

Cognitive Processing, PTSD Symptoms, and the Mediating Role of Posttraumatic Cognitions

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The association between cognitive processing strategies and posttraumatic stress disorder (PTSD) symptoms has been demonstrated in a number of studies. However, the process of how cognitive processing determines PTSD symptoms is yet to be understood. The present study aims to clarify the relationship between cognitive processing and PTSD symptoms by examining the mediating role of posttraumatic cognitions in a sample of natural disaster survivors. The participants of the present study include 632 individuals who were directly affected by typhoon Haiyan. Findings of the study reveal that negative cognitions about the self mediated the relationship between cognitive processing of trauma (i.e., denial, regret, and resolution/acceptance), and PTSD symptom severity. Denial and regret were related to more severe PTSD symptoms through increased negative cognitions about the self. On the other hand, resolution/acceptance was associated with lesser PTSD symptom severity through decreased negative self-cognitions.

Keywords: cognitive processing, posttraumatic cognitions, PTSD symptoms, natural disasters

Human beings are meaning-oriented—seeking, searching, and constantly making sense of everything around them. Part of this meaning-making process is the continuous evaluation and organization of information that shape individuals' views and beliefs about their lives, of other people, and of the world. These worldviews and meaning structures heavily influence how we perform daily functional activities and interact with others. However, when faced with new experiences, particularly traumatic ones, these belief systems and cognitive frameworks might not be able to accommodate this new set of circumstances. This incongruence with pre-existing beliefs and the failure to integrate the new trauma-related information usually result in debilitating distress (Foa, Steketee, & Rothbaum, 1989; Horowitz, 1986; Janoff-Bulman, 1992).

In an effort to reconcile the inconsistent information and reduce the resulting distress, trauma survivors actively engage in cognitive processing. The role of cognitive processing in addressing distress symptoms has been noted in several studies (*see* Park, 2010). However, findings show inconsistencies in its influence on posttraumatic stress disorder (PTSD) and related symptoms (e.g., Gangstad, Norman, & Barton, 2009; Phelps, Williams, Raichle, Turner, & Ehde 2008). This study attempts to clarify this issue and address this gap by looking at how cognitive processing affects trauma cognitions, and in turn, influence the level of PTSD symptomatology. Understanding the mediating role of posttraumatic cognition clarifies the important relationship between cognitive processing and PTSD symptoms.

Cognitive Processing and PTSD Symptoms

Cognitive processing is a vital component in the development of PTSD (Halligan, Clark, & Ehlers, 2002; Halligan, Michael, Clark, & Ehlers, 2003). It is a cognitive task that involves integrating the new data from traumatic experiences to the trauma survivors' existing schemas (Janoff-Bulman, 1989).

Cognitive processing may take the form of one of the following: accommodation, assimilation, or overaccommodation (Resick, Monson, & Chard, 2014; Resick & Schnicke, 1993). Accommodation takes place when individuals successfully incorporate new information

from the stressful experience with their pre-existing beliefs, which helps in the attainment of acceptance. Assimilation is when individuals adjust their appraisal of the event in such a way that they can maintain their previous beliefs. Overaccommodation occurs when individuals excessively modify their beliefs to the point of overgeneralizing their thoughts about themselves, the world, and others. Whereas accommodation contributes to resolution and acceptance, assimilation and overaccommodation lead to distortion of one's thoughts and beliefs (Iverson, King, Cunningham, & Resick, 2015; Resick et al., 2014; Resick & Schnicke, 1993).

On the other hand, Williams, Davis, and Millsap (2002) proposed classifying cognitive processing strategies following a traumatic experience based on how an individual tries to make sense of it, whether adaptive or nonadaptive. Adaptive cognitive processing involves coping and coming to terms with the traumatic experiences (resolution/acceptance), restructuring beliefs and finding positive aspects following the traumatizing event (positive cognitive restructuring), and construing trauma experiences as less debilitating than others (downward comparison). In contrast, nonadaptive cognitive processing portrays repetitive thinking of the things that could have been done to avoid what happened (regret), and absence or minimal acceptance of the trauma event (denial).

Following the preceding classification, a number of studies have demonstrated the association between cognitive processing and PTSD symptoms. Negative components of cognitive processing such as denial and regret were found to be positively correlated with PTSD symptoms of intrusion and avoidance, whereas positive components of cognitive processing such as positive cognitive restructuring, resolution/acceptance, and downward comparison were negatively associated with PTSD symptoms (Williams et al., 2002). These relationships were found across various samples including individuals who have been amputated (Phelps et al., 2008), military veterans (Currier, Lisman, Irene Harris, Tait, & Erbes, 2013), stroke survivors (Gangstad et al., 2009), and undergraduate students with varied trauma experiences (Boals & Shuettler, 2011; Williams et al., 2002).

However, inconsistencies were also observed in certain studies regarding the role of cognitive processing in the development of

posttraumatic psychopathological symptoms. For instance, Phelps et al. (2008) found a consistent negative link between adaptive processing and distress, yet maladaptive processing did not consistently predict negative outcomes (i.e., posttraumatic stress symptoms, depression). Moreover, Gangstad et al. (2009) found that although positive restructuring and resolution were negatively associated with anxiety and depression among traumatized individuals, regret was positively related with depression but not anxiety. Further scrutiny of their results shows that downward comparison and denial did not significantly relate with anxiety and depression.

Posttraumatic Cognition and PTSD Symptoms

The role of cognition in the development and maintenance of PTSD symptoms has been exhaustively studied (*most recently* Blain, Galovski, Elwood, & Meriac, 2013; Hiskey, Ayres, Andrews, & Troop, 2015; Shahar, Noyman, Schnidel-Allon, & Gilboa-Schechtman, 2013). Most of these studies were heavily influenced by the views of Foa, Ehlers, Clark, Tolin, and Orsillo (1999) who classified the types of posttraumatic cognition into three: negative cognitions about the self (e.g., “I am a weak person”); negative cognitions about the world (e.g., “The world is a dangerous place”); and self-blame (e.g., “The event happened because of the way I acted”). The most recent Diagnostic and Statistical Manual of Mental Disorders (DSM-5; American Psychiatric Association, 2013) has recognized the importance of cognition, particularly negative cognition, as it is now grouped together with feeling states and numbing, forming the negative alterations in cognition and mood cluster.

Posttraumatic cognitions have been found to predict PTSD symptom severity and have the ability to distinguish between those with or without PTSD (Daie-Gabai, Aderka, Allon-Schindel, Foa, & Gilboa-Schechtman, 2011; Schindel-Allon, Aderka, Shahar, Stein, & Gilboa-Schechtman, 2010; Su & Chen, 2008; Van Emmerik, Schoorl, Emmelkamp, & Kamphuis, 2006). Among the posttraumatic cognitions, negative cognitions about the self is consistently associated with PTSD symptoms (Moser, Hajcak, Simons, & Foa, 2007; Shahar et al., 2013; Schindel-Allon et al., 2010). In determining how substantial

the influence of negative self-cognition is in PTSD, Moser et al. (2007) implemented prolonged exposure treatment with the goal of lowering negative posttraumatic cognitions. The results yielded that with the decrease of negative self-cognition, PTSD symptoms significantly decreased. Whereas numerous studies have also shown that negative world-cognitions are linked with PTSD (e.g., Beck et al., 2004, Cieslak, Benight, & Lehman, 2008; Kolts, Robinson, & Tracy, 2004; Moser et al., 2007; Startup, Makgekene, & Webster, 2007), this is not true with self-blame. Self-blame was found not to be related with PTSD in a number of studies (Beck et al., 2004; Cieslak et al., 2008; Kolts et al., 2004; Moser et al., 2007; Startup et al., 2007). Müller et al. (2010) explained that this is so because self-blame is relevant to the increase of PTSD symptom severity only if it pertains to interpersonal trauma.

The Mediating Role of Posttraumatic Cognitions

Although several studies have indicated that cognitive processing and posttraumatic cognition substantially influence PTSD symptom development and maintenance, there is a lack of empirical studies that look at the relationship between these cognitive factors as it affects PTSD. The hypothesis that these variables are related is supported by the robust cognitive models of Ehlers and Clark (2000), and Foa and Rothbaum (1998). These models show that cognitive processing of trauma-related information (i.e., encoding of information to survivors' autobiographical memory) produce and form negative cognitions regarding one's self and the world. These cognitions arising from the information brought about by the encoded trauma-related information eventually play an essential role in the onset of PTSD symptoms.

Moreover, the model putting posttraumatic cognitions as mediators is strengthened by the concept of cognitive processing therapy (CPT; Resick et al., 2014; Resick & Schnicke, 1993) wherein adaptive cognitive strategies are taught to clients who have been traumatized to have realistic, balanced, and accurate evaluations about the self, others, and the world. These changes in clients' thinking were found to reduce PTSD symptoms and other related clinical disorders among rape victims (Iverson et al., 2015; Resick, Nishith, Weaver, Astin, & Feuer, 2002; Sobel, Resick, & Rabalais, 2009), torture victims

(Kaysen et al., 2013), interpersonal survivors (Galovski, Blain, Mott, Elwood, & Houle, 2012), refugees (Schulz, Resick, Huber, & Griffin 2006), and war veterans (Alvarez et al., 2011). CPT underscores the importance of improving trauma survivors' cognitive processing as it has substantial importance on how they view their self and the world, which ultimately affects their mental health (i.e., development of clinical symptoms).

The Current Study

Whereas the mediating role of trauma-related cognitions is clearly demonstrated by CPT in the therapeutic setting in relation to clients' recovery from PTSD, the present study focuses on cognitive processing as a disposition and how it is associated with PTSD symptom severity through posttraumatic cognitions. Thus, this study seeks to clarify the mechanism of cognitive processing as it influences posttraumatic cognitions and how posttraumatic cognitions, in turn contribute to the development of PTSD symptoms.

In addition, although a number of studies have demonstrated the prevalence of PTSD among natural disaster survivors such as those of an earthquake (Anberg, Johannesson, & Michel, 2013; Goenjian et al., 2014; Wang et al., 2014), tsunami (Arnberg et al., 2013), hurricane (Caramanica, Brackbill, Stellman, & Farfel, 2015), and typhoon (Chen et al., 2015), very few have examined the role of cognition among Filipino survivors of natural disasters. Nevertheless, Constans et al. (2012) identified negative cognitions as a factor that is strongly associated with PTSD among disaster survivors. So far, this study is the first to examine the mediating role of posttraumatic cognitions among Filipino natural disaster survivors.

METHOD

Participants

The participants of the present study are 632 college students who were directly affected by Typhoon Haiyan. With sustained winds of 190 to 195 mph by the time it struck the Philippines, Haiyan is the

strongest typhoon ever recorded at the time of its landfall in November 2013 (Fischetti, 2013). The participants were purposively selected from Leyte Normal University in Tacloban, one of the areas that suffered the most damage from the typhoon. The participants were identified on the criterion that they have had direct exposure to the typhoon, pursuant to the criterion A of PTSD. This was determined through self-report by the participants and validated through reports from the guidance counselors of the university. The sample is comprised of 20.1% males ($n = 127$) and 79.9% females ($n = 505$), with ages ranging from 15 to 31 years old ($M = 18.03$; $SD = 1.78$).

Procedures

Data gathering was conducted three months after Typhoon Haiyan took place. Tacloban was identified as the site of research because it was one of the areas that have been affected the most by the typhoon. Prior to the testing sessions, written informed consent was sought from each participant. Instructions were given and the nature and purpose of the study were explained. The participants were informed of their rights, such as assurance of anonymity and full confidentiality. The participants were also encouraged to ask questions should they need to clarify any aspect of the research. All applicable ethical guidelines were followed throughout the conduct of the study. Procedures of the study have been reviewed and approved by a university ethics review committee.

Measures

Cognitive processing of trauma, or the meaning-making employed by the individual on the traumatic experience (i.e., positive cognitive restructuring, denial, downward comparison, regrets, and resolution/acceptance), was measured using Cognitive Processing of Trauma Scale (CPOTS; Williams et al., 2002). It is a 17-item test in which statements are rated on a scale of -3 (*strongly disagree*) to 3 (*strongly agree*). Higher scores pertain to stronger endorsement of a particular component of cognitive processing. CPOTS demonstrated adequate reliability, as well as discriminant and convergent validity (Williams

et al., 2002). For the current study, CPOTS has a composite reliability rho of .85 and a Cronbach's alpha of .80.

Posttraumatic cognitions, or the negative thoughts and beliefs about the self and the world, and self-blame that an individual may have after the traumatic experience, were measured using Posttraumatic Cognitions Inventory (PTCI; Foa et al., 1999). The test is comprised of 33 items rated on a scale of 1 (*completely disagree*) to 7 (*completely agree*). Higher scores pertain to more negative cognitions. The instrument demonstrated good test-retest reliability and excellent internal consistency. It made favorable comparison to other instruments that measure trauma-related cognitions and was able to discriminate between those with and without PTSD (Foa et al., 1999). The data for the current sample has a composite reliability rho of .92 and a Cronbach's alpha of .92.

PTSD symptom severity was measured using PTSD Checklist 5 (PCL-5; Weathers et al., 2013), a 20-item self-report measure of PTSD symptom severity based on PTSD diagnostic criteria of DSM-5 (American Psychiatric Association, 2013). This checklist is comprised of four factors: intrusion, avoidance, negative alterations in cognition and mood, and alterations in arousal and reactivity. Each item is rated on a scale of 0 (*not at all*) to 4 (*extremely*). Higher scores in PCL-5 pertain to more severe PTSD symptoms. A cut-off score of 38 is suggested to indicate that the individual is likely to be suffering from PTSD (Weathers et al., 2013). PCL-5 data of the present sample has a composite reliability rho of .94 and a Cronbach's alpha of .93.

All the questionnaires were administered in their original English form. The researchers deemed it unnecessary to translate the instruments because all the participants are fluent in the English language. In fact, the university uses English as the medium of instruction, and all students were screened for English proficiency prior to their admission to the university.

Data Analysis

Prior to the mediation analyses, the data were screened and estimation-maximization technique of imputation was utilized to replace values that appear to be missing at random. Parallel multiple

mediation analyses were conducted in order to find out if cognitive processing of trauma (i.e., denial, positive cognitive restructuring, resolution/acceptance, regret, and downward comparison), entered simultaneously as independent variables, is related to PTSD symptom severity (i.e., overall PTSD symptom severity, intrusion, avoidance, negative alterations in cognition and mood, and alterations in arousal and reactivity) through posttraumatic cognitions (i.e., negative cognitions about the self, negative cognitions about the world, and self-blame), which were entered as parallel mediators. The PROCESS macro for SPSS (Hayes, 2012) was used to perform the analyses. Because indirect effects usually do not have normal sampling distributions (Preacher & Hayes, 2008), the indirect effects of the mediators operating in parallel were analyzed using the nonparametric bootstrapping procedure based on 5,000 resamples (Hayes, 2012).

RESULTS

Descriptive Statistics

Out of the 632 participants, 295 (46.68%) reached the cut-off score of 38 in PCL-5, which indicates that these individuals are likely to suffer from PTSD (Weathers et al., 2013). The means, standard deviations, and bivariate correlations between variables are shown in Table 1. As expected, overall PTSD symptom severity negatively correlated with positive cognitive restructuring ($r = -.08, p < .05$) and resolution/acceptance ($r = -.17, p < .01$), and positively correlated with denial ($r = .21, p < .01$), regret ($r = .28, p < .01$), and posttraumatic cognitions: self ($r = .53, p < .01$), world ($r = .37, p < .01$), and blame ($r = .40, p < .01$).

Intrusion was found to be negatively associated with resolution/acceptance ($r = -.13, p < .01$) whereas it was found to be positively associated with denial ($r = .15, p < .01$), regret ($r = .22, p < .01$), and posttraumatic cognitions: self ($r = .35, p < .01$), world ($r = .28, p < .01$), and blame ($r = .25, p < .01$). Negative correlations were found between negative alterations in cognition and mood, and positive cognitive restructuring ($r = -.12, p < .01$) and resolution/acceptance ($r = -.18, p < .01$), whereas it positively correlated with denial ($r = .22, p < .01$),

Table 1. Results of Descriptive Statistics and Bivariate Correlations

	M	SD	1	2	3	4	5	6	7	8	9	10	11	12
1. Positive Cognitive Restructuring	3.93	1.24	--											
2. Denial	2.88	1.23	.20**	--										
3. Downward Comparison	4.14	1.26	.46**	.20**	--									
4. Regret	2.76	1.28	.13**	.52**	.12**	--								
5. Resolution/ Acceptance	4.04	1.14	.56**	.12**	.37**	.05	--							
6. Self	2.23	0.87	-.13**	.22**	-.08*	.29**	-.23**	--						
7. World	3.81	1.14	.03	.11**	.06	.12**	-.03	.51**	--					
8. Blame	2.55	1.14	-.05	.16**	.00	.35**	-.09*	.68**	.49**	--				
9. Intrusion	10.61	4.29	-.03	.15**	.00	.22**	-.13**	.39**	.28**	.29**	--			
10. Avoidance	4.02	1.94	-.01	.24**	.03	.24**	-.07	.36**	.27**	.29**	.66**	--		
11. Cognition and Mood	12.55	5.16	-.12**	.22**	-.05	.29**	-.18**	.56**	.32**	.43**	.65**	.62**	--	
12. Arousal	11.24	4.06	-.09*	.15**	-.03	.21**	-.14**	.49**	.37**	.36**	.63**	.58**	.72**	--
13. PTSD	38.42	13.35	-.08*	.21**	-.02	.28**	-.17**	.53**	.37**	.40**	.86**	.77**	.90**	.87**

Note. * $p < .05$. ** $p < .01$.

regret ($r = .29, p < .01$), and posttraumatic cognitions: self ($r = .56, p < .01$), world ($r = .32, p < .01$), and blame ($r = .43, p < .01$). Alterations in arousal and reactivity was found to have negative associations with positive cognitive restructuring ($r = -.09, p < .05$) and resolution/acceptance ($r = -.14, p < .01$), and positive associations with denial ($r = .15, p < .01$), regret ($r = .21, p < .01$), and posttraumatic cognitions: self ($r = .49, p < .01$), world ($r = .37, p < .01$), and blame ($r = .36, p < .01$).

Mediation Analysis

The results of multiple mediation analyses can be found in Tables 2 to 6. Findings of the study reveal that negative cognitions about the self mediates the relationship between denial, regret, and resolution/acceptance, and overall PTSD symptom severity. Denial and regret are associated with more severe overall PTSD symptoms brought about by increased levels of negative self-cognitions (indirect effect CI = .27 to 1.00 and .58 to 1.39, respectively), whereas resolution/acceptance is associated with lesser overall PTSD symptom severity due to decreased levels of negative self-cognitions (indirect effect CI = -1.53 to -.57).

The same pattern of results was found with specific PTSD symptoms. Negative cognitions about the self mediated the relationships between denial, regret, and resolution/acceptance, and intrusion (indirect effect CI = .04 to .23 for denial, .09 to .32 for regret, and -.36 to -.09 for resolution/acceptance); avoidance (indirect effect CI = .02 to .10 for denial, .03 to .14 for regret, and -.15 to -.03 for resolution/acceptance); negative alterations in cognition and mood (indirect effect CI = .12 to .44 for denial, .26 to .60 for regret, and -.66 to -.27 for resolution/acceptance); and alterations in arousal, and reactivity (indirect effect CI = .07 to .29 for denial, .16 to .41 for regret, and -.45 to -.16 for resolution/acceptance).

DISCUSSION

The purpose of the study is to find out if posttraumatic cognitions mediate the relationship between cognitive processing of trauma and PTSD symptom severity in a sample of natural disaster survivors. The

Table 2. Results of Multiple Mediation Analysis With PTSD as DV

Independent Variable (IV)	Mediating Variable (M)	Effect of IV on M (a)	Effect of M on DV (b)	Direct Effect (c')	Total Effect (c)	Indirect Effects	Standard Error	BC 95% CI	
								LL	UL
Positive Cognitive Restructuring	Self	-.04	5.90**			-0.21	.21	-0.66	0.15
	World	.03	1.70**	-0.34	-0.49	0.05	.08	-0.09	0.24
Denial	Blame	-.06	0.01			0.00	.05	-0.10	0.10
	Self	.10**	5.90**			0.60*	.19	0.27	1.00
Downward Comparison	World	.06	1.70**	0.64	1.34*	0.10	.08	-0.02	0.28
	Blame	-.01	0.01			0.00	.02	-0.06	0.05
Regret	Self	-.02	5.90**			-0.14	.17	-0.46	0.21
	World	.04	1.70**	0.15	0.09	0.07	.07	-0.05	0.25
Resolution/Acceptance	Blame	.02	0.01			0.00	.03	-0.05	0.06
	Self	.16**	5.90**			0.94*	.21	0.58	1.39
Acceptance	World	.07	1.70**	1.30**	2.37**	0.13	.08	0.00	0.34
	Blame	.33**	0.01			0.00	.20	-0.40	0.41
Resolution/Acceptance	Self	-.17**	5.90**			-1.00*	.25	-1.53	-0.57
	World	-.08	1.70**	-0.85	-1.99**	-0.13	.10	-0.37	0.02
	Blame	-.08	0.01			0.00	.06	-0.13	0.11

Note. Independent variables are entered simultaneously in the model, * $p < .05$, ** $p < .01$. Effects are unstandardized; BC 95% CI = bias-corrected 95% bootstrap confidence interval (5,000 bootstrap samples); LL = lower limit; UL = upper limit; SE = standard errors based on the HC3 heteroscedasticity-consistent standard error estimator; *significant mediation effect

Table 3. Results of Multiple Mediation Analysis With Intrusion as DV

Independent Variable (IV)	Mediating Variable (M)	Effect of IV on M (a)	Effect of M on DV (b)	Direct Effect (c')	Total Effect (c)	Indirect Effects	Standard Error	BC 95% CI	
								LL	UL
Positive Cognitive Restructuring	Self	-.04	1.17**			-.04	.04	-.14	.03
	World Blame	.03	0.58**	.10	.09	.02	.03	-.03	.08
Denial	Self	-.06	-0.19**			.01	.02	-.01	.07
	World Blame	.10**	1.17**	.09	.24	.12*	.05	.04	.23
Downward Comparison	World Blame	.06	0.58**			.03	.03	-.01	.09
	Self	-.01	-0.19**			.00	.01	-.01	.04
Regret	World Blame	-.02	1.17**	.04	.04	-.03	.03	-.10	.04
	Self	.02	0.58**			.02	.03	-.01	.09
Resolution/Acceptance	World Blame	.02	-0.19**			.00	.01	-.05	.01
	Self	.16**	1.17**	.46**	.63**	.19*	.06	.09	.32
Acceptance	World Blame	.07	0.58**			.04	.06	.00	.12
	Self	.33**	-0.19**			-.06	.08	-.21	.08
Resolution/Acceptance	World Blame	-.17**	1.17**	-.40*	-.63**	-.20*	.06	-.36	-.09
	Self	-.08	0.58**			-.05	.03	-.14	.01
Acceptance	World Blame	-.08	-0.19**			.01	.02	-.01	.08

Note. Independent variables are entered simultaneously in the model, * $p < .05$, ** $p < .01$. Effects are unstandardized; BC 95% CI = bias-corrected 95% bootstrap confidence interval (5,000 bootstrap samples); LL = lower limit; UL = upper limit; SE = standard errors based on the HC3 heteroscedasticity-consistent standard error estimator; * significant mediation effect

Table 4. Results of Multiple Mediation Analysis With Avoidance as DV

Independent Variable (IV)	Mediating Variable (M)	Effect of IV on M (a)	Effect of M on DV (b)	Direct Effect (c')	Total Effect (c)	Indirect Effects	Standard Error	BC 95% CI	
								LL	UL
Positive Cognitive Restructuring	Self	-.04	.48**	.00	-.01	-.02	.02	-.06	.01
	World Blame	.03	.19*	.05		.01	.01	-.01	.03
Denial	Self	-.06	.48**			.00	.01	-.03	.01
	World Blame	.10**	.19*	.20*	.26**	.05*	.02	.02	.10
Downward Comparison	World Blame	.06	.19*			.01	.01	.00	.04
	Self	-.01	.05	.03	.03	.00	.00	-.02	.00
Regret	World Blame	-.02	.48**			-.01	.01	-.04	.01
	Self	.04	.19*	.03	.03	.01	.01	.00	.03
Resolution/Acceptance	World Blame	.02	.05			.00	.00	.00	.02
	Self	.16**	.48**	.12	.23**	.08*	.03	.03	.14
Acceptance	World Blame	.07	.19*			.01	.01	.00	.05
	Self	.33**	.05			.02	.03	-.05	.08
Acceptance	World Blame	-.17**	.48**			-.08*	.03	-.15	-.03
	Self	-.08	.19*	-.08	-.18*	-.02	.01	-.05	.00
	World Blame	-.08	.05			.00	.01	-.03	.01

Note. Independent variables are entered simultaneously in the model, * $p < .05$, ** $p < .01$. Effects are unstandardized; BC 95% CI = bias-corrected 95% bootstrap confidence interval (5,000 bootstrap samples); LL = lower limit; UL = upper limit; SE = standard errors based on the HC3 heteroscedasticity-consistent standard error estimator; *significant mediation effect

Table 5. Results of Multiple Mediation Analysis With Negative Alterations in Cognition and Mood as DV

Independent Variable (IV)	Mediating Variable (M)	Effect of IV on M (a)	Effect of M on DV (b)	Direct Effect (c')	Total Effect (c)	Indirect Effects	Standard Error	BC 95% CI	
								LL	UL
Positive Cognitive Restructuring	Self	-.04	2.59**			-.09	.09	-.28	.08
	World Blame	.03	0.27	-.25	-.34	.01	.02	-.01	.06
Denial	Self	-.06	0.18			-.01	.02	-.07	.01
	World Blame	.10**	2.59**	.28	.56**	.26*	.08	.12	.44
Downward Comparison	World Blame	.06	0.27			.02	.02	.00	.07
	Self	-.01	0.18			.00	.01	-.04	.01
Regret	World Blame	-.02	2.59**	.02	-.03	-.06	.07	-.20	.09
	Self	.04	-0.27			.01	.02	-.01	.06
Resolution/Acceptance	World Blame	.02	0.18			.00	.01	-.01	.05
	Self	.16**	2.59**	.46*	.96**	.41*	.09	.26	.60
Acceptance	World Blame	.07	0.27			.02	.02	.00	.08
	Self	.33**	0.18			.06	.07	-.09	.21
Acceptance	World Blame	-.17**	2.59**	-.25	-.72**	-.44*	.10	-.66	-.27
	Self	-.08	0.27			-.02	.02	-.09	.00
Acceptance	World Blame	-.08	0.18			-.01	.02	-.08	.01

Note. Independent variables are entered simultaneously in the model, * $p < .05$, ** $p < .01$. Effects are unstandardized; BC 95% CI = bias-corrected 95% bootstrap confidence interval (5,000 bootstrap samples); LL = lower limit; UL = upper limit; SE = standard errors based on the HC3 heteroscedasticity-consistent standard error estimator; * significant mediation effect

Table 6. Results of Multiple Mediation Analysis With Alterations in Arousal and Reactivity as DV

Independent Variable (IV)	Mediating Variable (M)	Effect of IV on M (a)	Effect of M on DV (b)	Direct Effect (c')	Total Effect (c)	Indirect Effects	Standard Error	BC 95% CI	
								LL	UL
Positive Cognitive Restructuring	Self	-.04	1.65**			-.06	.06	-.19	.04
	World	.03	0.66**	-.19	-.22	.02	.03	-.04	.09
Denial	Blame	-.06	-0.03			.00	.01	-.02	.04
	Self	.10**	1.65**		.28	.17*	.06	.07	.29
Downward Comparison	World	.06	0.66**	.07		.04	.03	-.01	.11
	Blame	-.01	-0.03			.00	.01	-.01	.02
Regret	Self	-.02	1.65**	.06	.04	-.04	.05	-.13	.06
	World	.04	0.66**			.03	.03	-.02	.09
Resolution/Acceptance	Blame	.02	-0.03			.00	.01	-.03	.01
	Self	.16**	1.65**		.56**	.26*	.06	.16	.41
Resolution/Acceptance	World	.07	0.66**	.26		.05	.03	.00	.13
	Blame	.33**	-0.03			-.01	.07	-.14	.12
Resolution/Acceptance	Self	-.17**	1.65**		-.46*	-.28*	.07	-.45	-.16
	World	-.08	0.66**	-.13		-.05	.04	-.14	.01
	Blame	-.08	-0.03			.00	.02	-.03	.05

Note. Independent variables are entered simultaneously in the model, * $p < .05$, ** $p < .01$. Effects are unstandardized; BC 95% CI = bias-corrected 95% bootstrap confidence interval (5,000 bootstrap samples); LL = lower limit; UL = upper limit; SE = standard errors based on the HC3 heteroscedasticity-consistent standard error estimator; * significant mediation effect

findings indicate that cognitive processing strategies of denial and regret is positively associated with negative cognitions about the self and, in turn, is associated with increased severity of PTSD symptoms. Moreover, cognitive processing strategy of resolution/acceptance decreases PTSD symptom severity due to lesser negative cognition about the self. These findings are consistent with all the symptom clusters of PTSD including intrusion, avoidance, negative alterations in cognition and mood, and alterations in arousal and reactivity. The results underscore the importance of negative cognition about the self in the relationship between adaptive and maladaptive cognitive processes and PTSD symptom severity. Survivors who failed to integrate (i.e., denial, regret) the trauma brought about by the typhoon are likely to have higher PTSD symptoms because of their perceived incompetence in dealing with what happened. On the other hand, those who were successful in integrating the trauma-related information to their new meaning structures are likely to lower their tendency to perceive themselves as incompetent, and thus, have lower degree of PTSD symptoms.

The findings of this study supports to the notion of Ehlers and Clark (2000), and Foa and colleagues (Foa et al., 1989; Foa & Kozak, 1986; Foa & Riggs, 1993; Foa & Rothbaum, 1998) that due to the incongruence of trauma-related information to survivors' meaning structures or schemas, the failure to successfully process the experience cognitively will result in the formation of dysfunctional cognitions (i.e., that the world is entirely dangerous and that the self is entirely incompetent). In this study, only the cognition that the self is extremely incompetent was found to be responsible for the increase of posttraumatic stress symptoms. This is in line with numerous studies showing how negative cognitions about the self influence the increase of PTSD symptoms (Meiser-Stedman et al., 2009; Moser et al., 2007; Schindel-Allon et al., 2010; Shahar et al., 2013). Negative self-cognitions, unlike negative cognitions of the world or self-blame, are indicative of one's own core abilities. This might affect one's self-evaluation and self-perception, thus exacerbating the trauma symptoms (Shahar et al., 2013).

The findings of this study also complement observations in the use of CPT, wherein clients are taught about how to effectively process

trauma-related thoughts. In the study of Iverson et al. (2015), it was found that after the treatment and during the long-term follow-up, positive changes in trauma-related thoughts have been observed, which was related to lowered PTSD symptoms. Furthermore, decline in adaptive processing and increase in maladaptive processing were associated with increased symptomatology. Similarly, Sobel et al. (2009) found changes in cognitions assessed through writing of impact statements observed during the therapy. Problematic cognitions were lessened while more realistic thoughts increased. These changes were found to be related to reduction of PTSD symptoms.

Some limitations must be considered in interpreting the results of the study. First, the study made use of self-report measures, which makes responses susceptible to social desirability and bias. Second, the study employed cross-sectional design, thus, causality cannot be inferred. Nevertheless, the findings of the study were viewed in light of cognitive theories and findings of previous research. Lastly, the results of the study may be applicable only to natural disaster survivors because the cognitive processing strategies employed by individuals may vary depending on the type and nature of trauma (Williams et al., 2002).

Notwithstanding the abovementioned limitations, the study was able to contribute to the limited knowledge on the role of posttraumatic cognitions in the link between cognitive processing and PTSD symptoms. This clarification has substantial implications in developing interventions in lowering distress following a traumatic event. Treatment goals can be formulated to reframe negative self-cognition by enhancing survivors' resolution/acceptance cognitive processing and decreasing non-adaptive (i.e., regret and denial) cognitive processing. This knowledge is of clinical significance as it can serve as a basis for the development and implementation of cognitive interventions for helping survivors of trauma. Finally, the applicability of this mediation model in the context of natural disasters is essential. For instance, with the goal of strengthening the perceived competence of disaster survivors, a social policy or program could be formulated where psychological interventions that would improve one's sense of competency in dealing with the after-effects of disasters can be incorporated in the overall disaster intervention. These interventions

can be extended and applied not only in the aftermath of a disaster but also during the preparation stage.

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