Emotional Distress Tolerance and Pain Tolerance: The Moderating Effect of Painful Events

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Emotional distress tolerance has been considered a lower-order dimension of distress tolerance as well as being closely related to pain tolerance. However, there is accumulating evidence that emotional distress tolerance and pain tolerance might not be associated with each other in individuals with psychological problems related to repetitive painful events. This study aimed to examine the role of painful events in the relationship between emotional distress tolerance and pain tolerance. Three hundred undergraduate students completed measures of emotional distress tolerance, pain tolerance, painful events, depression, and anxiety. Hierarchical regression analyses revealed that painful events moderated the relationship between emotional distress tolerance and pain tolerance even after controlling for the effects of depression and anxiety on pain tolerance. More specifically, it was found that painful events weakened the relationship between emotional distress tolerance and pain tolerance. These findings highlight the need for further exploration of the relationship between emotional distress tolerance and pain tolerance.

Keywords: distress tolerance, emotional distress tolerance, pain tolerance, painful events, moderating effect

Introduction

Distress tolerance has been defined as the capacity to withstand aversive experiential states(Brown, Lejuez, Kahler, Strong, & Zvolensky, 2005; Simons & Gaher, 2005). An inability to tolerate distress has been linked to many forms of psychopathology, including specific psychiatric disorders(e.g., antisocial personality disorder, borderline personality disorder, and eating disorders: Corstorphine, Mountford, Tomlinson, Waller, & Meyer, 2007; Daughters, Sargeant, Bornovalova, Gratz, & Lejuez, 2008; Linehan, 1993) and a range of maladaptive behaviors(e.g., deliberate self-injury, substance use, and hoarding behaviors: Buckner, Keough, & Schmidt, 2007; Nock & Mendes, 2008; Timpano, Buckner, Richey, Murphy, & Schmidt, 2009). However, research in this area is in its early stages and ambiguities in the literature are abundant. Among them, the structure of distress tolerance has been considered an important issue that needs to be addressed.

By definition, distress tolerance is the ability to withstand aversive experiential states and scholars have conceptualized various distress tolerance constructs that differ in their focus of distress (Leyro, Zvolensky, & Bernstein, 2010). Among those constructs, emotional distress tolerance and physical pain tolerance are the two major constructs that have been widely studied in the field of distress tolerance research. Emotional distress tolerance and physical pain tolerance are similar in that they are capturing the capacity to withstand aversive experience. The difference between the two concepts is the type of aversive experience(i.e., emotional distress vs. physical pain). Thus, emotional distress tolerance and pain tolerance have been considered lower-order dimensions of distress tolerance and instruments that assess these two distress tolerance subtypes have been used to evaluate one's distress tolerance(Leyro et al., 2010). For example, the Distress Tolerance

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Scale(Simons & Gaher, 2005), a measure of emotional distress tolerance, have been used to assess distress tolerance in many studies(e.g., Anestis, Selby, Fink, & Joiner, 2007; Buckner et al., 2007). Tasks that assess pain tolerance(e.g., cold pressor task, physiological pain tolerance task) have also been used as measures of distress tolerance in many studies(e.g., Anestis et al., 2012; MacPherson, Stipelman, Duplinsky, Brown, & Lejuez, 2008).

However, there is growing evidence that the relationship between emotional distress tolerance and pain tolerance could be more complicated than expected. For example, a study on young adults with a recent deliberate self-injury showed high pain tolerance and low emotional distress tolerance under conditions of interpersonal distress(Gratz et al., 2011). Another investigation reported that patients with obsessive-compulsive disorder(OCD) did not differ from a healthy comparison group in levels of emotional distress tolerance, whereas patients with OCD exhibited higher pain tolerance than the healthy subjects(Hezel, Riemann, & McNally, 2012). Studies on suicidality also found that low emotional distress tolerance is related to suicidal ideation(Capron, Norr, Macatee, & Schmidt, 2013), while the capacity for suicide is closely associated with high pain tolerance(Franklin, Hessel, & Prinstein, 2011). Such findings suggest that emotional distress tolerance and pain tolerance might not be related to each other under certain conditions.

One possible moderator in the relationship between emotional distress tolerance and pain tolerance is physically painful events. According to the literature on deliberate self-injury, some individuals tend to resort to such actions for emotional distress relief (Klonsky, 2007). Persons with OCD may also use self-inflicted pain to reduce emotional distress(e.g., guilt) induced by repugnant obsessions(Hezel et al., 2012). These people use self-inflicted pain when distressed because painful events tend to distract people from acute negative affect(Just & Alloy, 1997). Moreover, the endorphin(i.e., endogenous opioids)-release following self-inflicted pain may cause the mood effect that alleviate acute negative affect(Favazza & Conterio, 1988). However, repeated painful stimulation such as self-injury results in decreased pain perception to identical painful stimuli(Bingel, Schoell, Herken, Büchel, & May, 2007). Thus, the pain tolerance of those with deliberate self-injury would be heightened with the increasing frequency of self-harm-

ing behaviors. In contrast, the chronic use of self-injury may have paradoxical effects, engendering heightened levels of emotional distress. According to the experiential avoidance model of deliberate self-harm, the act of avoiding or escaping emotions through self-harming behavior increases the likelihood that the individual will experience a rebound effect, consisting of more frequent or more intense experiences of the avoided emotions(Chapman, Gratz, & Brown, 2006). This rebound then may result in decreased emotional distress tolerance. This may be the way how deliberate self-injury could act as a moderator in the relationship between emotional distress tolerance and pain tolerance.

Similarly, other repetitive painful events such as physical fights or physical abuse also enhance one's ability to tolerate physical pain(e.g., Fillingim & Edwards, 2005), even if they are not directly related to emotional avoidance and may not weaken the capacity to tolerate emotional distress. Thus, it is reasonable to speculate that painful events moderate the relationship between tolerance for emotional distress and for pain. However, there are no studies that examined this moderating effect of painful events on the relationship between the two subtypes of distress tolerance.

Thus, the present study aimed to examine the role of painful events in the relationship between emotional distress tolerance and pain tolerance. To this end, self-reports that assess emotional distress tolerance, pain tolerance, and painful events were administered and the relationships among the three variables were analyzed. Based on the results from prior studies, it was expected that painful events moderate the relationship between emotional distress tolerance and pain tolerance.

Methods

Participants

The sample comprised 300 undergraduate students(53% women) from a national university in South Korea. The subjects participated in partial fulfillment of their research participation credit. Only native Korean speakers were retained for the study and the age of the participants ranged from 17 to 27 years($M = 20.98$ years, $SD = 1.67$). Seoul National University's Institutional Review Board on human subject research approved this study.

Procedures and Measures

Participants accessed an online research participation system and completed the measures of emotional distress tolerance, pain tolerance, painful events, depression and anxiety. The questionnaires were completed anonymously and all participants provided informed consent.

Emotional distress tolerance

The Distress Intolerance Index (DII) was used to assess emotional distress tolerance. The DII is a 10-item questionnaire measuring perceived emotional distress tolerance with good reliability and construct validity(McHugh & Otto, 2012). The scale is composed of items from three emotional distress tolerance measures(i.e., Anxiety Sensitivity Index: Peterson & Reiss, 1992; Distress Tolerance Scale: Simons & Gaher, 2005; Frustration-Discomfort Scale: Harrington, 2005) that exhibited the strongest associations with a latent distress tolerance factor(McHugh & Otto, 2012). Each item of the scale is scored on a Likert-type scale ranging from 0(*very little*) to 4(*very much*). A Korean version of the DII also displayed good internal consistency, test-retest reliability, and convergent/discriminant validity(Seo & Kwon, 2014). In the current study, the internal consistency of the scale was suitable(Cronbach's α = .88).

Pain tolerance

The Pain Anxiety Symptom Scale-20(PASS-20) was administered to assess pain tolerance. The PASS-20 is a short 20-item version of the Pain Anxiety Symptoms Scale(McCracken & Dhingra, 2002). The scale assesses fear and anxiety responses to pain. Because pain anxiety is closely related to pain tolerance(Es-teve & Camacho, 2008; Hirsh, George, Bialosky, & Robinson, 2008; Roelofs, Peters, Deutz, Spijker, & Vlaeyen, 2005), measures that assess pain anxiety have been used to capture pain tolerance in many studies(e.g., Ribeiro et al., 2014). The items of the PASS-20 are scored on a 6-point Likert scale(from 0 to 5). A Korean version of the PASS-20 was administered, which had previously demonstrated good reliability and validity(Cho, Lee, McCracken, Moon, & Heiby, 2010). The scale's internal consistency estimate for the current sample was high(Cronbach's α = .90).

Painful events

The Painful and Provocative Events Scale(PPES) was used to measure painful events. The PPES is a 10-item self-report measure that assesses the number of painful and provocative events the participant experienced(Van Orden, Witte, Gordon, Bender, & Joiner, 2008). Each item is scored on a scale ranging from 1(*never*) to 5(*regularly*). In this study, five items that assess events accompanied by physical pain were selected from the Korean version of the PPES(Seo & Kwon, 2018) to measure physically painful events(e.g., physical fights, physical abuse, physical injury, and self-harming). The internal consistency estimate of the five items was acceptable (Cronbach's α = .69).

Depression and anxiety

The Center for Epidemiologic Studies Depression Scale(CES-D) is a 20-item questionnaire that assesses depressive symptoms with good psychometric properties(Radloff, 1977). The estimate of internal consistency on this measure for the current sample was high (Cronbach's α = .91). The brief version of the State-Trait Anxiety Inventory(STAI-B), a widely used six-item questionnaire assessing anxiety symptoms, was also administered(Marteau & Bekker, 1992). In the current study, an adequate internal consistency estimate of the STAI-B was obtained(Cronbach's α = .81). These two measures were included to control for depression and anxiety of the participants when examining the relations among emotional distress tolerance, pain tolerance, and painful events.

Results

Descriptive statistics and correlations are presented in Table 1. As expected, the DII was closely related to the PASS-20. The PPES was not associated with the DII nor the PASS-20. Hierarchical regression analyses were conducted to examine the role of painful events in the relationship between emotional distress tolerance and pain tolerance. In step 1, the CES-D and the STAI-B were entered into the model to control for the effect of depression and anxiety on pain tolerance. In step 2, the DII was entered to examine the effect of emotional distress tolerance on pain tolerance. In step 3, the PPES was entered to evaluate contributions of painful events in predicting pain tolerance. In step 4, the interaction term

Table 1. *Intercorrelations and Descriptive Statistics for Study Variables (N = 300)*

Variable	1	2	3	4	5
1. PASS-20	-				
2. DII	.57**	-			
3. PPES	.01	.07	-		
4. CESD	.16**	.41**	.25**	-	
5. STAI-B	.08	.33**	.22**	.62**	-
M	33.13	15.33	2.68	15.13	6.75
SD	14.80	7.59	2.38	8.75	3.35

Note. PASS-20 = Pain Anxiety Symptoms Scale-20; DII = Distress Intolerance Index; PPES = Painful and Provocative Events Scale; CESD = Center for Epidemiologic Studies Depression Scale; STAI-B = State-Trait Anxiety Inventory-Brief.
**$p < .01$.

Table 2. *Final Regression Model of Emotional Distress Tolerance and Painful Events to Predict Pain Tolerance*

	B (SE)	t	p
CESD	-.09 (.11)	-.86	.389
STAI-B	-.30 (.27)	-1.12	.264
DII	1.23 (.10)	11.97	< .001
PPES	-.02 (.31)	-.08	.940
DII × PPES	-.09 (.04)	-2.43	.016

Note. CESD = Center for Epidemiologic Studies Depression Scale; STAI-B = State-Trait Anxiety Inventory-Brief; DII = Distress Intolerance Index; PPES = Painful and Provocative Events Scale.

produced from the multiplication of the scores of the PPES and the DII was entered into the model to examine the moderating effect of painful events in the relationship between emotional distress tolerance and pain tolerance.

In step 1 of the analyses, the CES-D and the STAI-B accounted for 2.2% of the PASS-20 variance, $R^2 = .022$, $F(2, 298) = 3.36$, $p < .05$. In step 2, the DII explained 31% of the variance in the PASS-20, $\Delta R^2 = .31$, $F(1, 297) = 136.63$, $p < .001$. In step 3, the PPES did not explain variance of the PASS-20, $\Delta R^2 = .00$, $F(1, 296) = .02$, $p = .90$. In step 4, the interaction term of the PPES and the DII accounted for 1.3% of the variance in the PASS-20, $\Delta R^2 = .013$, $F(1, 295) = 5.91$, $p < .05$. The final regression model is presented in Table 2.

To examine the moderating effect of the PPES in the relationship between the DII and the PASS-20 in a more detailed manner, the slopes of the simple regression lines representing relations between the DII and the PASS-20 of two separate PPES groups(i.e., below-average and above-average PPES groups) were compared. The standardized coefficient of the DII was .65($t = 10.88$, $p < .001$)
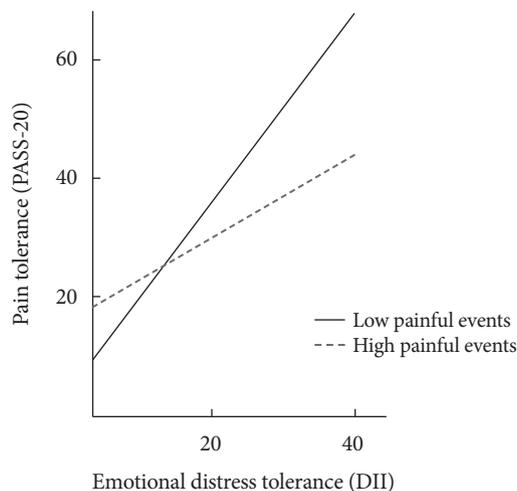

Figure 1. *Relationship between emotional distress tolerance and pain tolerance according to the level of painful events.*
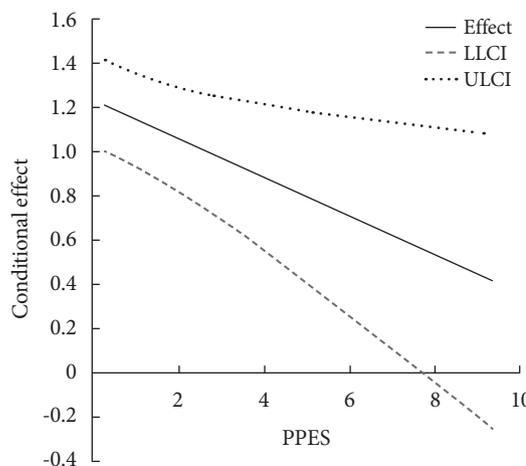*Note.* PASS-20 = Pain Anxiety Symptoms Scale-20; DII = Distress Intolerance Index.

Figure 2. *A plot of the conditional effect of emotional distress tolerance on pain tolerance versus the moderator(painful events), with confidence bands.*
Note. PPES = Painful and Provocative Events Scale; LLCI = Lower Limit of Confidence Interval; ULCI = Upper limit.

in the low PPES group($n = 160$) and the coefficient was .49($t = 6.52$, $p < .001$) in the high PPES group($n = 140$). These results indicate that painful events might weaken the relationship between emotional distress tolerance and pain tolerance(Figure 1).

The Johnson-Neyman technique was also applied to probe the moderating effect of the PPES in the relations between the DII and the PASS-20. The Johnson-Neyman technique identifies regions in the range of the moderator variable where the effect of the pre-

dictor on the outcome is statistically significant and not significant (Preacher, Curran, & Bauer, 2006). This technique is superior to the more common pick-a point approach that merely picks representative values(e.g., high, moderate, and low) of the moderator variable(Bauer & Curran, 2005). In the current study, the Johnson-Neyman technique indicates the regions of the PPES for which the relationship between the DII and the PASS-20 is significant or not significant. An analysis utilizing the technique revealed that increasing distress tolerance was associated with increasing pain tolerance until a participant's painful events exceeded a raw score of 7.70(Figure 2).

Discussion

The current study examined the role of painful events in the relationship between emotional distress tolerance and pain tolerance. Results showed that painful events moderated the relationship between emotional distress tolerance and pain tolerance even after controlling for the effects of depression and anxiety on pain tolerance. More specifically, it was found that painful events weaken the relationship between emotional distress tolerance and pain tolerance.

These results shed a light on complicated findings related to emotional distress tolerance and pain tolerance. In the literature on the two constructs, the most problematic issue was the presence of people who simultaneously have low emotional distress tolerance and high pain tolerance(e.g., patients with deliberate self-injury or OCD). Disparity between emotional distress tolerance and pain tolerance in such a group could not be fully explained by the existing taxonomy of distress tolerance proposing that the two constructs belong to the same higher-rank construct(i.e., distress tolerance) and that they are closely related to each other(Leyro et al., 2010). The findings from the present study propose that disparity between emotional distress tolerance and pain tolerance in patients with deliberate self-injury, OCD, or suicidality might result from the moderating effect of repetitive painful events.

The current findings also suggest that researchers should be cautious about using pain tolerance tasks to assess global distress tolerance. Many studies have used them, such as the cold pressor test or the physiological pain tolerance task as a measure of dis-

tress tolerance(e.g., Anestis et al., 2012; MacPherson et al., 2008). However, pain tolerance might not be a proper index of distress tolerance in those with repetitive painful stimulations because physical pain would not be perceived as distressful as other emotional distress. In this case, it would be better to consider using other measures to assess global distress tolerance. In addition, future research needs to examine the relationship between emotional distress tolerance and pain tolerance in more detail and to evaluate validity of the taxonomy that regards pain tolerance as a subtype of distress tolerance.

An important issue related to therapeutic interventions on emotional distress tolerance and pain tolerance is that strategies improving emotional distress tolerance may enhance pain tolerance in suicidal patients or people with deliberate self-injury and they may enact self-inflicted pain or suicide attempts more easily because of heightened ability to endure physical pain. However, the findings from the current study suggest that those interventions strengthening emotional distress tolerance may not influence on pain tolerance in persons with painful events such as self-injury or suicide attempts. If future research could confirm this hypothesis with clinical samples, interventions enhancing emotional distress tolerance would be considered an effective therapeutic option for those with self-inflicted pain and suicidal patients.

Several limitations of this study should be noted. First, a self-report instrument was used to assess pain tolerance in this study. Although the PASS-20 has been used in many studies to measure pain anxiety and pain tolerance, it would be better to use more direct measures such as a physical pain tolerance task(e.g., Anestis et al., 2012).

Second, the current study did not examine the effect of a specific painful event but rather explored the total effect of various painful events in the relationship between emotional distress tolerance and pain tolerance. Although this approach is a common way to assess the effect of painful events(Van Orden et al., 2008), a possibility exists that a certain type of painful events bears specific influences on the relationship between emotional distress tolerance and pain tolerance. For example, deliberate self-injuries tend to be used for coping with negative emotions, which results in weakened emotional distress tolerance and strengthened pain tolerance, whereas tattooing/piercing is likely to only enhance pain tol-

erance. Thus, future research needs to address the effect of specific painful events in the relationship between emotional distress tolerance and pain tolerance.

Third, a self-report instrument was also employed to assess emotional distress tolerance in this study. Although the self-report technique has been used in many studies to measure emotional distress tolerance, behavioral measures could also be used to assess the construct(e.g., Nock & Mendes, 2008). Thus, it would be valuable to measure emotional distress tolerance with other assessment modalities for confirmation of the findings from the current study.

Fourth, in the current study, the three major research variables (i.e., emotional distress tolerance, pain tolerance, repetitive painful events) were considered as relatively stable features in line with many other studies(e.g., Anestis et al., 2012; Hezel et al., 2012). However, it is possible that the three variables change in a short time and the relationships among the variables in certain situations could be different from the findings of the current study. Although there are few studies examining variables influencing state-like changes in emotional distress tolerance and pain tolerance and it is difficult to suggest possible causes or mechanisms of those changes, exploring this issue would be valuable to understanding the detailed relationships among the three variables.

Fifth, only healthy college student sample data were analyzed in this study. Thus, the findings should only be interpreted within this demographic and ought to be replicated with other samples. Although healthy individuals might experience painful events, the intensity and frequency of the events could be different from those with severe mental disorders such as borderline personality disorder or complex post-traumatic stress disorder. More specifically, those with severe mental disorders that are characterized by repetitive painful events could display more drastic change in the relationship between emotional distress tolerance and pain tolerance than healthy individuals. In other words, it is possible that emotional distress tolerance and pain tolerance are not related to each other with individuals experiencing repetitive painful events, whereas the two constructs still are closely associated with each other in relatively healthy individuals. Thus, future research needs to scrutinize the relationship between emotional distress tolerance and pain tolerance in people with severe mental disorders charac-

terized by repetitive painful events.

Despite these limitations, this empirical test of the hypothesis proposing that painful events moderate the relationship between emotional distress tolerance and pain tolerance has been the first one of its kind. The findings of the present study could be an important starting point for further explorations about the relationship between emotional distress tolerance and pain tolerance.

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