Ehlers and Clark postulated that under certain conditions (e.g., high arousal), events are more likely to be processed in terms of sensory information rather than meaning (i.e., dysfunctional processing), resulting in memories that are poorly elaborated and contextually integrated in terms of time, place, and related information (see also Brewin et al., 1996). According to Ehlers and Clark, sensory encoded memories are more likely to be unintentionally triggered by sensory cues reminiscent of the event. In addition, the persistence of PTSD symptoms, including intrusive thoughts, is made more likely by the use of dysfunctional post-
trauma coping strategies, such as suppression, rumination, and avoidance, which are adopted to reduce distress. Such strategies are hypothesized to maintain symptoms by preventing changes in the trauma memory that would allow it to be integrated into autobiographical memory. Thus, Ehlers and Clark have proposed a clear sequence of events that lead to ongoing intrusive thoughts.

The Ehlers and Clark model's emphasis on dysfunctional processing and encoding is in line with other contemporary theories of PTSD (e.g., Brewin et al., 1996; Foa & Rothbaum, 1998). A growing body of studies has examined the relationship between dysfunctional processing and PTSD. In particular, many theorists consider dissociation to be a marker of dysfunctional processing. Dissociation is defined by The American Psychiatric Association (APA) as a “disruption of the usually integrated functions of consciousness, memory, identity or perception of the environment” (APA, 1994, p. 822), and is measured by self-reported alterations in cognitive and perceptual functioning. Individuals frequently report experiencing dissociation during traumatic events, with one of the more common sensations being time distortion (Shalev, Peri, Canetti, & Schreiber, 1996; Ursano et al. 1999). A large body of literature has linked peritraumatic dissociation to the development and maintenance of PTSD and intrusive thoughts (Birmes et al., 2003; Clohessy & Ehlers, 1999), even when controlling for trait dissociation (Ehlers, Mayou, & Bryant, 1998; Holmes, Brewin, & Hennessy, 2004; Murray, Ehlers, & Mayou, 2002) and prior PTSD diagnosis (Ursano et al., 1999; see, however, Marshall & Schell, 2002; Shalev et al., 1998). Recently, Engelhard and her colleagues supported the assertion that dissociation may be responsible for the processing of sensory and emotional impressions of the event, which later characterizes the trauma memory (Engelhard, van den Hout, Kindt, Arntz, & Schouten, 2003).
To better operationalize dysfunctional cognitive processing, Ehlers and Clark drew on research in cognitive psychology to develop a measure they called *data-driven processing* (Halligan, Michael, Clark, & Ehlers, 2003). Data-driven processing is said to be characterized by sensory driven processing, as opposed to meaning-based processing. However, research examining the link between data-driven processing and intrusive thoughts has been scarce and has yielded mixed results. Halligan, Clark and Ehlers (2002) attempted to manipulate data-driven and conceptual processing (i.e., processing the meaning of the event) in an analogue study, but found no between-group differences in PTSD “symptoms”, including intrusive thoughts. Those authors then repeated the experiment, selecting participants with high trait tendencies to engage in conceptual or data-driven processing. Compared to the trait conceptual processing group, the data-driven group demonstrated greater avoidance, arousal, and intrusive recollections, which was consistent with the Ehlers and Clark model. Further evidence linking data-driven processing and PTSD symptoms was found in a sample of motor vehicle victims (Murray et al., 2002). Overall, more research relating dysfunctional processing to intrusive cognitions is needed to firmly establish that link.

The second tenet of the Ehlers and Clark model is the assertion that the link between dysfunctional cognitive processing and ongoing PTSD symptoms is dependent, in part, upon the use of dysfunctional coping strategies, such as suppression, rumination and safety behaviours. Although those strategies are adopted to control symptoms, research indicates that they actually perpetuate them. For example, a number of studies have demonstrated a paradoxical increase in intrusive thoughts following attempts to suppress them (e.g., Wegner, 1994), and support exists for this effect in the context of PTSD (Davies & Clark, 1998a; Davies & Clark, 1998b; Ehlers et al., 1998; Harvey & Bryant, 1998). Rumination about the trauma has also been associated with
PTSD severity (Clohessy & Ehlers, 1999; Laposa & Alden, 2003; Mayou, Ehlers, Bryant, 2002). Ehlers and Clark proposed that the “what if” nature of rumination (e.g., what if I would have left the house five minutes earlier?) may prevent the trauma memory from being integrated into autobiographical memory. Finally, Ehlers and Clark postulated that safety behaviours maintain PTSD symptoms. These behaviours (e.g., vigilance to threat cues) are meant to prevent or minimize further “catastrophes” associated with the trauma. Little research has explored the role of safety behaviours in the context of PTSD, however, steps taken to feel safe by assault victims (e.g., sleeping with lights on, carrying a weapon) were associated with greater PTSD severity both in the short (i.e., 6 months post-assault) and long term (i.e., 9 months post-assault) (Dunmore, Clark, & Ehlers, 2001). Safety behaviours can also include complete avoidance of trauma reminders, and the role of avoiding trauma reminders in maintaining PTSD is well documented (Bryant & Harvey, 1995; Charlton & Thompson, 1996; Dunmore et al., 2001). In summary, there is consistent support for the hypothesized role of dysfunctional post-trauma coping strategies in maintaining PTSD.

In addition to the cognitive processes described above, contemporary PTSD models acknowledge the contribution of preexisting psychological and emotional vulnerabilities to the onset of PTSD, although those variables receive less emphasis. Preexisting emotional vulnerabilities have been shown to be associated with PTSD development and severity in clinical samples. Two well established vulnerability factors are depression (e.g., Breslau, Davis, Peterson, & Schultz, 1997; Ozer, Best, Lipsey, & Weiss, 2003; Ursano et al., 1999) and trait anxiety (e.g., Frommberger et al., 1998; Tampke & Irwin, 1999). However, little research has examined how preexisting emotional vulnerabilities may exert their influence on the development of PTSD.
Ozer and her colleagues concluded in a recent meta-analysis of PTSD predictors that there is a need determine the proximal predictors (e.g., dissociation and peritraumatic emotionality) that explain the statistical relationships between the distal predictors (e.g., depression and trait anxiety) and PTSD (Ozer, et al., 2003). Dysfunctional processing and dysfunctional coping strategies are both proximal predictors from the Ehlers and Clark model that could explain the relationship between preexisting emotional vulnerabilities and PTSD severity, and more specifically the frequency of intrusive thoughts. In an analogue trauma study, trait anxiety was associated with higher levels of trait data-driven processing during a distressing movie (Halligan et al., 2002). Furthermore, in a sample of assault victims, depression measured shortly after an assault correlated with peritraumatic data-driven processing and persistent dissociation (Halligan et al., 2003). In contrast, however, one prospective analogue study failed to find a direct relationship between depression and intrusive thoughts (Davies & Clark, 1998a).

Preexisting vulnerability factors may also affect post-event coping. Suppression is a common form of mental control in adults with depression and in those at risk of developing depression (Wegner & Zanakos, 1994; Wenzlaff & Bates, 1998). Furthermore, trait anxiety is associated with a general tendency to suppress thoughts (Muris, Merckelbach, Horselenberg, 1996). Rumination is also a characteristic of both depressive (Kuehner & Weber, 1999; Nolen-Hoeksema, 2000) and anxious thinking (Muris, Roelofs, Rassin, Franken, & Mayer, 2005).

Overall, the process through which preexisting factors increase vulnerability to PTSD, and the effect of vulnerability factors on the other elements of the cognitive model, requires further study.

Most theorists, as well as the DSM-IV, emphasize the importance of individuals’ emotional reactions to the traumatic situation as a key factor in PTSD. Responding to the event
with fear, helplessness and horror are required for a PTSD diagnosis. In addition, there is now evidence to suggest that other emotions, such as sadness, anger and shame, are experienced and associated with the trauma features that are later reexperienced (Holmes, Grey, & Young, 2005). According to earlier emotional theories, heightened levels of positive or negative emotions increases sympathetic nervous system responding and thus influences what is remembered (Witvliet, 1997). Furthermore, there is a large body of evidence supporting the role of emotional arousal in the enhanced memory consolidation of emotional events (Cahill & McGaugh, 1998). A pioneering trauma analogue study conducted by Davies and Clark (1998a) observed that mood change (i.e., change in anxiety, depression, happiness and anger) proved to be the strongest and most consistent predictor of movie-related intrusive thoughts. Cognitive models acknowledge the potential for higher emotional reactivity (i.e., state emotion) to influence both the quality of processing and the content of intrusive memories. In one study, it was found that individuals higher on trait data-driven processing were higher on state anxiety, but that they did not differ from individuals lower on trait data-driven processing on increases in anxiety during the video (Halligan et al., 2003). However, the influence of peritraumatic emotional reactivity has not been consistently explored in the context of contemporary cognitive models. The goal of the current study was to use structural equation modeling (SEM) to simultaneously examine the associations between the various elements of contemporary cognitive models in the context of a laboratory trauma analogue task. The complexity of the relationships among those components, and the incorporation of emotional reactivity, make SEM an ideal statistical procedure to address the current research questions. A few authors have applied SEM to causal models of preexisting vulnerabilities and the development of PTSD in war veterans (King, King, Foy, & Gudanowski, 1996; King, King, Fairbank, Keane, & Adams,
1998; Vukšić-Mihaljević, Mandić, Benšić, & Mihaljević, 2000). However, those studies did not include the cognitive processes implicated in contemporary PTSD models, and given the methodological challenges of prospective measurement, have relied on retrospective reports. The laboratory analogue methodology allows for the truly prospective measurement of preexisting factors and the direct and immediate assessment of peritraumatic variables. This methodology allows stronger causal conclusions to be drawn from SEM methods. Another advantage of analogue studies is that the nature of the distressing event is precisely controlled, resulting in each person being exposed to the exact same stimulus. The hypothesized model, which is based on Ehlers and Clark's cognitive theory, is found in Figure 1. This model addressed hypotheses one two and three:

1) A preexisting emotional vulnerability (i.e., depression and trait anxiety) will directly increase a) emotional reactivity b) levels of dysfunctional processing (i.e., data-driven processing and dissociation) and c) dysfunctional post-trauma coping strategies (i.e., thought suppression, rumination and safety behaviours).

2) Greater emotional reactivity will result in more dysfunctional processing.

3) Higher levels of dysfunctional processing and dysfunctional coping strategies will be associated with a greater frequency of intrusive thoughts.

4) We were uncertain if dysfunctional processing would completely mediate the affect of emotional reactivity on intrusion frequency. Therefore, following the recommendation by MacCallum, Roznowski, & Necowitz (1992), we proposed a second a priori model rather than rely solely on modification statistics, which can capitalize on chance and not replicate. In this model, hypotheses 1-3 remained the same with the addition of a direct pathway from emotional reactivity to intrusion frequency.
Method

Overview

Participants completed measures of depression, trait anxiety and emotional state, and then watched a short movie of a medical event. After the movie, participants completed measures of their cognitive processing during the movie and reassessed their emotional state. Over the next week, participants recorded any spontaneous thoughts they had about the movie. When participants returned to the lab, they completed questionnaires measuring their reactions to their spontaneous thoughts.

Participants

Participants consisted of undergraduate students who were enrolled in at least one psychology course at the University of British Columbia. Participants received class credit for their participation. There were three exclusion criteria: 1) current mental health treatment, 2) recent experience (i.e., within the last 6 months) with a car accident 3) recent death of a relative or friend due to a car accident. The exclusion criteria were meant to exclude any participants who may be adversely affected by the video, due to potential car-accident related trauma symptoms, and to ensure participants’ responses during the study were not a result of a past car accident.

159 participants completed session one. Five participants failed to complete session two and one participant was excluded because he failed to watch the entire movie, resulting in 153 participants who completed both sessions. From this sample, five participants were classified as multivariate outliers and were subsequently removed from the analysis. The resulting sample size for the analysis was 148 participants.
Participants were primarily single (73%), female (70%) and had completed an average of 1.86 years of university (SD=1.19). The average age was 20.23 years (SD=2.90). The most common cultural backgrounds consisted of European Canadian (33%), Indo Canadian (23%) and Asian Canadian (19%). In the past, 7% of participants had been in a serious car accident and 7% had a friend or relative die in a car accident.

**Materials**

Participants viewed a nine-minute film of graphic real-life footage depicting a car accident patient undergoing medical treatment and dying from his injuries. This video was used in a previous analogue study and was shown to produce intrusive thoughts (Laposa & Alden, 2006). Participants viewed the film on a 27-inch television screen from a distance of approximately 5 feet from the screen.

**Measures**

*Preexisting emotional vulnerabilities.* Vulnerability was assessed with measures of depression and trait anxiety. Depression was assessed with the Beck Depression Inventory-II (BDI; Beck, Steer, & Brown, 1996). The BDI consists of 21 items, each rated on a scale ranging from 0 to 3, with higher scores indicating greater severity. The BDI has high internal consistency (e.g., $\alpha = .92$) and test-retest reliability ($r = .93$) in student and outpatient populations (Beck, et al., 1996). Cronbach’s alpha in this sample was 0.86.

The State Trait Anxiety Inventory- Trait subscale (STAIT) was used to assess trait anxiety (Speilberger, Gorsuch, Lushene, Vagg, & Jacobs, 1983). The STAIT consists of 20 items rated on a 4-point scale in relation to various anxiety symptoms. The STAIT has good internal consistency ($\alpha = .86 -.95$), test-retest reliability ($r = .71-.86$) and convergent validity (Antony, Orsillo, & Roemer, 2001). Chronbach’s alpha for this sample was .92.
Emotional reactivity. Four measures were used to assess emotional reactivity during the film. Current levels of depression, happiness and anger were assessed using visual analogue scales (see Appendix A). Congruent with Davies and Clark (1998a), participants were asked to rate each emotion “at this moment” on scales ranging from 0 (not at all) to 100 (extremely).

State anxiety was measured using the State Trait Anxiety Inventory- State subscale (STAIS; Spielberger et al., 1983). The STAIS has been shown to have acceptable reliability and validity (Spielberg et al., 1983). Cronbach’s alpha in this sample was .93.

Dysfunctional processing. We included two measures of dysfunctional processing. Data-driven processing was assessed using the data-driven subscale of the Cognitive Processing Questionnaire (DDP; Ehlers, 1998). The DDP was developed through a series of studies with various types of trauma victims (e.g., Ehlers et al., 1998; Halligan et al., 2002; Murray et al., 2002). The score on the data-driven scale (eight items) reflects the degree to which an individual focused on sensory or surface information during a target event (see Appendix B). Items are scored on a 4-point Likert-type scale with a higher score reflecting more data-driven processing. The DDP has been shown to have good internal consistency (α = .70) and predictive ability of PTSD in MVA victims (Halligan et al. 2002). In this sample, Chronbach’s alpha was 0.78.

Dissociation was assessed using the Peritraumatic Dissociation Experiences Questionnaire (PDEQ; Marmar, Weiss, & Metzler, 1997). The PDEQ assesses experiences such as depersonalization, derealization and altered sense of time during the critical incident. There are 10 items rated on a 5-point Likert-type scale. The PDEQ has shown internal consistency (α = .81) and is strongly associated with other measures of general dissociation (Marmar et al., 1997). In this sample, the internal consistency was also adequate (α =0.84).
Dysfunctional coping strategies. Maladaptive coping strategies were assessed using three measures. Rumination and thought suppression was measured by the respective subscales from The Response to Intrusions Questionnaire (RIQ; Clohessy & Ehlers, 1999) (see Appendix C). Each subscale is rated on a seven-point Likert-type Scale. The rumination subscale consists of three items ($\alpha = .31$), and the suppression subscale has four items ($\alpha = .73$) (Laposa & Alden, 2006). Chronbach’s alphas for the rumination and suppression subscales in this study were .69 and .64, respectively.

Safety behaviours were measured using a three-item measure developed for this study (see Appendix D). This measure built on a previous measure of avoidance used by Laposa & Alden (2006). The revisions targeted more subtle forms of behavioural changes after viewing the film, as past research suggests participants are unlikely to completely avoid road-related situations as a result of viewing the film. The measure consisted of three questions which asked participants “since viewing the film last week did you notice an increase in”: 1) discomfort associated with road-related situations 2) hesitancy surrounding road related situations and 3) vigilance while in a car. Participants rated their responses on 9-point Likert scales ranging from 0 (not at all) to 9 (very much). Chronbach’s alpha for this sample was .93.

Intrusive thoughts. The number of movie-related intrusive thoughts was measured using an intrusion diary (see Appendix E). The diary is a commonly used measure in analogue studies, and has been shown to correlate with well established questionnaire measures of intrusive recollections (e.g., Holmes et al., 2004; Laposa & Alden, 2006). Participants recorded the date and time for each spontaneous intrusive thought of the film, gave a description of the thought and indicated how much distress it caused them. These instructions were included with the diary.
The number of distressing intrusions (i.e., those rated as causing any distress) was summed to create an intrusion frequency total score.

**Experimental Checks**

*Attention.* Participants rated the amount of attention they paid to the film on a scale of 0 (not at all) to 10 (full attention) (cf. Laposa & Alden, 2006) (see Appendix F).

*Diary compliance.* Participants were asked to rate the extent to which they forgot to record their intrusions on a scale of 0 (not at all true of me) to 10 (extremely true of me) (cf. Holmes et al., 2004) (see Appendix F).

*Prior frequency of medical footage exposure.* Participants rated their tendency to watch medical footage on a scale of 0 (never) to 10 (almost every day) (cf. Laposa & Alden, 2006) (see Appendix F).

**Procedure**

Participants individually attended two sessions, one week apart. In the first session, they completed the preexisting emotional vulnerability measures of depression and anxiety, the STAIS and emotional reactivity questionnaire. Participants were then left alone to watch the film. Immediately after the film, participants then completed the dysfunctional processing questionnaires, STAIS and emotional reactivity questionnaire. Participants received verbal and written instructions on how to complete the diary. Specifically, they were instructed to only record thoughts that occurred when they did not intend to think about the film.

During session two, participants completed the subsections of the RIQ and safety behaviours questionnaire. Participants were fully debriefed.
Data Analytic Approach

Change scores for the individual emotional reactivity measures and STAIS were derived by taking the unstandardized residuals after regressing participants’ post movie scores on their pre-movie scores.

LISREL 8.72 (Jöreskog & Sörbom, 2005) was used for all modeling procedures. Because of a small proportion of missing data, the raw data file was analyzed using full information maximum likelihood (FIML). FIML has been demonstrated to be superior to other missing data techniques (i.e., list-wise deletion and pairwise deletion) in determining parameter estimates, parameter estimate efficiency, model goodness of fit and reducing model convergence failures (Enders & Bandalos, 2001). Factors were scaled and the model identified by setting one indicator for each latent variable to a unit weight of 1.0.

FIML provides two indices of model fit: the root mean square error (RMSEA) and chi-square ($\chi^2$) statistic. Good model fit was defined by a RMSEA value less than .06 (Hu & Bentler, 1999), and a nonsignificant chi-square value.

Results

Assumptions

Two main assumptions of FIML are multivariate normality and linearity (Enders, 2001). Multivariate normality was indirectly assessed by examining the univariate distributions. Test statistics revealed that one distribution was significantly skewed and kurtotic ($p < .001$). Five other distributions were significantly, but mildly, skewed. The most common way to address the impacts of nonnormality with a full data set (i.e., no missing data) is through a statistical correction. However, there is no readily available correction for data sets with missing data and multivariate nonnormality, and those available are still in their infancy and require further
assessment (e.g., Enders, 2001). Given the mildness of skew, no corrections were made to the univariate distributions\(^2\). To address the assumption of linearity scatter plots were examined and there was no evidence of nonlinearity. Using Malahanobis distance \((p < .001)\), five multivariate outliers were detected and deleted.

**Descriptive Statistics**

Table 1 displays the descriptive information and bivariate correlations among the observed variables. Participants experienced an average of 2.76 \((SD = 2.69)\) intrusive thoughts over a one week period, with a range of 0-11.

There were no significant correlations between participants’ prior exposure to medical footage and any of the outcome measures. There was a small relationship between the residualized change score for depression and attention to the film, \(r (146) = .27, p < .05\). Finally, there were small correlations with the degree to which participants forgot to record their intrusive thoughts in their diary and the following measures: thought suppression, \(r (147) = .17, p < .05\); rumination, \(r (146) = .19, p < .05\); safety behaviours, \(r (142) = .20, p < .05\); and the BDI, \(r (147) = .20, p < .05\). Given the small magnitude of the associations, the analyses were conducted without any corrections.

**Measurement Model**

The development of the final structural model followed the two-step method outlined by Kline (2005). The two-step method is useful as it eliminates the factor structure as a source of model misfit when modifying the structural model. Following this method, the structural model is first specified as a confirmatory factor analysis in which the factors are allowed to freely correlate. If the measurement model provides an acceptable fit to the data, the structural model is
tested. There should be only small discrepancies between the factor loadings of an adequately fit measurement model and the final structural model.

The measurement model contained four latent variables. The latent variable of preexisting emotional vulnerability was composed of the total scores on the BDI and STAIT. The latent variable of emotional reactivity consisted of the residualized change scores for happiness, depression and anger, as well as the residualized change of the total STAIS score. The latent variable of dysfunctional processing was composed of the total scores for the DDP and PDEQ. The latent variable of dysfunctional coping strategies consisted of the composite scores on the measures of rumination, thought suppression and safety behaviours. Finally, intrusions were represented by total number of distressing intrusive thoughts as recorded in the diary. All latent variables were considered causal for observed scores. To test the measurement model all variables were allowed to freely correlate with each other, and the covariance among the residuals was set to zero. The results for this model suggested good fit, \( \chi^2 (45) = 55.34, p > .05, \) and RMSEA = .039, indicating that it was appropriate to test the more restrictive structural model. Congruent with an adequate fitting measurement model, the factor loadings were only slightly different from the values in the measurement model therefore, Table 2 contains the composition of the latent variables and factor loading information from the final structural model.

**Structural Model**

To examine the more restrictive structural model the variables were no longer allowed to freely correlate and were restrained to the hypothesized relationships (see Figure 1). Only marginal support was found for the hypothesized model, \( \chi^2 (49) = 100.45, p < .001, \) RMSEA = .084 (see Figure 2). To improve model fit we tested the second a priori hypothesis and
allowed emotional reactivity to have a direct effect on the frequency of intrusive thoughts, rather than its effect to be completely mediated by dysfunctional processing. This modification resulted in a significant improvement in model fit, $\chi^2(48) = 88.50, p < .001$, RMSEA = .076 (see Table 3), however the model fit was not yet acceptable.

Post hoc model modifications were performed in an attempt to develop a better fitting model. However, to reduce data-driven modifications a few restrictions were set: 1) due to the adequate fit of the measurement model, modification indices were not considered for factor loadings; 2) to maintain the causal nature of the model, pathways that did not follow the temporal order of data collection were not considered; 3) the model did not meet specifications to be empirically identified for bi-directional pathways. With these restrictions, a significant model misfit was identified by not allowing a direct pathway between dysfunctional processing and dysfunctional coping strategies. When this was accomplished, the final model fit was good, $\chi^2(47) = 58.25, p > .05$, RMSEA = .04 (see Figure 3) and produced a significant increase in model fit (see Table 3). The correlations among the latent variables are presented in Table 4.

**Direct and Indirect Effects**

The direct and indirect effects on intrusive thoughts are summarized in Table 5. A preexisting emotional vulnerability was not significantly related to emotional reactivity. Consistent with the hypothesis, a preexisting emotional vulnerability was associated with greater levels of dysfunctional processing during the movie ($\beta = .28, p < .05$). Although a preexisting emotional vulnerability predicted dysfunctional coping strategies in Model 1, this was no longer significant when dysfunctional processing directly predicted dysfunctional coping strategies (i.e., Model 2). However, a preexisting emotional vulnerability exerted a significant indirect effect on dysfunctional coping strategies through dysfunctional processing ($\beta = .20, p < .05$).
Emotional reactivity ($\beta = .32, p < .05$) and dysfunctional coping strategies ($\beta = .48, p < .05$) were both significant predictors of the frequency of intrusive thoughts. Thus, individuals who displayed greater increases in negative emotions during the film experienced more frequent intrusive thoughts, as did people who engaged in dysfunctional coping strategies. Interestingly, dysfunctional processing during the movie was not a significant predictor of intrusive thoughts once emotional reactivity was allowed a direct pathway to intrusive thoughts. However, dysfunctional processing exerted an indirect effect on intrusive thoughts through dysfunctional coping strategies ($\beta = .27, p < .05$).

Discussion

We used structural equation modeling (SEM) to predict analogue distressing intrusive thoughts, by incorporating preexisting emotional vulnerabilities and peritraumatic emotional reactivity with cognitive processes central to the Ehlers and Clark cognitive model of PTSD. Of particular interest from the Ehlers and Clark model was peritraumatic dysfunctional cognitive processing and dysfunctional post-trauma coping strategies. To our knowledge, this is the first study to incorporate these four sets of variables in the prediction of intrusive thoughts. This incorporation established that cognitive variables have meaningful links to both preexisting vulnerabilities and emotional reactivity variables. Furthermore, all variables contributed, either directly or indirectly, to the development of intrusive thoughts. Specifically, a preexisting emotional vulnerability was associated with increased dysfunctional processing and, indirectly with the use of dysfunctional coping strategies. Increased emotional reactivity was related to increases in dysfunctional processing. In turn, dysfunctional processing was indirectly related to an increase in intrusive thoughts through dysfunctional coping strategies. The findings will be discussed below following the temporal sequence that underlies the proposed model.
Preexisting Emotional Vulnerabilities

A body of literature suggests that negative affect (i.e., depression and anxiety) increases an individual’s risk of developing PTSD, and more specifically trauma related intrusive thoughts. This study not only confirmed these results, but also elucidated the mechanism through which a preexisting emotional vulnerability contributes to the development of intrusive thoughts, namely dysfunctional processing. Furthermore, the truly prospective measure of preexisting vulnerabilities afforded by analogue research strengthened our confidence in this result.

According to our model, general negative affect, as captured by the preexisting emotional vulnerability factor, results in certain types of dysfunctional cognitive processing. Traumatic and distressing events may exacerbate such dysfunctional cognitive processing, which, in turn, furthers the severity of the trauma related symptoms, such as intrusive thoughts. This result has important implications for the potential screening of individuals who may be at particular risk for developing PTSD. However, this result needs to be confirmed in clinical samples.

The standard practice in the PTSD literature has been to explore the role of anxiety and depression separately in the development of PTSD. One limitation to this approach is that any common etiology or mechanism between the two constructs is lost. In this study, SEM allowed for the advantage of combining these two constructs and our results indicated that both constructs were readily viewed as markers of a latent emotional vulnerability variable. That finding is consistent with earlier research on tripartite models of negative affect, which indicated that depression and anxiety share a nonspecific core feature of general distress, or negative affect (e.g., Mineka, Watson, & Clark, 1998), which this study suggests increases vulnerability to intrusive recollections of distressing information.
The hypothesis that a preexisting emotional vulnerability would affect emotional reactivity was not supported. A few explanations may exist for this finding. First, is it possible that individuals higher on the factor of preexisting emotional vulnerability have a higher baseline of emotional arousal and therefore, the magnitude of change in negative affect is not as large as individuals lower on this variable. Second, individuals without a higher baseline of general negative affect may rate their emotional change differently. These individuals may rate the change more accurately than individuals with higher negative affect, or exaggerate the change since it is different from their typical emotional state.

In summary, these results helped to clear up a point of confusion in the literature, which is how preexisting emotional vulnerabilities are related to the development of distressing intrusive thoughts. In line with Ozer et al.'s conceptualization of PTSD predictors, it is likely a preexisting emotional vulnerability is a distal predictor that interacts with the proximal predictor of dysfunctional processing.

*Emotional Reactivity*

Most theorists conclude that levels of emotion are an important determinant of PTSD symptoms. Our results were consistent with such assertions and past research (Davies & Clark 1998a), as emotional reactivity was strongly associated with dysfunctional processing and directly related to the frequency of intrusive thoughts.

One explanation for the direct pathway from emotional reactivity to intrusive thoughts is the enhanced retrieval of emotionally relevant material. Ehlers and Clark proposed two mechanisms of retrieval that may influence the frequency of intrusive thoughts. The first mechanism of retrieval involves the implicit memory process of *priming*, “the facilitated identification of perceptual objects as a result of prior exposure to those objects” (Ehlers,
Michael, Chen, Payne, & Shan, 2006, p. 317). Clinical populations have demonstrated enhanced priming for trauma related material (Michael, Ehlers, & Halligan, 2005), and analogue research has supported enhanced priming for degraded analogue stimuli (Ehlers et al., 2006). In both populations, priming predicted the frequency of intrusive thoughts. Emotion is thought to enhance priming through its activation of the amygdala. The amygdala can discern which stimuli are most threatening, and anticipate fearful stimuli based on only fragmentary cues or sensory stimuli (Joseph, 1997).

The second process of intrusive memory retrieval proposed by Ehlers and Clark is associated learning, the process through which cues perceptually similar to trauma stimuli trigger both the trauma memory and the affective response during the trauma. Analogue research has supported the role of associated learning in the development of intrusive thoughts (Ehlers et al. 2006). Once again, the amygdala is postulated to play a vital role in this process. Elzinga & Bremner (2002) suggested that while witnessing a traumatic event there is a rapid reaction and release of adrenaline, which acts on the amygdala producing enhanced consolidation of the event. The result of this reaction is a strengthened emotional memory trace and fear conditioning that automatically triggers the autonomic, emotional and behavioural responses associated with the trauma. Ehlers and Clark proposed that it is the reexperiencing of those strong affective responses that contribute to the distressing nature of the intrusive thoughts. This is in line with the finding that distressing intrusions are more persistent than non-distressing intrusions (Michael, Ehlers, Halligan, & Clark, 2005).

Thus, emotional reactivity may play a vital role in the retrieval of traumatic memories and our results indicate this is plausible explanation. However, our results suggested that
emotional reactivity also indirectly affects the frequency of intrusions through dysfunctional processing.

**Cognitive Variables: Dysfunctional Processing**

Ehlers and Clark emphasized the influence of dysfunctional processing (i.e., quality of encoding) in the development of the trauma memory and, more specifically, intrusive thoughts. They also hypothesized that dysfunctional processing is influenced by state factors (i.e., degree of arousal and fear). This study underscored the relationship between general emotional reactivity and dysfunctional processing. Furthermore, the importance of dysfunctional processing in the development of “long-term” intrusions was elucidated by the indirect effect of dysfunctional processing on intrusions through dysfunctional coping strategies.

Emotional reactivity may assist with certain memory processes, but the subjective experience of emotional arousal may cause some individuals to engage in dysfunctional processing. For example, some writers postulate that dissociation is a “hardwired response” for dealing with extreme anxiety, which combines increased alertness and the inhibition of emotion. During this time, an individual may intensely focus on external stimuli while attention is taken away from internal experiences. This has been termed “detachment” by some theorists (e.g., Holmes et al., 2005). This sense of being separated from the experience and environment, and narrowed attention, may suspend higher cognitive structures and deter the encoding of peripheral environmental information. Conceptual processing involves the encoding of information that helps to place the event into *context*, which decreases the likelihood the memory will be unintentionally retrieved by sensory cues (Ehlers & Clark, 2000). Thus, narrowed attention would detract from conceptual encoding, and contribute to data-driven processing. There is
speculation that the experience of dissociation, and associated reduction in emotional experience, results from the partial inhibition of the amygdala (Elzinga & Bremner, 2002).

Since emotion has memory enhancing effects implicated in PTSD symptoms, it is unlikely that the entire emotional experience is suspended during dissociation. Furthermore, some writers assert that dissociation may be a transient experience during a traumatic event (Allen, Console, & Lewis, 1999) allowing for periods of time when emotion is felt more strongly. Sierra and Berrios (1998) put forth a neurobiological model of depersonalization to explain the concurrent experiences of emotional numbing/reduction and vivid sensory processing. According to those authors, once a threshold of anxiety is reached, the medial prefrontal cortex inhibits the emotional processing of material by the amygdala. There is a reduced emotional experience and dampening of sympathetic output (e.g., reduced heart, skin conductance). The hypothesized result is qualitative changes in perception, cognition and feelings of reality. However, the authors suggest that the central nucleus of the amygdala is spared this inhibitory control, allowing for the hyperalertness and sensory processing that typically accompanies dissociation. This sensory processing can be conceptualized as a component of the dysfunctional processing variable proposed by this study.

Although these results are promising, causal statements must be tempered because only the pre-movie emotion ratings were measured before the processing questionnaires, the post-movie emotion ratings were measured at the same time as the dysfunctional processing questionnaires.

**Cognitive Variables: Dysfunctional Coping Strategies**

Our results supported Ehlers and Clark’s emphasis on post-event dysfunctional coping strategies in the development of intrusive thoughts. Furthermore, the prediction of dysfunctional
coping strategies from dysfunctional processing elucidated a series of events leading to long-term intrusive thoughts.

Intrusive thoughts are a common reaction to witnessing distressing and traumatic events (Michael et al., 2005). The experience of these initial distressing sensory laden memories causes some people to engage in dysfunctional coping strategies (i.e., suppression and rumination), resulting in ongoing intrusions. Conversely, it is plausible that people who cope with initial distressing intrusions in a more functional way would experience fewer intrusions, even if they engaged in dysfunctional processing during the trauma. For these people, there may still be a significant direct relationship between dysfunctional processing and intrusions, especially at symptom onset. For example, Dunmore et al. (2001) found that after controlling for initial PTSD severity, peritraumatic cognitive processing variables were no longer correlated with PTSD severity at 6 and 9 months post-assault. However, avoidance/safety behaviours were still associated with symptom severity. Thus, peritraumatic variables were more important at predicting only initial PTSD severity. However, this hypothesis must be tested directly with further investigation into dysfunctional processing and the use of dysfunctional, as well as functional, coping strategies.

Conclusions

The results of this study are tempered by the following limitations. First, it is unclear to what extent individuals can comment on their internal cognitive processes when reporting dissociation and data-driven processing. Second, the generalization of these findings beyond university undergraduate students who are not receiving mental health treatment, or recently involved in a car accident, remains to be determined. Finally, the severity of intrusive imagery exists on a continuum, on which the analogue paradigm fits (Holmes, 2003-2004). However, it
necessarily produces intrusive imagery to a lesser degree and severity than either directly witnessing or experiencing a real-life trauma. However, consistent with the assertion of existing on a continuum, the intrusive thoughts experienced by the participants were mainly visual in nature and described as distressing, qualities of intrusive thoughts reported by clinical populations (Ehlers & Steil, 1995; Ehlers et al., 2002).

A number of strengths also characterized this study. The distressing film paradigm allowed for the prospective measure of preexisting depression and trait anxiety, strengthening causal statements about the association between these variables and other variables implicated in the development of intrusive thoughts. Secondly, the use of SEM allowed for the exploration of recursive pathways amongst key variables in the Ehlers and Clark model of PTSD and intrusive thought development. This recursive nature highlighted both unique variance and error associated with the prediction of each component in the model. Finally, the factor approach to variables commonly associated with similar concepts (i.e., preexisting vulnerabilities, dysfunctional processing) allowed for a more parsimonious exploration of highly associated predictors in the development of intrusive thoughts.

The current results support the role of preexisting vulnerabilities, emotional reactivity, dysfunctional processing and dysfunctional coping strategies in the development of intrusive thoughts. Moreover, these four sets of variables were dynamically inter-related, underscoring the importance of using techniques such as SEM. Future research would add additional components to the model, for example priming, and continue to incorporate preexisting vulnerabilities and emotional reactivity with contemporary cognitive constructs.
Table 1

Descriptive Statistics and Bivariate Correlations Among Model Variables

<table>
<thead>
<tr>
<th>Variables</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
<th>11</th>
<th>12</th>
</tr>
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<tbody>
<tr>
<td>1. Happiness</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Depression</td>
<td>-.40**</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Anger</td>
<td>-.29**</td>
<td>.39**</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. STAIS</td>
<td>-.66**</td>
<td>.61**</td>
<td>.39**</td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. DDP</td>
<td>-.28**</td>
<td>.30**</td>
<td>.23**</td>
<td>.53**</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>6. PDEQ</td>
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<td>.23**</td>
<td>.24**</td>
<td>.39**</td>
<td>.72**</td>
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<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>7. Intrusions</td>
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<td>.24**</td>
<td>.11</td>
<td>.40**</td>
<td>.35**</td>
<td>.24**</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>8. Suppression</td>
<td>-.07</td>
<td>.08</td>
<td>.11</td>
<td>.13</td>
<td>.25**</td>
<td>.25**</td>
<td>.33**</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9. Rumination</td>
<td>-.18*</td>
<td>.23**</td>
<td>.08</td>
<td>.25**</td>
<td>.43**</td>
<td>.38**</td>
<td>.33**</td>
<td>.27**</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10. Safety</td>
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<td>.11</td>
<td>.06</td>
<td>.16</td>
<td>.40**</td>
<td>.40**</td>
<td>.37**</td>
<td>.39**</td>
<td>.56**</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11. BDI</td>
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<td>.05</td>
<td>.14</td>
<td>.07</td>
<td>.18*</td>
<td>.30**</td>
<td>.23**</td>
<td>.11</td>
<td>.25**</td>
<td>.19*</td>
<td></td>
<td></td>
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<td>12. STAIT</td>
<td>-.05</td>
<td>.04</td>
<td>.08</td>
<td>.12</td>
<td>.23**</td>
<td>.37**</td>
<td>.23**</td>
<td>.13</td>
<td>.27**</td>
<td>.21*</td>
<td>.70**</td>
<td></td>
</tr>
</tbody>
</table>

Mean       | 0.00 | 0.00 | 0.00 | 0.00 | 7.30 | 16.79 | 2.76 | 11.83 | 8.85 | 6.68 | 8.48 | 39.95 |
SD         | 18.51| 17.26| 12.20| 9.49 | 4.63 | 6.30  | 2.69 | 4.37  | 4.16 | 6.98 | 6.34 | 9.92  |

Note: Happiness = residualized change score for happiness; Depression = residualized change score for depression; Anger = residualized change score for anger; STAIS = residualized change score for State Trait Anxiety Inventory- State Version; DDP = Data-driven Processing; PDEQ = Peritraumatic Dissociation Experiences Questionnaire; Safety = Safety Behaviours Questionnaire; BDI = Beck Depression Inventory; STAIT = State Trait Anxiety Inventory- Trait Version.

* p < .05
** p < .001
Table 2

Final Structural Model Factor Loadings for Latent Variables

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Unstandardized</th>
<th>SE</th>
<th>Standardized</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Factor Loadings</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Preexisting: BDI (P1)</td>
<td>1.00&lt;sup&gt;a&lt;/sup&gt;</td>
<td>-</td>
<td>.78</td>
</tr>
<tr>
<td>Preexisting: STAIT (P2)</td>
<td>1.81</td>
<td>.38</td>
<td>.90</td>
</tr>
<tr>
<td>Reactivity: Happiness (R1)</td>
<td>-1.34</td>
<td>.16</td>
<td>-.67</td>
</tr>
<tr>
<td>Reactivity: Depression (R2)</td>
<td>1.16</td>
<td>.15</td>
<td>.62</td>
</tr>
<tr>
<td>Reactivity: Anger (R3)</td>
<td>.54</td>
<td>.11</td>
<td>.40</td>
</tr>
<tr>
<td>Reactivity: STAIS (R4)</td>
<td>1.00&lt;sup&gt;a&lt;/sup&gt;</td>
<td>-</td>
<td>.97</td>
</tr>
<tr>
<td>Processing: DDP (PR1)</td>
<td>1.00&lt;sup&gt;a&lt;/sup&gt;</td>
<td>-</td>
<td>.89</td>
</tr>
<tr>
<td>Processing: PDEQ (PR2)</td>
<td>1.23</td>
<td>.13</td>
<td>.81</td>
</tr>
<tr>
<td>Response: Suppression (RP1)</td>
<td>1.00&lt;sup&gt;a&lt;/sup&gt;</td>
<td>-</td>
<td>.47</td>
</tr>
<tr>
<td>Response: Rumination (RP2)</td>
<td>1.44</td>
<td>.29</td>
<td>.72</td>
</tr>
<tr>
<td>Response: Safety (RP3)</td>
<td>2.60</td>
<td>.52</td>
<td>.77</td>
</tr>
</tbody>
</table>

Measurement Error Variances

<table>
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<tr>
<th>Metric</th>
<th>Value</th>
<th>SE</th>
<th>Proportion</th>
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<tbody>
<tr>
<td>E&lt;sub&gt;P1&lt;/sub&gt;</td>
<td>15.92</td>
<td>5.06</td>
<td>.40</td>
</tr>
<tr>
<td>E&lt;sub&gt;P2&lt;/sub&gt;</td>
<td>18.96&lt;sup&gt;ns&lt;/sup&gt;</td>
<td>15.61</td>
<td>.19</td>
</tr>
<tr>
<td>E&lt;sub&gt;R1&lt;/sub&gt;</td>
<td>187.86</td>
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<td>E&lt;sub&gt;R2&lt;/sub&gt;</td>
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<tr>
<td>E&lt;sub&gt;R3&lt;/sub&gt;</td>
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<tr>
<td>E&lt;sub&gt;R4&lt;/sub&gt;</td>
<td>4.45&lt;sup&gt;ns&lt;/sup&gt;</td>
<td>5.99</td>
<td>.05</td>
</tr>
<tr>
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<td>1.45</td>
<td>.20</td>
</tr>
<tr>
<td>E&lt;sub&gt;PR2&lt;/sub&gt;</td>
<td>13.55</td>
<td>2.63</td>
<td>.34</td>
</tr>
<tr>
<td>E&lt;sub&gt;RPI&lt;/sub&gt;</td>
<td>14.72</td>
<td>1.87</td>
<td>.77</td>
</tr>
<tr>
<td>E&lt;sub&gt;RP2&lt;/sub&gt;</td>
<td>8.40</td>
<td>1.44</td>
<td>.48</td>
</tr>
<tr>
<td>E&lt;sub&gt;RP3&lt;/sub&gt;</td>
<td>19.77</td>
<td>4.05</td>
<td>.41</td>
</tr>
</tbody>
</table>

<sup>a</sup> Marker variables set to 1.00

Note: BDI = Beck Depression Inventory; STAIT = State Trait Anxiety Inventory- Trait Version; Happiness = residualized change score for happiness; Depression = residualized change score for depression; Anger = residualized change score for anger; STAIS = residualized change score for State Trait Anxiety Inventory- State Version; DDP = Data-driven Processing; PDEQ = Peritraumatic Dissociation Experiences Questionnaire; Safety = Safety Behaviours Questionnaire; Standardized estimates for measurement error are proportions of unexplained variance.

<sup>ns</sup> p > .05
Table 3

*Model Modification Statistics*

<table>
<thead>
<tr>
<th>Model</th>
<th>$\chi^2$</th>
<th>df</th>
<th>p</th>
<th>$\chi^2$</th>
<th>df</th>
<th>p</th>
<th>$\chi^2$</th>
<th>df</th>
<th>p</th>
</tr>
</thead>
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<tr>
<td>Base (measurement model)</td>
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<td>&lt;.00</td>
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<td></td>
<td></td>
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</tr>
<tr>
<td>Initial model</td>
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<td>49</td>
<td>&lt;.00</td>
<td>45.11</td>
<td>4</td>
<td>&lt;.05</td>
<td>-11.95</td>
<td>1</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Add path from reactivity to intrusions</td>
<td>88.50</td>
<td>48</td>
<td>&lt;.00</td>
<td>33.16</td>
<td>3</td>
<td>&lt;.001</td>
<td>-30.25</td>
<td>1</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Add path from processing to responses</td>
<td>58.25</td>
<td>47</td>
<td>&gt;.05</td>
<td>2.91</td>
<td>2</td>
<td>&gt;.05</td>
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<td></td>
</tr>
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</table>
Table 4

*Factor Correlations*

<table>
<thead>
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<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Preexisting Vulnerability</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Emotional Reactivity</td>
<td>.13</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Dysfunctional Processing</td>
<td>.35</td>
<td>.56</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Dysfunctional Strategies</td>
<td>.38</td>
<td>.34</td>
<td>.63</td>
<td></td>
</tr>
<tr>
<td>5. Intrusions</td>
<td>.18</td>
<td>.41</td>
<td>.35</td>
<td>.51</td>
</tr>
</tbody>
</table>

*Note:* Significance values are not available for these parameters.
Table 5

*Total, Direct and Indirect Effects on Intrusive Thoughts*

<table>
<thead>
<tr>
<th>Latent Variable</th>
<th>Total effect</th>
<th>Direct Effect</th>
<th>Indirect Effect</th>
</tr>
</thead>
<tbody>
<tr>
<td>Preexisting Vulnerability</td>
<td>.18*</td>
<td></td>
<td>.18*</td>
</tr>
<tr>
<td>Emotional Reactivity</td>
<td>.39*</td>
<td>.32*</td>
<td>.07</td>
</tr>
<tr>
<td>Dysfunctional Processing</td>
<td>.14</td>
<td>-.13</td>
<td>.27*</td>
</tr>
<tr>
<td>Dysfunctional Strategies</td>
<td>.48*</td>
<td>.48*</td>
<td></td>
</tr>
</tbody>
</table>

* * p < .05
Figure 1

Predicted Model
Figure 2

*Model 1: Initial Structural Equation Model*

*p < .05*
Model 2: Final Structural Equation Model

Figure 3

* $p < .05$
Footnotes

1 This study was supervised by Dr. Lynn Alden.

2 Three consistent results have emerged from Monte Carlo studies on the impacts of nonnormality on maximum likelihood estimations in structural equation modeling (Enders, 2001): parameter estimates are generally unbiased; parameter standard errors are negatively biased (i.e., smaller); and model fit statistics yields excessive model rejection.
References


Marshall, G. N., & Schell, T. L. (2002). Reappraising the link between peritraumatic dissociation


Appendix A

Emotional Reactivity Questionnaire

Please rate how you feel at this moment:

<table>
<thead>
<tr>
<th></th>
<th>0</th>
<th>10</th>
<th>20</th>
<th>30</th>
<th>40</th>
<th>50</th>
<th>60</th>
<th>70</th>
<th>80</th>
<th>90</th>
<th>100</th>
</tr>
</thead>
<tbody>
<tr>
<td>Happy</td>
<td>0</td>
<td>10</td>
<td>20</td>
<td>30</td>
<td>40</td>
<td>50</td>
<td>60</td>
<td>70</td>
<td>80</td>
<td>90</td>
<td>100</td>
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<tr>
<td>Depressed</td>
<td>0</td>
<td>10</td>
<td>20</td>
<td>30</td>
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<td>50</td>
<td>60</td>
<td>70</td>
<td>80</td>
<td>90</td>
<td>100</td>
</tr>
<tr>
<td>Angry</td>
<td>0</td>
<td>10</td>
<td>20</td>
<td>30</td>
<td>40</td>
<td>50</td>
<td>60</td>
<td>70</td>
<td>80</td>
<td>90</td>
<td>100</td>
</tr>
</tbody>
</table>
Appendix B

Data-driven Processing Scale

During the event this applied to me:

<table>
<thead>
<tr>
<th></th>
<th>Not at all</th>
<th>A little</th>
<th>Moderately</th>
<th>Strongly</th>
<th>Very strongly</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>I couldn’t really take it all in.</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>2.</td>
<td>I did not fully understand what was going on.</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>3.</td>
<td>It was just like a stream of unconnected impressions following each other.</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>4.</td>
<td>I could not think clearly.</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>5.</td>
<td>I was overwhelmed by sensations and couldn’t put everything together.</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>6.</td>
<td>I was confused and could not fully make sense of what was happening.</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>7.</td>
<td>My mind was fully occupied with what I saw, heard, smelled, and felt.</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>8.</td>
<td>My mind was full of impressions and my reactions to them.</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
</tbody>
</table>
Appendix C

Response to Intrusions Questionnaire

Suppression and Rumination Subscales

Think back to the intrusive memories you had about the film.

What did you do when the recollections occur?

<table>
<thead>
<tr>
<th></th>
<th>Never</th>
<th>Very often</th>
</tr>
</thead>
<tbody>
<tr>
<td>3. I try to push them out of my mind.</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
</tr>
<tr>
<td>4. I dwell on them.</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
</tr>
<tr>
<td>5. I think about something else.</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
</tr>
<tr>
<td>6. I worry that something like that could happen to me or my family.</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
</tr>
<tr>
<td>7. I watch TV, listen to music, or read.</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
</tr>
<tr>
<td>8. I drink alcohol or smoke.</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
</tr>
<tr>
<td>9. I think about what could have been done differently.</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
</tr>
</tbody>
</table>
Appendix D

Safety Behaviours Questionnaire

Since viewing the film last week did you notice an increase in:

<table>
<thead>
<tr>
<th></th>
<th>Not at all</th>
<th>Very Much</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Discomfort associated with road-related situations</td>
<td>0 1 2 3 4 5 6 7 8 9</td>
<td></td>
</tr>
<tr>
<td>2. Hesitancy surrounding road-related situations</td>
<td>0 1 2 3 4 5 6 7 8 9</td>
<td></td>
</tr>
<tr>
<td>3. Vigilance while in a car</td>
<td>0 1 2 3 4 5 6 7 8 9</td>
<td></td>
</tr>
</tbody>
</table>
Appendix E

Intrusion Diary

Over the course of the next week, starting as soon as you leave this room, please fill out the appropriate columns of the chart each time you spontaneously have a memory/image/thought about the film that occurs *when you do not intend to think about the film*.

**Each time this happens**, please enter the date and time, rate how distressing it was, give a description of it’s content, and indicate whether it took the form of a thought, image, or combination of the two. It is very important that you try to fill out the columns as soon as possible after it occurs. Please return this form to the experimenter at your appointment next week.

<table>
<thead>
<tr>
<th>Date and Time (please enter each one)</th>
<th>How distressing was it? 0-------------10 not extremely at all (please rate each one)</th>
<th>Description of its contents (please describe each one)</th>
<th>Was it a thought(T), image(I), or Combination (C)? (Please circle the appropriate letter for each one)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td></td>
<td>T I C</td>
</tr>
<tr>
<td>2</td>
<td></td>
<td></td>
<td>T I C</td>
</tr>
<tr>
<td>3</td>
<td></td>
<td></td>
<td>T I C</td>
</tr>
<tr>
<td>4</td>
<td></td>
<td></td>
<td>T I C</td>
</tr>
<tr>
<td>5</td>
<td></td>
<td></td>
<td>T I C</td>
</tr>
<tr>
<td>6</td>
<td></td>
<td></td>
<td>T I C</td>
</tr>
</tbody>
</table>
Appendix F

Experimental Checks

Attention

How much attention did you pay to the film?

<table>
<thead>
<tr>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
</tr>
</thead>
<tbody>
<tr>
<td>not at all</td>
<td>full attention</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Prior frequency of medical footage exposure

To what extent is this statement true of you?

I watch surgical TV programs, for example like those on The Learning Channel

never | almost everyday
---|---
0 | 1 | 2 | 3 | 4 | 5 | 6 | 7

Diary Compliance

To what extent is this statement true of you? I was often unable (or forgot) to record my spontaneous memories/images/thoughts in the diary chart.

Not at all | Extremely true of me
---|---
0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10