

Assessing posttraumatic cognitive processes: the Event Related Rumination Inventory

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Cognitive processes in the aftermath of experiencing a major life stressor play an important role in the impact of the event on the person. Intrusive thoughts about the event are likely to be associated with continued distress, while deliberate rumination, aimed at understanding and problem-solving, should be predictive of posttraumatic growth (PTG). The Event Related Rumination Inventory (ERRI), designed to measure these two styles of rumination, is described and validation information is provided. Using a college student sample screened for having experienced highly stressful life events, data were obtained ($N = 323$) to conduct an exploratory factor analysis that supported the two factors of the ERRI. Separate confirmatory factor analyses (CFA) on two additional samples ($Ns = 186$ and 400) supported a two-factor model. The two ERRI factors were validated by comparison with related variables and by assessing their contributions to predicting distress and PTG in two samples ($Ns = 198$ and 202) that had been combined to conduct the second CFA. Data indicate the ERRI has solid psychometric properties, captures variance not measured by stable differences in cognitive styles, and the separate factors are related to posttraumatic distress and growth as predicted by existing models of PTG.

Keywords: posttraumatic growth; posttraumatic distress; rumination styles; rumination; assessment

Highly stressful and traumatic events can lead to distressing posttraumatic symptoms, but the struggle with major life crises can also lead to the experience of posttraumatic growth (PTG; Joseph & Linley, 2008; Tedeschi & Calhoun, 1995). Two of the main elements that can lay the foundation for the possibility of growth are the degree to which the event presents a significant challenge to, or invalidates components of, the individual's assumptive world, and the degree to which this challenge initiates cognitive processes that focus on the life crisis and its implications (Cann et al., 2009; Janoff-Bulman, 1992).

When a major stressful event seriously challenges individuals' beliefs about how the world works and their place in the world, they have lost their framework for understanding. However, through the process of attempting to understand the event and rebuilding those core beliefs about the world individuals are provided with the opportunity for realizing growth. Effective cognitive work that confronts the

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challenged beliefs can help restore or revise the assumptive world and allow the person to appreciate how they have been challenged and changed by the experience of a major crisis (Janoff-Bulman, 2006).

The term rumination has acquired a negative connotation in recent years, particularly in the clinical literature on depression and posttraumatic stress disorder (PTSD), where the word has been used by some to mean only self-focused negative thinking about symptoms (e.g., Nolen-Hoeksema, McBride, & Larson, 1997) or it has been defined as closely related to worry (Ehring, Frank, & Ehlers, 2008; Michael, Halligan, Clark, & Ehlers, 2007). However, rumination as it is generally defined simply means repetitive thought, pondering or meditating on information, essentially a cognitive “chewing the cud.” Multiple authors have recognized that ruminative thought can take alternative forms and attempts have been made to identify stable differences in ruminative thinking (Scott & McIntosh, 1999; Segerstrom, Stanton, Alden, & Shortridge, 2003; Treynor, Gonzalez, & Nolen-Hoeksema, 2003; Wyer, 1996). Ruminative thoughts precipitated by a highly stressful event can include a variety of different types of recurrent thinking; these can include intrusive thoughts that are often undesired, like those commonly associated with rumination as a symptom of distress, but they can also include more controlled thoughts focused on making sense of the experience, problem-solving, reminiscence, and anticipation (Martin & Tesser, 1996; Watkins, 2008). We propose that in order to understand the processes related to the experience of PTG and posttraumatic distress, it is important to distinguish two major types of rumination: intrusive and deliberate. Furthermore, assessing rumination more neutrally, rather than with a focus on negative content, will help clarify its role in PTG.

It is important to recognize and appreciate the difference between these styles of ruminative thought and the symptoms of posttraumatic distress that have been labeled by some as rumination. Although repetitive thinking about psychological symptoms and the sources of the symptoms (e.g., Nolen-Hoeksema, 1991) or worry associated with a negative experience (e.g., Michael et al., 2007) can be a contributor to continued distress, all rumination is not negative. Even intrusive thoughts in the aftermath of a significant life event, which are often seen as symptoms of distress, are an expected and normal response to the event. We would expect intrusive rumination even in cases where the significant life event was a positive experience. A first encounter with someone you find highly desirable, for example, can result in intrusive thoughts as you experience difficulty in “getting him/her out of your head.” While it is important to understand how some forms of rumination might be detrimental to well-being, it also is important to recognize that all forms of rumination are not negative, and that some intrusive thoughts are quite natural after significant experiences.

Intrusive ruminations are, by definition, unsolicited invasions of one’s cognitive world-thoughts about an experience that one does not choose to bring to mind. Deliberate ruminations about events, however, are engaged in voluntarily and can be focused purposefully on trying to understand events and their implications. In one of the primary models of PTG (Calhoun, Cann, & Tedeschi, 2010), it has been proposed that intrusive and deliberate thoughts play different roles in influencing outcomes following a highly stressful experience. Although there is limited empirical evidence examining the two styles of ruminative thought, what is available suggests that the distinction between deliberate and intrusive rumination is important not

only conceptually, but also empirically. These different forms of ruminative thought have been found to differ in their relationships with PTG and with posttraumatic distress. Event-related deliberate rumination, that is not negatively focused, is more likely to be related to eventual PTG, and event-related intrusive rumination, which is not controlled by the individual, is more likely to be related to various kinds of posttraumatic distress (Affleck & Tennen, 1996; Calhoun, Cann, Tedeschi, & McMillan, 2000; Cann, Calhoun, Tedeschi, & Solomon, 2010; Taku, Calhoun, Cann, & Tedeschi, 2008). In addition, it is assumed that the level of intrusive thoughts will be predictive of the level of deliberate thoughts, since intrusive thoughts are a precursor leading the individual to seek a better understanding of the stressful experience (Calhoun et al., 2010). Identifying the impact and correlates of these two styles of event-related thought is important for the understanding of posttraumatic adaptation processes, especially those leading to the experience of PTG.

Given that intrusive thoughts are expected to occur as a normal by-product of a major life event, it is desirable to have an instrument that assesses the presence of these thoughts without implying posttraumatic symptoms. For example, when intrusive thoughts are viewed as symptoms of distress they are typically associated with the re-experiencing of the event, having flashbacks, and creating difficulty in sleeping (Elwood, Hahn, Olatunji, & Williams, 2009). A commonly used measure of PTSD symptoms, the Impact of Event Scale – Revised (IES-R; Weiss & Marmar, 1997), includes a factor assessing intrusive event-related rumination; however, it includes items that involve difficulties with sleeping and unpleasant dreams, so it does not provide the more neutral assessment of intrusive thoughts that could occur naturally without implying PTSD symptoms. In addition, the IES-R does not assess deliberate, more reflective rumination and the scale items assessing rumination are presented in the context of others focused on other symptoms of distress. Our goal is to devise a measure that captures the two rumination styles, without evaluative bias and without mixing in thoughts that specifically reflect PTSD symptoms. Such a measure would likely have some overlap with measures like the IES-R, but would capture some unique variance as well.

There are available scales that measure stable dispositions of the tendency to ruminate in different ways, including more reflective or deliberate rumination. The Ruminative Responses Scale, for example, measures the tendency to negatively brood or to neutrally ponder about one's thoughts or feelings in response to negative mood or depression (Treyner et al., 2003). The Rumination-Reflection Questionnaire (Trapnell & Campbell, 1999) assesses the general disposition to be ruminatively self-focused, dwelling on past threats or losses, or reflectively self-focused, seeking meaning or more global understanding of the self. The content of these two scales, and others like them, successfully distinguish between the kinds of habitual repeated thought that are essentially deliberate or intrusive; however, the scales do not assess transient, event-provoked thinking about a specific highly stressful or disruptive event. It would seem that when the focus of investigation is on repeated thinking about a specific set of circumstances, such as a major life crisis, an instrument that is focused on transient event-related processes will provide more useful and specific information than scales that measure general response tendencies or dispositions. Although groups of items that intercorrelate have been developed to assess event-related intrusive and deliberate ruminations (Calhoun et al., 2000), we are aware of no published scale that has solid psychometric properties, ensuring that the two

styles are being separately assessed as they apply to repeated thought about a specific stressful event.

A scale focused on repeated thinking about a specific event would allow for the investigation of the role of more transitory cognitive states, both in the development of PTG and of posttraumatic distress. No matter what one's stable predisposition to engage in intrusive or deliberate thinking, a major life crisis is likely to temporarily provoke both (Calhoun et al., 2000; Taku, Cann, Tedeschi, & Calhoun, 2009). We describe here the development of such a scale: the Event Related Rumination Inventory (ERRI). An important general question for the development of an inventory designed to assess specific event-related rumination, is whether such a scale does indeed add information about post-event processes beyond what the scales that assess stable ruminative styles already provide. In addition, the scale should clearly show the expected relationships with posttraumatic distress and PTG. Intrusive thoughts are expected to be more strongly related to levels of ongoing distress than to levels of PTG, especially if they occur well after the experienced event. Alternatively, deliberate rumination that is not negatively focused, but reflects potential problem-solving and meaning-seeking, should be more predictive of PTG. In addition, levels of intrusive thoughts should be positively related to levels of deliberate thoughts, since it is believed that the intrusive thoughts in the aftermath of a stressful experience serve to stimulate attempts to engage in more deliberate processing of one's experience.

Study 1: development of the Event Related Rumination Inventory (ERRI)

Method

Item development

The original set of event-related rumination items was developed for a study of religious beliefs, cognitive processing, and growth (Calhoun et al., 2000). The items were drawn from a variety of sources, including items modified from published scales (e.g., Barrett & Scott, 1989; Sanavio, 1988) and items created based on ideas suggested in the trauma literature (e.g., Tennen & Affleck, 1998; Yalom & Lieberman, 1991). The items were created or reworded to reflect either intrusive or deliberate forms of repetitive thinking about a highly stressful event. A revision of the items was required after their evaluation with a larger sample indicated that not all the original items loaded well on the expected dimensions (Taku et al., 2009).

In formulating the current versions of the items, an effort was made to exclude any clearly positive or negative implications of the different thoughts. With the original items as a starting point, various sets of items were tested to insure clarity and to insure internal consistency. Ultimately, based on several pretest results and the judgments of the three lead researchers and a group of doctoral students engaged in research on psychological responses to highly stressful or traumatic events, 10 items were chosen for each of the two rumination styles (see Table 1). Separate instructions preceded each set of items to reinforce the participants' appreciation for the type of cognitive activity that was being assessed. Participants rated the degree to which the thoughts occurred during a specified time frame on a 4-point scale (not at all = 0 to 3 = often). In the initial samples used to assess the factor structure of the ERRI, the time frame specified was the "weeks immediately after the event."

Table 1. Items included in the Event Related Rumination Inventory with factor loadings based on the exploratory factor analysis.

Intrusive items

After an experience like the one you reported, people sometimes, but not always, find themselves having thoughts about their experience even though they don't try to think about it. Indicate for the following items how often, if at all, you had the experiences described during the weeks immediately after the event.

Factors

Int	Del	
.784	.169	I thought about the event when I did not mean to.
.805	.241	Thoughts about the event came to mind and I could not stop thinking about them.
.736	.242	Thoughts about the event distracted me or kept me from being able to concentrate.
.826	.238	I could not keep images or thoughts about the event from entering my mind.
.776	.280	Thoughts, memories, or images of the event came to mind even when I did not want them.
.713	.232	Thoughts about the event caused me to relive my experience.
.754	.260	Reminders of the event brought back thoughts about my experience.
.793	.225	I found myself automatically thinking about what had happened.
.712	.302	Other things kept leading me to think about my experience.
.740	.315	I tried not to think about the event, but could not keep the thoughts from my mind.

Deliberate items

After an experience like the one you reported, people sometimes, but not always, deliberately and intentionally spend time thinking about their experience. Indicate for the following items how often, if at all, you deliberately spent time thinking about the issues indicated during the weeks immediately after the event.

.166	.687	I thought about whether I could find meaning from my experience.
.198	.731	I thought about whether changes in my life have come from dealing with my experience.
.175	.621	I forced myself to think about my feelings about my experience.
.129	.742	I thought about whether I have learned anything as a result of my experience.
.253	.682	I thought about whether the experience has changed my beliefs about the world.
.291	.583	I thought about what the experience might mean for my future.
.249	.681	I thought about whether my relationships with others have changed following my experience.
.195	.692	I forced myself to deal with my feelings about the event.
.290	.569	I deliberately thought about how the event had affected me.
.314	.568	I thought about the event and tried to understand what happened.

Note: "Int" refers to the intrusive dimension and "Del" to the deliberate dimension. $N = 323$.

Data collection

To determine, and to confirm, the factor structure of the ERRI, the two sets of 10 items were administered to participants as part of separate online studies of PTG processes not relevant to the current report. In each of these cases, participants

were responding to a specific highly stressful event that they had experienced. The ERRI data were collected for the purpose of examining the psychometric properties of the ERRI, so the other variables included in the surveys are not considered here.

Participants – exploratory factor analysis

Participants were students enrolled in psychology courses. At the beginning of the semester, all eligible students could take a common pretest. As part of that pretest, students indicated if they had experienced any of a preselected set of nine highly stressful events (death of close other, serious medical issue for self, or for close other, accident resulting in serious injury, residence seriously damaged, victim of assault, victim of robbery, been stalked, and divorce) within a specified time period (within 3 years). Only students who indicated “yes” to one of the events were eligible to participate in the research. If more than one event had been experienced, participants were instructed to respond based on the most stressful event experienced in the designated time period. The final sample used for the exploratory factor analysis ($N = 323$) included 221 women and 102 men with an average age of 21.45 years (range from 18 to 60 years) who were predominantly Caucasian (70%). The stressful event had taken place an average of 223.8 days ago. The most common stressful events that were reported were: serious medical problem (42%), death of a close other (34%), and victim of assault (11%).

Participants – confirmatory factor analysis (CFA)

A separate sample of participants was used for a confirmatory factor analysis (CFA). Participants were students enrolled in psychology courses. Using the same pretesting procedure described above, students were screened for exposure to a stressful event in order to be eligible. The sample ($N = 186$) included 141 women and 45 men, with an average age of 21.76 years (range from 19 to 58 years) who were predominantly Caucasian (68%). The stressful event had taken place an average of 334.4 days ago. The most common stressful events that were reported were: death of a close other (47%), serious medical problem (25%), victim of assault (10%), and serious accident with injury (7%).

Results

Exploratory factor analysis

The 20 items were subjected to an exploratory factor analysis with a varimax rotation. Using parallel analysis for identifying the number of components to extract (O'Connor, 2000), it was determined that the results supported the expected two-factor solution, with all items loading best on the expected factor. In addition, only the first two factors produced eigenvalues above 1. The items and factor loadings are presented in Table 1. The two factors accounted for 57% of the variance, with the intrusive factor accounting for 32% (eigenvalue = 6.394) and the deliberate factor accounting for 25% (eigenvalue = 4.980) of the variance based on the rotated factors. As would be expected, the internal consistencies were strong

(intrusive $\alpha = .94$, deliberate $\alpha = .88$). Although the two separate factors clearly emerged, they were, as expected, correlated ($r = .60$), indicating that those who tend to experience more intrusive thoughts also tend to engage in more deliberate rumination.

Confirmatory factor analysis (CFA)

The anticipated two-factor model was compared to a single-factor model. No other alternative model was suggested by theory or by the exploratory factor analysis. The single-factor model indicated a potential fit, $\chi^2 (170) = 678.90$, $p < .01$, with the fit indices above .90 (Normed Fit Index (NFI) = .91; Comparative Fit Index (CFI) = .93), but the root mean square error of approximation (RMSEA) (.18, 90% CI [.17–.19]) was relatively high. The two factor model produced a far superior fit, $\chi^2 (169) = 305.09$, $p < .01$, with all fit statistics meeting recommended levels (NFI = .96; CFI = .98; RMSEA = .061, 90% CI [.048–.073]). Thus, the CFA supports the presence of two factors; one capturing intrusive thoughts and the other more deliberate rumination. Once again, the two factors were correlated ($r = .61$).

Study 2: evaluation of the Event Related Rumination Inventory (ERRI)

Overview

To further evaluate the ERRI, data were collected from two additional samples. Having established that the ERRI has two factors and good psychometric properties, the next step was to show that it accounts for variance in predicting outcomes after exposure to a highly stressful event. Along with the ERRI, participants completed other measures relevant to the posttraumatic cognitive processes, especially as hypothesized in the current models (Calhoun & Tedeschi, 2006; Janoff-Bulman, 1992, 2006; Linley & Joseph, 2004). In addition, the ERRI was compared to an existing measure of stable tendencies to ruminate, to personality measures that might be related to the two rumination styles, and to stable differences in styles of coping. It was expected that the ERRI would be only weakly related to stable personality differences, stable differences in rumination styles, and stable differences in coping styles since it focuses on event-stimulated cognitive processing, that should occur regardless of existing stable differences.

Deliberate rumination, in the aftermath of a highly stressful experience, should be most strongly, and positively, related to PTG, while intrusive rumination should be positively related to symptoms of distress (Affleck & Tennen, 1996; Calhoun & Tedeschi, 2006; Janoff-Bulman, 1992). It also is possible that continued high levels of deliberate rumination long after the event could be related to distress, since that pattern would suggest a failure to completely process and deal with the experience.

The measures obtained from the two samples were identical except for the time frame requested for the ERRI ratings. In one sample, participants were instructed to rate their thoughts in “the weeks immediately after the event.” In the other sample, participants reported on their thoughts “during the last couple of weeks.” Although the ideal situation would be to track changes in cognitive processes longitudinally, these two samples allow for a preliminary investigation of the usefulness of the ERRI for assessing thought processes currently versus retrospectively.

Participants

To begin, 938 students completed the pre-screening measure and of those, 465 reported having experienced one of the designated highly stressful events in the past 6–8 months. Of those 465 who were eligible 208 volunteered to complete the online survey, but 10 were excluded from the analyses. Nine of the 10 chose to report on an event that had occurred longer ago than the designated time frame when they completed the survey, and one rated the event as not at all stressful. The usable sample of participants ($N = 198$), who reported about rumination immediately after the event, included 129 women and 69 men, with a mean age of 21.64 years (range from 18 to 52 years). The sample was predominantly Caucasian (66.7%; 21.2% African-American, 6.1% Asian American, and 6% other). The critical event had occurred within the past 240 days. To assess the immediate impact of the event, participants rated the event on its stressfulness at the time and the extent to which the event provoked extreme fear or horror on 7-point scales (1 not at all to 7 extremely). On both scales, the ratings averaged above 5 (stressfulness: $M = 5.94$, $SD = 1.25$; fear or horror: $M = 5.20$, $SD = 1.71$), indicating that the events were stressful life experiences.

For the second sample 1065 students completed the pre-screening measure, and of those 506 reported having experienced one of the designated stressful events in the past 6–8 months. Of those, 215 completed the online survey, but 13 were excluded from the analyses. Eight of the 13 chose to report on an event that had occurred longer ago than the designated time frame, three rated the event as not at all stressful, one failed to describe the event they were reporting about, and one listed two events rather than one. The usable sample of participants ($N = 202$), who were reporting about rumination recently (in the last couple of weeks), included 117 women and 85 men, with a mean age of 21.26 years (range from 18 to 50 years). The sample was predominantly Caucasian (60.4%; 19.8% African-American, 5.9% Asian American, 5.4% Latina/Latino, and 8.4% other). The critical event had occurred within the past 210 days. The ratings of stressfulness of the event and the fear or horror experienced averaged at least 5 (stressfulness: $M = 5.81$, $SD = 1.22$; fear or horror: $M = 5.00$, $SD = 1.66$).

The pre-screening assessment was changed for use with these two samples to include 12 possible events. The events, along with the number of participants reporting on that type of event, were: unexpected or violent death of close other (96), personally experienced very serious medical problem (31), close other experienced very serious medical problem (176), accident leading to serious injury to you or close other (40), place of residence seriously damaged (2), exposed to threat of death or serious bodily harm (14), witnessed severe assault of close other (5), victim of severe physical or sexual assault (4), intimate partner violence (6), victim of crime such as robbery or mugging (15), you were stalked (10), and deployed with the military to an active combat zone (1).

Materials in addition to the Event Related Rumination Inventory (ERRI)

Demographic information

Participants provided demographic information such as age, gender, and ethnicity. Participants indicated which of the 12 events they were reporting about, the

estimated days since the stressful event, and also rated the stressfulness of the event and experience of horror or fear on the 7-point scales described above.

Posttraumatic Growth Inventory (PTGI)

Participants completed the Posttraumatic Growth Inventory (PTGI; Tedeschi & Calhoun, 1996), a 21-item measure assessing the extent to which individuals believe they have changed positively as a result of a stressful experience. Scoring for the PTGI consists of a total score although the scale does capture growth on five dimensions: spiritual change, new possibilities in life, feeling stronger as a person, having a greater appreciation for life, and positive changes in the way survivors relate to others. The response scale ranges from 0 (I did not experience this change) to 5 (I experienced this change to a great degree). Scores are presented as means across the 21 items. The PTGI has been found to have appropriate internal consistency ($\alpha = .90$), test–retest reliability over a two-month interval ($r = .71$), scores are not correlated with social desirability and responses tend to be corroborated by others (Shakespeare-Finch & Enders, 2008). Within the current samples the reliability was very good ($\alpha = .94$).

Core Beliefs Inventory (CBI)

Participants completed the Core Beliefs Inventory (CBI; Cann et al., 2010), a 9-item scale designed to measure the degree to which a specific stressful event challenged participants' core beliefs about their world. In longitudinal and cross-sectional research, the CBI has been shown to be strongly related to subsequent PTGI scores. Responses are made on a scale from 0 (not at all) to 5 (to a very great degree). The measure has shown good internal reliability ($\alpha = .82$) and acceptable test–retest reliability over a 60 to 74 day time period ($r = .69$) (Cann et al., 2010). Across the current samples the reliability was acceptable ($\alpha = .85$).

The Impact of Events Scale – Revised (IES-R)

The IES-R (Weiss & Marmar, 1997) was used to assess the level of distress associated with posttraumatic symptoms experienced during the past 7 days. The scale includes 22 items and can be used to produce a total score or scores can be calculated for three symptom subscales: intrusion, avoidance, and hyperarousal. Responses are on a 0 (not at all) to 5 (often) scale. The internal consistency of the measure ranges from .79 to .92 for the three subscales with test–retest reliability ranging from .51 to .94 (Weiss & Marmar, 1997). In the current samples the total score for the IES-R had strong internal reliability ($\alpha = .94$), and all subscales had reliabilities of .85 or higher.

Rumination-Reflection Questionnaire (RRQ)

The Rumination-Reflection Questionnaire (RRQ; Trapnell & Campbell, 1999) assesses stable tendencies to engage in reflective versus ruminative thinking. Reflective thinking is defined as intellectual, involving curiosity or searching for understanding and is related to the personality trait of openness. Ruminative thinking is characterized as more neurotic, motivated by perceived threats or

potential losses. There are 12 items used to assess each style, and respondents indicate their agreement with each on a 5-point scale (strongly disagree [1] to [5] strongly agree). Scores are reported as means for the items assessing each style. The two scales have good internal reliability (Trapnell & Campbell, 1999; $\alpha = .90$ for rumination and $.91$ for reflection). In the current samples the internal reliabilities were also adequate (reflection $\alpha = .78$, rumination $\alpha = .88$).

Need for Cognition (NCog)

The Need for Cognition – Short Form (NCog-SF; Cacioppo, Petty, & Kao, 1984) measures individuals' stable tendencies to engage in and to enjoy thinking. Those high on NCog tend to process information and ponder it even when the information is not highly relevant, but they also are active processors of information with high personal relevance. High NCog people have been shown to engage in more effortful processing when trying to make sense of the world (Cacioppo, Petty, Feinstein, & Jarvis, 1996). The NCog has 18 items, and responses are made on a 5-point scale (extremely uncharacteristic [1] to [5] extremely characteristic). Scores are reported as means. In a review of research using the NCog and NCog-SF, the internal reliability was consistently above $.85$, and the validity of the measure as an indicator of cognitive effort was verified (Cacioppo et al., 1996). In the current samples the internal reliability was $.86$.

Private self-consciousness (PSCS)

The Self-Consciousness Scale (Fenigstein, Scheier, & Buss, 1975) assesses three dimensions: private self-consciousness (PSCS), public self-consciousness, and social anxiety. Only the 10 PSCS items were used in this study. PSCS captures stable tendencies to engage in thinking about inner feelings, and self-analysis. Responses are made on a 5-point scale (extremely uncharacteristic [0] to [4] extremely characteristic). Test–retest reliability for the PSCS is adequate ($.79$) over a two-week period (Fenigstein et al., 1975). In the current samples the internal reliability was adequate ($\alpha = .68$).

Coping style

The COPE Inventory (Carver, Scheier, & Weintraub, 1989) provides a theoretically based measure of differences in responses to stressors. The 60-item COPE provides scores for 15 variations in coping strategies. Responses are made on a 4-point scale (I usually don't do this [1] to [4] I usually do this a lot). The instructions indicated that participants should answer based on "what you usually do when you experience a stressful event." The internal reliabilities for the 15 scores were generally sufficient given that each is based on only four items. Test–retest reliabilities were reasonable over 6 and 8 week intervals (Carver et al., 1989). In the current samples, the internal consistencies ranged from $.52$ to $.95$, with mental disengagement ($.52$) and suppressing competing thoughts ($.54$) the only factors with α under $.65$.

Procedure

All procedures were approved by the university institutional review board. Students in eligible undergraduate psychology courses have access to an online research participation website. When they log into the web page, they can see a list of studies for which they are eligible. When students selected the current study, they were directed to an online survey. The Informed Consent statement appeared on the first page and, after agreeing to continue, participants began completing the measures. Measures that dealt with stable differences (COPE, PSCS, NCog, and RRQ) were presented first, in varied orders, before participants were asked to indicate the specific event they had experienced. Demographic information came next, and as part of those questions participants indicated and described the stressful event they had experienced. The remaining event-specific measures (CBI, PTGI, ERRI, and IES-R) were presented in random order for each participant. All responses were anonymous.

Results

Confirmatory factor analysis (CFA)

To further verify the two-factor structure of the ERRI, a CFA was conducted on the new sample, combining the two separate samples ($N=400$). Once again, the anticipated two-factor model was compared to the alternative single-factor model. The single-factor model indicated a potential fit, $\chi^2(170) = 1144.83, p < .01$, with the fit indices above .90 (NFI = .94; CFI = .94), but the RMSEA (.17, 90% CI [.16–.18]) was relatively high. The two-factor model produced a far superior fit, $\chi^2(169) = 362.07, p < .01$, with all fit statistics meeting recommended levels (NFI = .98; CFI = .99; RMSEA = .055, 90% CI [.047–.062]). Thus, these data further support the presence of two factors; intrusive thoughts and deliberate rumination. As in the previous analyses, the two factors, while representing distinct differences, also are correlated ($r = .67$).

Relationships with stable individual difference measures

Table 2 contains the correlations of the intrusive and deliberate scores with the personality and individual difference measures. The two ERRI styles appear to be unrelated to NCog, and moderately correlated with PSCS and the RRQ dimensions. To see more clearly how the ERRI styles relate to these stable individual differences, while controlling for the shared variance between the two ERRI types of thought, the intrusive and deliberate scores were used in multiple regression analyses to predict PSCS and the two RRQ styles. For both samples, the PSCS regression models were significant, $F(2, 197) = 6.22$ for immediate and $F(2, 199) = 5.34$ for recent, $p < .01$, although only a small amount of variance in PSCS was accounted for by the ERRI styles ($\text{adj}R^2 = .05$ for immediate and .04 for recent). In each model, only the deliberate style was individually significant (deliberate style $\beta = .189$ and .226 for immediate and recent, respectively, $p < .05$). Thus, it appears that people who have a stable tendency to engage in self-analysis were more likely to engage in deliberate rumination about a stressful experience, but the shared variance is still quite low.

For the reflection dimension of the RRQ a somewhat similar pattern was found. For both the immediate and the recent time frames the models were significant,

Table 2. Correlations of ERRI styles with private self-consciousness, need for cognition, rumination reflection questionnaire factors and COPE dimensions.

	Time frame for ERRI responses			
	Immediately after the event		Recent	
	Intrusive	Deliberate	Intrusive	Deliberate
Private self-consciousness	.20*	.24*	.13	.23*
Need for cognition	.02	.06	.02	.15
RRQ reflection	.21*	.20*	.13	.26*
RRQ rumination	.38*	.30*	.33*	.16
<i>COPE styles</i>				
Positive reinterpretation	.02	.15	-.10	.14
Mental disengagement	.26*	.22*	.00	.01
Venting emotions	.26*	.19*	.15	.13
Instrumental social support	-.02	.05	.07	.22*
Active coping	.00	.06	-.06	.02
Denial	.15	.10	.21*	.13
Religious	.04	.13	.07	.04
Humor	.07	.07	.04	.09
Behavioral disengagement	.20*	.14	.20*	.07
Restraint	.05	.10	.13	.06
Emotional social support	.01	.11	.12	.21*
Substance use	.29*	.15	.19*	.13
Acceptance	.04	.04	-.04	.00
Suppression	.09	.13	.00	.14
Planning	-.04	.01	-.04	.09

Note: The immediately after time frame sample size was 198, and the recent time frame sample size was 202.

* $p < .01$.

$F(2, 197) = 5.18$ for immediate and $F(2, 199) = 7.05$ for recent, $p < .01$, but explained only a small amount of variance ($\text{adj}R^2 = .04$ for immediate and $.06$ for recent). However, in the case of reflection, neither of the ERRI types was individually significant in the sample that reported rumination soon after the event ($\beta = .101$ for deliberate and $.144$ for intrusive, $p > .13$), but the deliberate style was individually significant for the sample reporting recent ruminations about the stressful event ($\beta = -.028$ for intrusive, $p = .74$, and $\beta = .273$ for deliberate, $p < .001$). A stable tendency to engage in intellectual cognitive processing was associated with a higher level of overall rumination immediately after experiencing a significant stressor, but only with more deliberate rumination recently.

Both ERRI styles of repeated thought were associated with the RRQ rumination dimension. In both samples the models were significant, $F(2, 197) = 17.32$ for immediate and $F(2, 199) = 12.67$ for recent, $p < .001$, and a greater percent of variance was explained than in the previous analyses ($\text{adj}R^2 = .14$ for immediate and $.10$ for recent). In this case, as expected, the ERRI intrusive rumination style shared more variance with the more neurotic RRQ rumination style. In each model, only the ERRI intrusive style was individually significant ($\beta = .331$ for the immediate sample, $p < .001$, and $\beta = .367$ for the recent sample, $p < .001$). A stable tendency to engage in

thinking focused on perceived threats and potential losses was associated with higher levels of intrusive rumination recalled as having occurred in the immediate aftermath of a stressful experience and also reported in the recent past. Again, while this was the expected relationship, there still was only a very limited amount of shared variance between the ERRI, designed to capture event-specific rumination styles, and measures designed to assess stable individual differences.

The results for the relationships with differences in typical coping styles (see Table 2) indicate that in the time immediately after the stressor was experienced, those who typically focus on their emotions, the venting emotions style, and those who use mental disengagement, trying to distract oneself from thoughts about the stressor, tend to experience more intrusive and more deliberate rumination. Again, because of the shared variance between the two rumination styles, multiple regression analyses were conducted for these two coping styles, using intrusive and deliberate styles as the predictors. Both of the models were significant, $F's(2, 197) = 7.34$ for venting and 7.24 for mental disengagement, $p's < .01$. In each case, the variance explained was small ($adjR^2 = .07$ for venting, $adjR^2 = .06$ for mental disengagement), and the only individually significant predictor was the intrusive style (for venting, intrusive $\beta = .251$, $p < .01$, deliberate $\beta = .020$, $p = .83$; for mental disengagement, intrusive $\beta = .201$, $p < .05$, deliberate $\beta = .081$, $p = .38$). Thus, it appears that for both of these coping styles, the primary relationship was with higher levels of intrusive rumination. Coping by focusing on emotions or by seeking distraction was associated with more intrusive thoughts about the event, but not with deliberate thinking. In each case, however, the variance explained was relatively small.

Intrusive rumination was also associated with the behavioral disengagement coping style, which involves reducing efforts to deal with the stressor. This relationship was present for both time frames and suggests that when one prefers to cope by avoiding dealing with the stressor, intrusive thoughts about the event are more common and salient. This same explanation could apply to the significant relationships found between intrusive thoughts and trying to cope through substance abuse. The coping style of substance abuse, like that of behavioral disengagement, involves trying to avoid thinking about the event, so any thoughts about the event would be intrusive, not deliberate.

The other results for the recent time frame are understandable. People who try to cope by denial refuse to engage in any constructive cognitive work about the stressor, so they are likely to experience continued intrusive thoughts if they have not dealt with their stressful experience. The results for deliberate rumination recently are interesting. The only significant relationships are the positive relationships with the two coping styles that involve seeking social support. A deliberate style of thinking, involving more problem-solving and meaning-seeking, is associated with seeking out others, perhaps to help in the process of making sense of the experience.

Relationships with distress and posttraumatic growth (PTG)

The ERRI dimensions should explain more variance in the outcomes associated with a stressful experience than the stable differences in styles of thinking. To evaluate these possibilities, the ERRI dimensions and the RRQ dimensions were used to predict distress levels as measured by the dimensions of the IES-R. The ERRI intrusive dimension should be related to distress reported. The three dimensions of

the IES-R, as well as the IES-R total score, were used as separate indicators of distress, to demonstrate that the potential to predict the IES-R total is not being biased by the inclusion of the intrusions dimension within the IES-R total score. The CBI also was included in the model, since it provides some assessment of the cognitive impact of the stressful event – the degree of challenge to core beliefs and the potential cognitive work that may be needed to rebuild them.

The same model was also used to predict PTG. In this case, the ERRI deliberate dimension should be the strongest predictor. The means for the variables used in the regression analyses are presented in Table 3. The correlations among the variables, for both time frames in which the ERRI was completed, are provided in Table 4. The results of the regression analyses are presented in Table 5.

The results indicate quite clearly that the amount of event-related intrusive rumination, both in the immediate aftermath of a stressful experience and during the most recent few weeks, was related to the level of distress reported. For all three of the symptoms of distress captured by the IES-R and, of course, for the total score on the IES-R, the overall models were highly significant. However, within each of the models, only the ERRI intrusive score was individually significant as a predictor. The stable difference in rumination about threats and potential losses, as measured by the RRQ, was not individually significant within the models. Using the semi-partial correlations for ERRI intrusive from the models, an estimate of the percent of variance explained by the ERRI intrusive score can be obtained. The lowest semi-partial correlation ($sr = .31$) was for the prediction of IES-R avoidance with the immediate time frame, and the highest ($sr = .45$) was for the IES-R total in the recent time frame. On average, across the four models tested for the immediate time frame, the ERRI intrusive score explained 15.5% of the variance in the IES scores. For the recent time frame the average variance explained by ERRI intrusive score was

Table 3. Means and standard deviations for variables used in regression analyses for both time frames.

	Immediately after the event time frame for ERRI		Recent time frame for ERRI	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
ERRI intrusive	1.63	0.85	1.46	0.82
ERRI deliberate	1.63	0.76	1.54	0.72
RRQ rumination	3.61	0.70	3.60	0.65
RRQ reflection	3.29	0.66	3.32	0.61
CBI	2.75	1.15	2.65	1.09
IES-R avoidance	1.36	0.95	1.29	0.86
IES-R hyperarousal	1.17	1.01	1.07	1.01
IES-R intrusions	1.46	1.01	1.29	0.97
IES-R total	1.34	1.19	1.23	0.85
PTGI	2.32	1.19	2.42	1.20

Note: $N=198$ for the immediately after time frame; and $N=202$ for the recent time frame. ERRI scores are on a 0 (not at all) to 4 (often) scale. RRQ scores are on a 1 (strongly disagree) to 5 (strongly agree) scale. CBI is on a 0 (not at all) to 5 (very great degree) scale. IES scores are on a 0 (not at all) to 5 (often) scale. PTGI is on a 0 (did not experience this change) to 5 (experienced this change to a very great degree) scale.

Table 4. Correlations of ERRI and RRQ dimensions with outcome variables of distress and growth for both time frames.

	2	3	4	5	6	7	8	9	10
<i>Immediately after the event time frame for ERRI</i>									
1 ERRI intrusive	.67*	.38*	.21*	.50*	.51*	.59*	.71*	.68*	.42*
2 ERRI deliberate		.30*	.20*	.61*	.42*	.44*	.52*	.51*	.57*
3 RRQ rumination			.20*	.35*	.14	.21*	.32*	.25*	.09
4 RRQ reflection				.17	.06	.15	.15	.13	.12
5 CBI					.34*	.32*	.41*	.40*	.56*
6 IES-R avoidance						.67*	.65*	.86*	.34*
7 IES-R hyperarousal							.81*	.91*	.23*
8 IES-R intrusions								.92*	.37*
9 IES-R total									.36*
10 PTGI									
<i>Recent time frame for ERRI</i>									
1 ERRI intrusive	.59*	.33*	.13	.48*	.56*	.65*	.74*	.73*	.27*
2 ERRI deliberate		.16	.26*	.44*	.47*	.45*	.53*	.54*	.38*
3 RRQ rumination			.17	.21*	.18*	.19*	.28*	.25*	-.05
4 RRQ reflection				.14	.15	.10	.18*	.16	.08
5 CBI					.33*	.39*	.39*	.41*	.49*
6 IES-R avoidance						.62*	.68*	.85*	.21*
7 IES-R hyperarousal							.84*	.90*	.19*
8 IES-R intrusions								.94*	.22*
9 IES-R total									.23*
10 PTGI									

Note: $N=198$ for the immediately after time frame; and $N=202$ for the recent time frame.

* $p < .01$.

17.2%. Thus, as predicted, the level of event-related intrusive rumination was a useful predictor of currently reported distress.

The two models predicting PTG (Table 4) support the predictions for the ERRI deliberate score. Both models were significant and, as expected, initial disruption of core beliefs, which sets the stage for possible PTG, was individually a significant predictor. In addition to the CBI scores, the ERRI deliberate scores were individually significant in both models. A finding that was not predicted, but which makes intuitive sense, was the negative relationships found in both models between the RRQ rumination measure and PTG. Apparently, a stable tendency to focus on threats and potential losses may be somehow inhibiting the experience of growth. The RRQ reflection dimension was not a significant predictor in either model. So, event-specific deliberate rumination was positively associated with PTG, and explained more variance in growth than did a stable tendency to engage in reflective rumination.

Predicting deliberate rumination

As indicated earlier, in the current model of PTG (Calhoun et al., 2010), it is assumed that intrusive thoughts are one of the factors that may lead a person to engage in

Table 5. Regression β s predicting distress and posttraumatic growth for two ERRI time frames.

Criterion	Predictors						F(5, 197)	adjR ²	p
	CBI	RRQ-Ru	RRQ-Rf	ERRI-I	ERRI-D				
<i>Immediately after the event ERRI time frame</i>									
IES-R avoidance	.107	-.085	-.050	.437*	.094	15.25	.27	<.001	
IES-R hyperarousal	.013	-.033	.021	.554*	.061	21.20	.34	<.001	
IES-R intrusions	.043	.053	-.010	.624*	.061	39.26	.49	<.001	
IES-R total	.063	-.021	-.017	.602*	.081	33.51	.45	<.001	
PTGI	.368*	-.171*	.006	.069	.350*	27.70	.40	<.001	
<i>Recent ERRI time frame</i>									
IES-R avoidance	.039	-.003	.040	.430*	.191	21.10	.33	<.001	
IES-R hyperarousal	.091	-.033	-.005	.566*	.083	29.83	.42	<.001	
IES-R intrusions	.010	.039	.056	.631*	.138	50.85	.55	<.001	
IES-R total	.048	.004	.036	.605*	.155	47.78	.54	<.001	
PTGI	.432*	-.170*	-.013	-.009	.225*	16.95	.28	<.001	

Note: RRQ-Ru is the rumination factor and RRQ-Rf is the reflection factor of the RRQ. ERRI-I is the intrusive factor and ERRI-D is the deliberate factor of the ERRI. The sample size for the immediately after sample was 198 and for the recent sample it was 202.

* β is significant at $p < .01$.

deliberate rumination. The presence of intrusive thoughts can initiate the process of more deliberately seeking understanding after the stressful experience. To test this possibility, and determine if the ERRI intrusive scale explains variance beyond that explained by the intrusion symptoms measured by the IES-R, regression analyses used the two RRQ dimensions, the ERRI intrusive dimension and the intrusions scale from the IES-R to predict the level of ERRI deliberate rumination. RRQ reflection should be predictive of ERRI deliberate rumination, and so should ERRI intrusive rumination.

For both time frames, the regression models were significant (see Table 6), and in each case the strongest predictor within the model was the ERRI intrusive

Table 6. Regression β s predicting ERRI deliberate rumination.

Criterion	Predictors				F(5, 197)	adjR ²	p
	RRQ-Ru	RRQ-Rf	ERRI-I	IES-I			
<i>Immediately after the event</i>							
ERRI deliberate	.038	.053	.582**	.090	40.71	.45	<.001
<i>Recent</i>							
ERRI deliberate	-.075	.175*	.444**	.195*	32.44	.39	<.001

Note: RRQ-Ru is the rumination factor and RRQ-Rf is the reflection factor of the RRQ. ERRI-I is the intrusive factor of the ERRI. IES-I is the intrusion scale from the IES-R. The sample size for the immediately after sample was 198 and for the recent sample it was 202.

* β significant at $p < .05$.

** β significant at $p < .001$.

dimension. When considering retrospectively reported intrusive rumination in the immediate aftermath of the experience, the ERRI intrusive dimension was the only individually significant predictor. For the data based on recent experiences of rumination, both RRQ reflection and the intrusions scale from the IES-R also were significant, but neither explains as much variance as the ERRI intrusive score (r 's for RRQ reflection, IES-intrusions, and ERRI intrusive were .17, .13, and .29, respectively). Thus, it appears that the ERRI intrusive scale does explain variance not explained by the intrusions scale from the IES-R.

General discussion

Major life events, especially negative ones that challenge one's assumptive world beliefs (Janoff-Bulman, 1992), tend to provoke cognitive processing. The style of cognitive processing in which a person engages in the aftermath of a stressful life experience has important implications for its psychological impact. Theory and research have both suggested that the presence of high levels of intrusive thoughts is likely to be associated with continued or increased distress and a failure to cope effectively (Ehlers & Clark, 2000; Elwood et al., 2009; Taku et al., 2008). On the other hand, more deliberate cognitive processing about the event has been viewed as potentially beneficial in facilitating the coping process (Affleck & Tennen, 1996; Taku et al., 2008). Deliberate rumination about an event indicates engagement in a process of examining the event and its implications that could lead to understanding, to restoring previous, or to rebuilding revised, core beliefs. For many people dealing with life's serious stressors, it is through a process of deliberate rumination that they recognize how they have changed and how they have grown.

Existing measures designed to assess this distinction in cognitive processing have either focused on stable differences in style (i.e., Trapnell & Campbell, 1999) or they have emphasized the negative aspects of the styles (Treyner et al., 2003). What has been needed is a measure that captures the cognitive styles provoked by a specific event, since transient changes in these styles may be more predictive of eventual outcomes. In addition, items that are relatively neutral allow for a better assessment of cognitive style over cognitive content or PTSD symptoms. Although a bias has existed in the literature suggesting that rumination, as an intrusive experience, is negative and predictive of distress, positive events also could increase intrusive thinking. A measure that has a more neutral tone associated with both styles would seem desirable and generally applicable as a research tool for assessing ruminative styles as potentially distinct from symptoms.

The ERRI appears to be a measure that could fill this existing gap and be a very useful research tool for tracking cognitive processing after a highly significant life event. Ideally, in longitudinal research following individuals who have experienced a highly stressful event, the ERRI could be used to assess both current levels of the two rumination styles, and changes over time in the levels of the two styles. The current analyses indicate that the ERRI has very good psychometric properties. Across three separate samples of individuals screened for having experienced a significant life stressor, using exploratory factor analysis and CFA, the two-factor structure was repeatedly supported and the two factors showed consistently high internal reliabilities.

The construct validity of the ERRI was supported by the relationships found with stable individual differences. Since the ERRI was assumed to capture event-provoked cognitive processing rather than stable differences in cognitive or coping style, it was unrelated to a measure of stable differences in global cognitive processing (NCog). Relatively small, but statistically reliable relationships were found between the two ERRI styles and stable tendencies to engage in self-analysis (PSCS), intellectual meaning-seeking thoughts (RRQ reflection), and more neurotic threat-based thinking (RRQ rumination). In each of these cases, the predicted ERRI style was related to the individual difference measure, the alternative style was not, and the low level of shared variance supported the absence of significant redundancy across the measures of event-provoked versus stable cognitive style. The ERRI factors do not seriously overlap with the stable differences, indicating that they are capturing some distinct variability in the likelihood of engaging in either intrusive or deliberate cognitive processing. Scores on the ERRI appear to be responses to a specific event, rather than a function of stable dispositional differences between individuals.

Although specific predictions about the relationships of the ERRI styles and coping styles were not advanced, it was expected that any relationships between the various stable differences in coping styles and the ERRI styles would not be substantial. The results not only supported that prediction, but the statistically reliable, but small relationships found, were all intuitively reasonable given the nature of the intrusive and deliberate rumination styles.

Additional support for the construct validity of the ERRI was derived from its ability to confirm a variety of predictions based upon current models of PTG (Calhoun et al., 2010; Cann et al., 2010; Janoff-Bulman, 1992). Expectations that the intrusive rumination style would be predictive of current distress, while the deliberate style would be predictive of PTG were supported in both samples; the ERRI cognitive styles also explained more variance in the outcome variables than did the stable individual difference RRQ styles. In addition, we were able to demonstrate that the ERRI intrusive factor explains variance in levels of deliberate rumination that cannot be explained by existing measures of intrusion based upon symptoms of PTSD. Thus, although there is some overlap between measures of intrusion as a symptom of a stressful experience, and intrusive thoughts provoked by the event, they are not redundant measures.

Next steps in evaluating the utility of the ERRI would include assessing it in a longitudinal design and broadening the sample of participants. The current research used only a cross-sectional design, but was able to show the usefulness of the ERRI based on two different time frames. An ideal research design would use the ERRI in the immediate aftermath of a highly stressful event, and then track potential changes in the levels of the two rumination styles to more precisely identify any causal connections. In addition, the current research looked at relatively young samples, so obtaining a more heterogeneous sample in future research would be desirable. Our samples were screened to insure that they had experienced events that would typically be considered highly stressful or traumatic, so we are not dealing with minor stressors that college students often experience. However, it also is the case that the scores on the IES-R do not suggest a high level of symptoms relevant to PTSD. Further tests will be useful with samples having clinically relevant levels of distress.

In summary, the degree of event-related rumination is only one of many variables that can be related to, and perhaps have an important influence on, the positive or

negative psychological consequences of facing major life challenges. However, intrusive and deliberate ruminations do appear to be important separate elements that should be examined when trying to understand the role of cognitive processes, and the possible consequences of the different styles of processing, that commonly occur in the aftermath of a major stressful event. The ERRI appears to have the potential of providing a good way of assessing two important components of the individual's experience in the wake of highly challenging life events

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