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Emotion Regulation Strategies as Moderators between Counterfactual Thinking Concerning Intimate Partner Violence and Trauma-related Emotions: An Ecological Momentary Assessment Study

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According to the cognitive model of posttraumatic stress disorder (PTSD), negative appraisals and negative emotions are key factors in PTSD symptoms. Moreover, emotion regulation strategies (ERS) may affect the severity of PTSD symptom differently. This study investigated the reported types and frequency of intimate partner violence (IPV) survivors, and the effects of counterfactual thinking (CFT) and ERS on trauma-related emotions in daily life via ecological momentary assessment (EMA). Data from 59 women who experienced IPV within the past year were analyzed. The results demonstrated that cognitive reappraisal may modulate the relationship between upward CFT and trauma-related emotions (B = -0.012, p = .005), but the effect of emotion suppression was not statistically significant (B = -0.006, p = .365). Especially, upward CFT may demonstrate a greater impact on trauma-related emotions in individuals who use a lower degree of cognitive reappraisal in daily life than in participants employing a higher degree. Conversely, although downward CFT also increased trauma-related emotions, neither type of ERS moderated this relationship (cognitive reappraisal: B = -0.069, p = .129; emotion suppression: B = -0.004, p = .947). These findings extend prior research on the effectiveness of cognitive reappraisal by reinforcing its ecological validity and emphasize the need for further investigations.

Keywords: IPV, PTSD, EMA, counterfactual thinking, trauma-related emotions, emotion regulation strategies

Introduction

Most individuals may likely be exposed to more than one traumatic event during their lifetime (Kilpatrick et al., 2013), which can be categorized as impersonal and interpersonal trauma, depending on the degree of interpersonal involvement. Individuals experiencing interpersonal trauma reportedly exhibit a more severe and pervasive PTSD symptomatology that also lasts longer (Chapman et al., 2012; Cougle et al., 2013; Ford et al., 2011). Allen (1995) contended that psychological sequelae are most severe if the trauma is man-made, repeated, unpredictable, multifaceted, sadistic or malevolent in intent, and has been experienced in childhood and perpetrated by a caregiver. Therefore, among interpersonal traumas, intimate partner violence (IPV), defined as psychological, physical, and/or sexual abuse/aggression, or stalking by a current or former intimate partner (Centers for Disease Control and Prevention; CDC, 2021; Heise & Garcia-Moreno, 2002), may lead to more severe psychological distress.

IPV is a major social issue concerning women, which has been steadily increasing in frequency and severity (Korean National

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Police Agency; KNPA, 2019), often contributing to PTSD symptoms (Lilly & Graham-Bermann, 2010). According to a study on survivors of violent crimes, PTSD symptoms, hyperarousal reactions, negative cognitive evaluations of trauma, negative belief in others, and negative emotional reactions were higher when the perpetrator was a male intimate partner than an acquaintance, stranger, or family member (Gong, 2015). A meta-analysis of 11 studies on IPV survivors documented a weighted mean prevalence of PTSD of 63.8% (Golding, 1999), the rate of women who met the clinical criteria for PTSD was 92.4% in a sample of women who experienced abuse (Woods et al., 2008). These results suggest that IPV is a traumatic event implicated with one of the highest risk levels leading to a higher prevalence of PTSD than other interpersonal traumas (Kemp et al., 1995; Nixon et al., 2004).

According to the cognitive model of PTSD, negative cognitive appraisals of trauma, negative emotions such as the sense of ongoing threat, and strategies intended to control negative emotions lead to PTSD symptoms (Ehlers & Clark, 2000). A meta-analysis indicated that rumination is one of negative appraisals and a key factor in PTSD (Seligowski et al., 2015). Rumination is multidimensional and consists of several components (Brinker & Dozois, 2009; Treynor et al., 2003), one of the which is recurrent thinking about alternative outcomes of trauma-related memory such as counterfactual thinking (CFT; Tanner et al., 2013). CFT indicates repetitive thoughts concerning potentially different outcomes of past events (Blix et al., 2018) and consists of two types, each reflecting the direction of the outcome. Upward CFT refers to simulating a better alternative than the actual outcome (e.g., "If I had not met him today, I would not have been hurt"), while downward CFT represents simulating worse alternatives (e.g., "If I had not run away, I would have been dead").

In particular, a few studies have constantly demonstrated the relationship between CFT and PTSD symptoms. CFT plays an important role in exacerbating PTSD symptoms and psychological distress (El Leithy et al., 2006). De Brigard et al.'s (2013) fMRI study contended that the recall of personal episodes and counterfactuals involves the activation of identical brain regions. Although many studies have supported a significant association between CFT and PTSD symptoms, the relationship between upward or downward CFT and PTSD has not been clearly confirmed. Gilbar et al. (2010) claimed that only upward CFT was associated with the diagnosis of PTSD. However, Blix et al. (2016, 2018) asserted that both CFT types are associated with posttraumatic stress reactions. More specifically, Blix et al. (2016) contended that downward CFT was generally more frequent than upward CFT, and Blix et al. (2018) also asserted that trauma survivors used downward CFT more frequently than the bereaved. Interestingly, according to a recent meta-analysis, which of upward or downward CFT is related to PTSD symptoms may differ depending on the type of trauma or exposure (e.g., direct vs. indirect trauma; Hoppen et al., 2020). The effect of upward and downward CFT on IPV survivors requires further investigation.

There are possible conceptual rationales concerning the relationship between CFT and PTSD symptoms (i.e., the mnemonic model of PTSD and different mechanisms that generate negative emotions), but this study assumed the reason that CFT are associated with PTSD may be because these generate negative emotions, based on the cognitive model of PTSD. Previous findings have indicated that upward and downward CFT elicit negative emotions through different mechanisms. Upward CFT may cause negative emotions, because comparisons with better alternatives often lead to contrast effects (Blix et al., 2018; Markman et al., 1993; Roese, 1994). Conversely, downward CFT may contribute to negative emotions because it renders individuals to feel that they are experiencing worse alternatives in reality via assimilation (Blix et al., 2018; Markman & McMullen, 2003; Markman et al., 2007). Trauma-related emotions, which are negative emotions experienced in the evaluation and interpretation of traumatic events (DePrince et al., 2010), are particularly relevant in IPV survivors. IPV, a repeated and intended traumatic event by an intimate person, may be related to more complicated emotions because of the characteristics of traumatic event itself and lack of social support (Cloitre et al., 2009; Filipas & Ullman, 2001). Furthermore, in a study on women with IPV-related PTSD, a greater reduction in trauma-related emotions was associated with remission following exposure therapy (Harned et al., 2015). Therefore, this study focused on whether these two types of CFT generate trauma-related emotions.

Regulating negative emotions while thinking about a traumatic event is highly demanding for trauma survivors because exposure to trauma causes intense emotional reactions (Seligowski et al.,

2016), emotional numbing, or chronic secondary emotions (Resick & Schnicke, 1992). Emotion regulation strategies (ERS) related to PTSD could be explained by the process model of emotion which focuses on two ERS (i.e., cognitive re-appraisal and emotion suppression; Gross, 1998), and Gratz and Roemer's (2004) model concerning a variety of facets (i.e., acceptance, rumination, and catastrophizing, etc.). Among these, there have been consistent and cumulative findings that the results of two ERS of the process model of emotion may exert a differential effect on PTSD symptoms (Seligowski et al., 2015, 2016). In particular, cognitive reappraisal works well in non-clinical samples to regulate negative emotions (S. H. Kim & Hamann, 2012), whereas patients diagnosed with PTSD under-utilize cognitive reappraisal and over-utilize emotion suppression (Boden et al., 2013; Moore et al., 2008; Shepherd & Wild, 2014). Furthermore, Boden et al. (2013) indicated that using emotion suppression predicted PTSD symptom severity. Given that recent theories of emotion regulation have demonstrated that strategies may differ depending on context (Aldao, 2013; Aldao & Nolen-Hoeksema, 2012; Bonanno & Burton, 2013), the strength of the association between negative appraisals and psychopathology may depend on contextual factors affecting the way negative appraisals are used, such as the setting or level of a stressor (McMahon & Naragon-Gainey, 2018). Therefore, this study aimed to determine how these two types of ERS modulate the relationship between upward and downward CFT in IPV and trauma-related emotions.

Moreover, most previous studies on ERS have used self-report questionnaires. This retrospective design holds the limitation that participants must be aware of the types of ERS they use at a particular point in time (Shepherd & Wild, 2014). However, it is necessary to consider the dynamics, reactivity to momentary situations, and variations in ERS (Aldao, 2013). Ecological momentary assessment (EMA) is based on repeated sampling of participants' current behaviors and experiences in real time and in a natural environment (Shiffman et al., 2008). EMA has many advantages such as maximizing ecological validity and allowing the examination of microprocesses that affect behavior in daily contexts (Shiffman et al., 2008). Therefore, the present study explored whether these two types of ERS modulate the relationship between CFT concerning IPV and trauma-related emotions in daily life. The following hypotheses were examined. Figure 1 illustrates the research model.

Hypothesis 1: A higher degree of upward and downward CFT will be associated with a greater level of trauma-related emotions.

Hypothesis 1-1: This relationship will be antagonistically moderated by cognitive reappraisal.

Hypothesis 1-2: This relationship will be synergistically moderated by emotion suppression.

Methods

Participants

Participants were recruited through online communities between July and November 2021. The inclusion criteria were (1) women aged over 18, (2) women who had experienced psychological, physical, and/or sexual abuse/aggression, or stalking by a current or former intimate partner within the past year, and (3) more than one month had passed since the occurrence of the traumatic event, according to the DSM-5 criteria for PTSD. To clarify the effects of IPV on PTSD, the exclusion criteria were: (1) women who had not been exposed to threat of death, actual or threatened serious injury, or sexual violence, (2) women who reported past interpersonal trauma such as child abuse, and (3) women who had been diagnosed with other psychological disorders. Among the 87 participants who provided consent, one requested to withdraw from the study, seven provided invalid e-mail addresses, and 18 did not an-

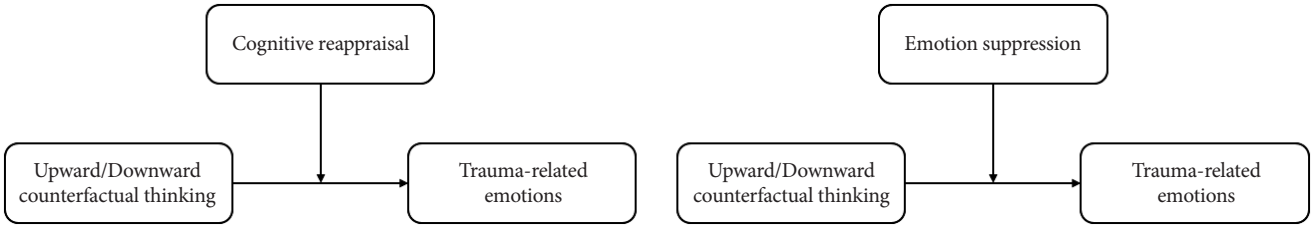

Figure 1. *The research model.*

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swer the survey for more than three days. Overall, 61 participants completed EMA 14 times for seven to nine days, and participants who did not answer for one or two days were not excluded unless they wanted to withdraw. The final statistical analysis was limited to participants whose reported IPV types and frequency did not exceed 2SD from the mean (N = 59). The participants were aged between 18 and 41 years of age (M = 24.10, SD = 5.00). Appendix A provides an a priori sample size estimation.

Procedure

First, information on demographic characteristics, IPV-related information, pre-EMA PTSD symptoms, and e-mail addresses were collected. Next, questionnaires were randomly sent out twice a day for seven days (once between 9 a.m. and 4 p.m., once between 4 p.m. and 11 p.m.). Daily EMA assessed CFT, trauma-related emotions, and ERS at the time. Finally, post-EMA PTSD symptoms were assessed, and participants were compensated with 20,000 Korean won. The participants were informed that the survey would be terminated when they stopped answering for over three consecutive days or when they requested to withdraw. All procedures were approved by the Institutional Review Board of the researchers' university.

Measures

EMA (Level 1) variables

Counterfactual thinking

CFT was measured via 12-items related to upward CFT and four items related to downward CFT using the Counterfactual Thinking for Negative Events Scale (CTNES; Rye et al., 2008). This study used the Korean version translated by Kwon (2009). Each item is rated on a five-point scale ranging from 1 (never) to 5 (very often). Higher sum scores indicated that the participants underwent more CFT. In this study, Cronbach's alpha of the upward and downward CFT was .93 and .88, respectively.

Trauma-related emotions

Trauma-related emotions were assessed using six items from the short version of the Trauma Appraisal Questionnaire (TAQ; DePrince et al., 2010). In this study, the Korean version of TAQ translated and validated by Chang (2011) was employed. This scale consists of 54 items that measure negative emotions following trauma. For the purpose of EMA study, the six factors (betrayal, self-blame, fear, alienation, anger, and shame) were changed to six questions rated on a Likert-type scale ranging from 1 (not at all) to 5 (extreme). Exploratory factor analysis confirmed that one factor is adequate, and the results can be found in Appendix B. In this study, Cronbach's alpha for the six items was .85.

Emotion regulation strategies

ERS were measured through the Emotion Regulation Questionnaire (ERQ; Gross & John, 2003). The Korean version of the ERQ translated by Shon (2005) was used. This scale consists of six items measuring cognitive reappraisal and four items assessing emotion suppression, for which Cronbach's alpha was .91 and .85, respectively in this study.

Level 2 variables

IPV Types and frequency within the past year

Based on the definition of IPV types (CDC, 2021; Heise & Garcia-Moreno, 2002), they were classified into four constructs. Psychological aggression was assessed using nine items from the Abusive Behavior Inventory (ABI; Shepard & Campbell, 1992), and physical aggression was measured by using the eight-item physical aggression subscale of the Conflict Tactic Scale (CTS; Straus, 1979). In this study, the Korean versions of the ABI and CTS translated and validated by Yoo (2000) were used. Furthermore, this study additionally collected information regarding IPV experiences associated with criminal allegations (KNPA, 2019), among these three items were categorized as physical aggression. Experiences of sexual criminal allegations were categorized as sexual aggression. The experience of stalking was also assessed. Consequently, 23 items (e.g., "Have you experienced IPV types within the past year?") were rated as "Yes" or "No" and the participants could select all that applied. All the number of types that the participant checked "Yes" was added and it named as IPV types. If a type was rated as "Yes", the IPV frequency for each type within the past year was collected.

PTSD symptoms

PTSD symptoms were assessed through the Posttraumatic Stress

Disorder Checklist for DSM-5 (PCL-5; Blevins et al., 2015). This study used the Korean version of the PCL-5 (K-PCL-5) translated and validated by J. W. Kim et al. (2017). Based on a previous study of elderly Korean veterans, the K-PCL-5 cut-off score was 37 (J. W. Kim et al., 2017) and the National Center for PTSD initially suggested that it should be between 31 and 33 (Weathers et al., 2016). Cronbach's alpha for the pre-EMA PCL-5 was .92, and .94 for the post-EMA PCL-5 in this study.

Data Analysis

Descriptive statistics were used to investigate IPV types and frequency of participants and PTSD symptoms. The mixed model, also known as the multilevel model, was used to assess the moderation effect of Level 1 variables. The restricted maximum likelihood (REML) method was used for parameter estimation. The repeated measures of Level 1 variables were nested within the participants' person-level measures (Level 2). Level 1 variables were person-mean centered and Level 2 variables were grand-mean centered. Data analysis was performed using IBM SPSS 26. Intraclass correlation coefficient (ICC) of the dependent variable was 0.82. A detailed explanation of the analytical strategy is provided in Appendix C.

Results

Descriptive Statistics and IPV Types and Frequency

The participants' mean number of reported experiences of IPV types was 8.51 ($SD = 3.70$). All participants reported experiencing psychological aggression, 38 participants reported physical aggression, 24 participants reported sexual aggression, and 25 participants reported experiencing stalking. Eight participants reported experiencing all types of IPV. The mean IPV frequency

Table 1. *Participants' Reported Trauma Types and Frequency by Intimate Partners (N = 59)*

	n, %	*M*	*SD*
Psychological aggression	59; 100%	116.24	167.58
Said humiliating or degrading words or blamed you	51; 86.4%	22.61	34.31
Yelled to threaten and scare you	42; 71.2%	15.62	20.73
Threatened to hit or throw something at you	26; 44.1%	12.35	22.78
Threatened to break up with you	35; 59.3%	11.57	28.75
Accused you of paying too much attention to someone or something else	52; 88.1%	21.04	29.31
Checked up on you (e.g., listened to your phone calls)	42; 71.2%	25.38	45.04
Put you on an allowance	51; 86.4%	33.37	66.46
Compared your body with other's bodies in a negative way	28; 47.5%	11.61	18.77
Threatened to have sex in words	17; 28.8%	8.00	12.75
Physical aggression	38; 64.41%	6.83	16.02
Threw something at you	15; 25.4%	5.07	7.55
Shoved you	30; 50.8%	6.90	12.94
Slapped you in the face	8; 13.6%	2.25	2.05
Kicked or punched you	10; 16.9%	3.80	4.08
Hit you with something	2; 3.4%	2.00	1.41
Pummeled you	5; 8.5%	3.60	4.78
Choked or Strangled you	6; 10.2%	2.50	2.35
Threatened you with a knife or gun	1; 1.7%	2.00	-
Body tied up, making movement impossible	8; 13.6%	2.00	0.93
False imprisonment	8; 13.6%	1.38	0.74
Attempted homicide	0; 0%	-	-
Sexual aggression	24; 40.68%	6.29	16.37
Unwanted sexual harassment	22; 37.3%	10.09	13.82
Sexual assault	18; 30.5%	8.28	11.37
Stalking	25; 42.4%	7.44	19.59
Threatened death, serious injury, or sexual aggression through stalking	25; 42.4%	7.44	19.59

Note. Participants could select all IPV types that were experienced.

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within the past year was 132.54 times (*SD* = 189.21, range = 2-905; Table 1). Participants demonstrated high-level pre-EMA PTSD symptoms (*M* = 41.44, *SD* = 14.80) and post-EMA PTSD symptoms (*M* = 36.00, *SD* = 16.23).

The Mixed Model

The moderating role of ERS on the relationship between upward CFT and trauma–related emotions

The mixed model was employed to assess the moderating role of ERS on the relationship between CFT and trauma-related emotions. After accounting for the control variables (IPV types and frequency), the main effect of upward CFT was statistically significant (*B* = 0.262, *p* < .001). That is, the more participants experienced upward CFT, the more they felt trauma-related emotions. The main effect of cognitive reappraisal was not statistically significant (*B* = -0.018, *p* = .58), implying cognitive reappraisal does not affect trauma-related emotions. The interaction effect between upward CFT and cognitive reappraisal was statistically significant (*B* = -0.012, *p* = .005; Table 2). Figure 2 illustrates the moderating role of cognitive reappraisal. Furthermore, the main effect of upward CFT was statistically significant (*B* = 0.264, *p* < .001), but the main effect of emotion suppression was not statistically significant (*B* = -0.052, *p* = .314). This finding implies that using emotion suppression does not affect trauma-related emotions. The interaction effect between upward CFT and emotion suppression was not statistically significant (*B* = -0.006, *p* = .365).

The moderating role of ERS on the relationship between downward CFT and trauma–related emotions

The more participants experienced downward CFT, the more they felt trauma-related emotions after controlling the control variables (*B* = 0.423, *p* < .001). However, the main effect of cognitive reap-

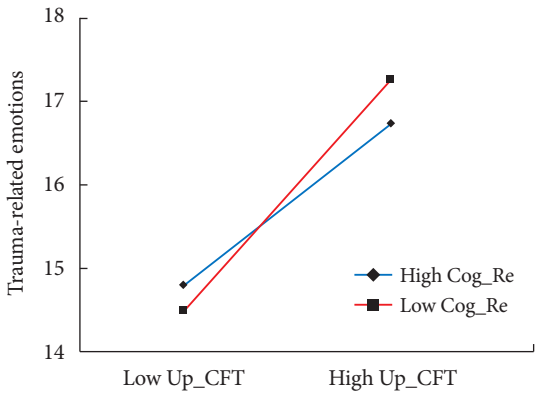

Figure 2. *The moderation effect of cognitive reappraisal on the relationship between upward CFT and trauma-related emotions (N = 59) Note. Up_CFT = upward counterfactual thinking, and Cog_Re = cognitive reappraisal.*

Table 2. *The Moderating Role of Cognitive Reappraisal on the Relationship Between Upward CFT and Trauma-related Emotions (N = 59)*

Final estimation of fixed effects (with robust standard errors)

Fixed Effect	Coefficient	*SE*	*d.f.*	*t*-ratio	*p*-value
For Intercept1, β_{0i}					
Intercept2, γ_{00}	15.814131	.724655	56.002	21.823	.000
For Up_CFT slope, β_{1i}					
Up_CFT, γ_{10}	.261589	.025422	33.668	10.290	.000
For Cog_Re slope, β_{2i}					
Cog_Re slope, γ_{20}	-.017795	.032228	36.826	-.552	.584
For Interaction, β_{3i}					
Interaction, γ_{30}	-.012316	.004407	601.381	-2.795	.005

Final estimation of variance components

Random Effect	Variance component	Standard deviation	Wald *Z*	*p*-value
Residual	5.130920	.278409	18.429	.000
Intercept1, u_0	30.615332	5.855055	5.229	.000
Up_CFT slope, u_1	.012275	.007043	1.743	.081
Cog_Re slope, u_2	.017906	.010034	1.785	.074

Note. Up_CFT = upward counterfactual thinking, and Cog_Re = cognitive reappraisal.

praisal (B = -0.069, p = .129) and the interaction effect (B = 0.0002, p = .990) were not statistically significant. In addition, the main effect of downward CFT was statistically significant (B = 0.411, p < .001), but the main effect of emotion suppression was not significant (B = -0.004, p = .947). This means that thinking about downward CFT affected trauma-related emotions, but the two types of ERS did not. The interaction effect between downward CFT and emotion suppression was not statistically significant (B = -0.017, p = .337).

Discussion

This study aimed to investigate participants' reported IPV types and frequency and the effects of CFT and ERS on trauma-related emotions in daily life through EMA.

The participants had experienced several IPV types and frequency within the past year. These results imply that IPV may be experienced frequently in different forms, and confirm that IPV could have a lasting impact on chronic and severe episodes over several years (CDC, 2021). In addition, the participants' mean pre- and post-EMA PTSD symptoms scores were higher than the suggested cut-off scores. This investigation corroborates the result of Pico-Alfonso et al. (2006) wherein experiencing physical, psychological, and sexual IPV manifested a cumulative effect on the development of PTSD. In summary, the results indicate that IPV survivors experience extensive psychological distress and PTSD symptoms.

Furthermore, the mixed model demonstrated the moderation effect of cognitive reappraisal on the relationship between upward CFT and trauma-related emotions. This indicates that although upward CFT affects trauma-related emotions, the more participants employ cognitive reappraisal in daily life, the lesser they feel trauma-related emotions. In particular, upward CFT may demonstrate a greater impact on trauma-related emotions for participants with a lower degree of cognitive reappraisal in daily life than in individuals with a higher degree of cognitive reappraisal. In contrast, the moderation effect of emotion suppression on the relationship between the two variables was not statistically significant. This result substantiates the view that cognitive reappraisal is more effective than emotion suppression (Gross, 1998), and that cognitive reappraisal would be helpful in decrease negative emotions by altering the way individuals think about and interpret a situation (Gross, 2002). Several previous studies have demonstrated that cognitive reappraisal has a positive effect on alleviating PTSD symptoms as the combination of emotional clarity and cognitive reappraisal correlates with lower PTSD severity (Boden et al., 2012), and that cognitive reappraisal is associated with fewer self-reported stress-related symptoms in women exposed to trauma (Moore et al., 2008). In an fMRI study on the effectiveness of trauma-focused cognitive-behavioral therapy for assault survivors, changes in the functional connectivity of the amygdala during cognitive reappraisal predicted a reduction in PTSD symptoms (Cisler et al., 2016). In a longitudinal test conducted during and after PTSD treatment, the more PTSD patients employed emotion suppression and avoidance coping, the higher the risk of PTSD symptoms predicted at discharge. Monitoring and targeting negative appraisal and negative secondary emotions through cognitive reappraisal may be therapeutically efficient in patients with PTSD and IPV survivors.

In contrast, although downward CFT also increased trauma-related emotions, neither type of ERS moderated this relationship. There are possible conceptual rationales. First, this may be because negative emotions generated by upward and downward CFT may be qualitatively different. Many studies have defined upward CFT as self-focused inference (Epstude & Roese, 2008; Gilovich & Medvec, 1995; Zeelenberg, 1999) and have demonstrated that upward CFT is associated with secondary emotions such as guilt, shame, regret, and disappointment (Mandel, 2003; Miller & Taylor, 1995; Niedenthal et al., 1994). Compared to better alternatives, self-related inferences are more likely to cause individuals to feel secondary emotions through the contrast effect. However, there is limited evidence of a direct relationship between downward CFT and secondary emotions. Compared to worse outcomes through the assimilation effect of downward CFT, individuals may immediately feel primary emotions such as fear, sadness, or anxiety (Epstude & Roese, 2008). More specifically, trauma-related emotions may not be appropriate for measuring exact emotions generated through downward CFT. However, limited research has been conducted to determine whether these two types of CFT cause different emotions. From this standpoint, future research should investigate whether downward CFT is related to primary negative emotions,

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and what type of ERS leads to a decrease in negative emotions.

Second, there is another possible conceptual rationale for the relationship between downward CFT themselves as a recollection of traumatic memories and PTSD symptoms. One of the studies has indicated through the mnemonic model of PTSD that downward CFT may affect posttraumatic stress reactions in a manner similar to trauma memories (Rubin et al., 2008). According to this model, traumatic events are encoded as highly sensory and emotional memories that are not integrated into existing cognitive schemas (Brewin et al., 1996). Instead, these memories are stored in a fragmented and disorganized manner in the brain. Consequently, when cues or triggers associated with the traumatic experience are encountered, the brain is unable to contextualize the memory, leading to intrusive and distressing re-experiencing symptoms (Brewin et al., 1996). The simulation of alternative outcomes may be explained by the same basic mechanisms as episodic recollection (Van Hoeck et al., 2013; De Brigard, 2013; Özbek et al., 2017). Furthermore, given that intrusive memories of traumatic events are important factors in the development and maintenance of posttraumatic stress reactions (Rubin et al., 2008), downward CFT may affect PTSD symptoms, especially intrusive memories, by recollecting fragmented and inaccurate episodic memories. However, there is limited findings as to whether only downward CFT has the same basic mechanism as episodic recollection, or whether upward CFT is not. It is imperative to conduct further research to investigate the relationship between these two types of CFT and the basic mechanisms of episodic recollection.

This study contributes to understanding survivors' reported experiences of IPV and PTSD symptoms. Notably, this study is significant in that it substantiates the finding that cognitive reappraisal may play a crucial role in reducing trauma-related emotions by reinforcing the ecological validity of previous findings.

However, the current study is not without limitations. First, women diagnosed with other psychological disorders and those who reported past interpersonal trauma were excluded to investigate the particular effects of PTSD symptoms. At first, this study aimed to investigate the relationship between variables of survivors who were recently exposed to traumatic events, and focus on how trauma-related emotions are developed or maintained by thinking of CFT and employing ERS in real time, allowing the examination of how constructs change together over time by using the EMA method (Shiffman et al., 2008). However, previous studies have reported that people diagnosed with PTSD without comorbid psychological disorders are a minority (Ginzburg et al., 2010; Pico-Alfonso et al., 2006). Additionally, as clinical diagnostic information was not collected, this study may not have fully explored the general characteristics of patients diagnosed with PTSD. Future research should investigate the validity of the current finding by gathering information on the survivors' primary diagnoses and comorbidity. Second, this study did not allow for the unique contribution of specific IPV-related constructs such as experienced IPV types or frequency. Given that the concomitance of experiences with sexual violence was associated with a higher severity of depressive symptoms and incidence of suicide attempts (Pico-Alfonso et al., 2006), analyzing variables that reflect this relationship may yield different results. Given that the diagnosis of PTSD is often insufficient and inappropriate for IPV survivors when demonstrating the effects of repeated trauma (Pill et al., 2017), it implies that the frequency of IPV may cause survivors to experience PTSD symptoms and other variables differently. Next, this study analyzed only 826 EMA data points (2 daily EMAs for 7 days from 59 participants), despite the sample size being above the minimum required sample size determined by the G*power 3.1.9.7 program (Faul et al., 2007). Although the data points are not that small in comparison with previous EMA studies (i.e., 768, Short et al., 2018; 544 data time points containing missing data, Kolar et al., 2020) and there is no rule of thumb for determining sample size in EMA studies. However, the more data points for EMA study may increase the generalizability of the research. This study had the limitation of obtaining a large number of data points because of the nature of the participants who had experienced IPV within the past year. Future research is encouraged to investigate more data points by including additional participants or times per day or longer days to prospectively investigate the effects of CFT and ERS on negative emotions or PTSD symptoms. Finally, this study did not measure PTSD symptoms as an EMA variable. To identify how daily thoughts, emotions, and ERS cause PTSD symptoms, it is suggested that PTSD symptoms are measured as an EMA variable.

Investigating cognitive components that are subject to intervention is essential given that cognitive elements affect long-term

treatment efficacy in PTSD patients (Asmundson et al., 2019; Resick et al., 2002). Previous studies, focused on "what could have been" prevented survivors from recovering as well as reinforced problematic evaluation of the traumatic event (Ehlers & Clark, 2000). Consequently, it is recommended that future studies clarify ways to reduce negative appraisals and negative emotions in interventions, and the specific mechanism of each treatment.

Author contributions statement

YJH, graduate of the Master's Degree Program in Clinical Psychology in the Department of Psychology at Yonsei University, conceived and designed the study, collected the data, performed data analysis, and drafted the manuscript. SHP, a full-time Professor in the Department of Psychology of Yonsei University, supervised all the processes of this study. All authors participated in the revision and submission of the manuscript.

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Appendix A

An a priori sample size estimation was performed for a repeated measures ANOVA using G*power software version 3.1.9.7 (the input parameters were as follows: Statistical test = MANOVA: Repeated measures, within factors; Effect size $f = 0.25$; α err prob = 0.05; Power ($1-\beta$ err prob) = 0.95; Number of groups = 1; Number of measurements = 14; Faul et al., 2007), and the sample size in this study ($N = 59$) was satisfied under this condition ($N = 43$).

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Appendix B

The Kaiser-Meyer-Olkin (KMO) statistic and Bartlett's test were used to assess factorial validity. The KMO result for the data was 0.832, which was confirmed by Bartlett's test ($\chi^2 = 2{,}025.15$, $p < .001$). Oblique rotation was chosen because the perpetuating components are likely to be correlated. The results of the common factor of the direct oblimin rotation confirmed that one factor was adequate; thus, the six items were used as one scale.

Table B1. *KMO and Bartlett's Test*

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		0.832
Bartlett's Test of Sphericity	Approx. Chi-Square	2025.152
	df	15
	p	0.000

Table B2. *Factor Matrix*

	Factor 1
TAQ6	.772
TAQ4	.731
TAQ1	.704
TAQ2	.697
TAQ5	.679
TAQ3	.623

Extraction Method: CFA (common factor analysis)

Rotation Method: Direct Oblimin

Note. TAQ = Trauma Appraisal Questionnaire

a. 1 factor extracted

Appendix C

Analytic strategy

The intercept-only model is the following equation:

Level1 Model: $Trauma\text{-}related\ emotions = \beta_{0i} + e_{it}$

Level2 Model: $\beta_{0i} = \gamma_{00} + u_{0i}$

The Level 1 model includes a person's mean trauma-related emotions and time deviation from the person's mean, which implies individual deviation of trauma-related emotions at the time points. The Level 2 model includes individual deviations from the grand mean (u_{0i}), meaning that trauma-related emotions may differ between participants. The intraclass correlation coefficient (ICC) of the dependent variable was 0.82. Specifically, 82% of the total variance in participants' trauma-related emotions was due to the mean difference between participants.

The research model is the following equation:

Level1 Model: $Trauma\text{-}related\ emotions = \beta_{0i} + \beta_{1i} \times X + \beta_{2i} \times M + \beta_{3i} \times XM + e_{it}$

Level2 Model: $\beta_{0i} = \gamma_{00} + u_{0i}$

$\beta_{1i} = \gamma_{10} + u_{1i}$

$\beta_{2i} = \gamma_{20} + u_{2i}$

$\beta_{3i} = \gamma_{30}$

X, the independent variables, implies CFT (upward and downward), and M, the moderating variables, are ERS. Four equations were used: upward CFT*cognitive reappraisal, upward CFT*emotion suppression, downward CFT*cognitive reappraisal, and downward CFT*emotion suppression. The grand-mean centered IPV types and frequency were employed as control variables (fixed effect).

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