Mindfulness
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ORIGINAL PAPER

Mindfulness as a Moderator in the Relation Among Core Belief Disruption, Rumination, Posttraumatic Symptoms, and Growth

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Abstract

Objectives In the present study, we tested moderated mediation models where the moderator role of mindfulness and its subscales has an indirect effect of core belief disruption (CBD) on posttraumatic symptoms (PTS) and posttraumatic growth (PTG) through intrusive (IR) and deliberate (DR) ruminations.

Methods Two hundred forty-six individuals, ages ranging between 19 and 77, with traumatic experiences participated in the study. The data were collected by Traumatic Experience Screening List, Core Beliefs Inventory (CBI), Impact of Event Scale-Revised Form (IES-R), Event-Related Rumination Inventory, Posttraumatic Growth Inventory (PTGI), and Five Facet Mindfulness Questionnaire (FFMQ).

Results The moderator role of mindfulness was supported both for PTS and PTG. The analysis indicated that the indirect effect of CBD on PTS only through IR was moderated by mindfulness total score (MF-T) and nonreactivity (NR) subscales. The analysis revealed that the MF-T × IR interaction effect was statistically significant. The interaction effect was significant for only low and medium levels of MF-T. When the model was analyzed for PTG, it was observed that the indirect effect of CBD on PTG through IR and DR was moderated significantly only for describing (DES) subscale of mindfulness. In addition, the DES × IR interaction effect was significant only for medium and higher levels of DES. It was also observed that the DES × DR interaction effect was significant only for medium and high levels of DES.

Conclusions Mindfulness and its components should be taken into consideration when assessing posttraumatic symptoms and growth.

Keywords Posttraumatic symptoms · Posttraumatic growth · Core beliefs · Ruminations · Mindfulness

In DSM-5 (APA 2013), traumatic events are also comprised of "exposure to actual or threatened death, serious injury, or sexual violence" (p. 271). Trauma is also conceptualized as events that threaten physical, emotional, and behavioral integrity, cause severe feelings of helplessness, and shatter individual's beliefs about the controllability and predictability of the world (Herman 2015). As a result of being exposed to single or multiple traumatic events, learning that a close person had such an experience or repetitive and intensive exposure to the details of the event may cause posttraumatic symptoms (PTS), including hyperarousal, intrusive thoughts, dissociation reactions, avoidance of reminders of the traumatic event, negative cognition, and mood changes (APA 2013). In addition, traumatic events may disclose positive changes, conceptualized as posttraumatic growth (PTG) (Calhoun and Tedeschi 1999). After a certain period of time following the traumatic experiences, individuals may experience positive changes and improvements compared to their pre-event states, in several areas such as personal strength, interpersonal relations, appreciation of life, and recognition of new possibilities as well as belief systems (Tedeschi and Calhoun 2004).

It is known that cognitive processes influence the development of PTS and PTG (Ehlers and Clark 2000; Tedeschi and Calhoun 2004). Traumatic experiences disrupt the core beliefs of individuals that are functional in interpreting the world (Janoff-Bulman 2004). Such disruption in the existing cognitive structures then triggers the rumination process that will

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enable the interpretation of the traumatic experience (Taku et al. 2015). Individuals may experience two types of rumination regarding the traumatic events, namely intrusive and deliberate rumination, and the effects of the traumatic event may differ depending on the types of rumination experienced by individuals (Allbaugh et al. 2016; Calhoun et al. 2010).

Immediately after the traumatic events, intrusive ruminations are accepted as natural reactions against trauma and act as triggers for the following deliberate rumination process (Cann et al. 2011). However, if they endure unmitigated in the long term, they may cause an increase in their stress symptoms (Ogińska-Bulik and Juczyński 2016; Valdez and Lilly 2017). On the other hand, deliberate ruminations, defined as intentional thinking to interpret the event (Cann et al. 2010), enable individuals to notice the outcome of gains in a paradoxical manner as well as noticing losses (Soo and Sherman 2015) and are considered to be related with the PTG experience (García et al. 2015; Hallam and Morris 2014). In a study considering both intrusive and deliberate ruminations, it was found that intrusive ruminations mediated between the core belief disruption (CBD) and PTG (Zhou et al. 2015). However, deliberate ruminations mediated between CBD and PTG and between intrusive ruminations and PTG.

In the literature, it is observed that the knowledge on the source of individual differences observed in experiencing PTS, PTG, and ruminations is very limited. In recent literature, it was proposed that the concept of mindfulness may bring insight into individual differences in the effects of trauma (e.g., Hanley et al. 2017). Mindfulness is defined as focusing the attention on what is happening in the mind, body, or environment at that present moment in a nonjudgemental or accepting way (Kabat-Zinn 1991). It is considered that the mindfulness conceptualized as either a state or a trait (Vago and Silbersweig 2012) reduces the need for experiential avoidances (Vujanovic et al. 2016) known to have a relation with PTS (Banks et al. 2015; Martin et al. 2018; Thompson and Waltz 2010). Also, it is proposed that through metacognitive awareness, mindfulness reduces the possibility of the exacerbation and the chronicity of PTS (Nitzan-Assayag et al. 2015) by preventing individuals from perceiving reactions to trauma as unchangeable realities and by supporting emotion regulation skills (Jazaieri et al. 2014). Various studies in the literature suggest that trait mindfulness is associated with lower PTS (Boelen and Lenferink 2018; Chopko and Schwartz 2009) and that ruminations play a mediator role in the negative relation between PTS and mindfulness (Im and Follette 2016). In addition, trait mindfulness increases the possibility of developing PTG (Hanley et al. 2015; Zhang et al. 2017). It is claimed that mindfulness may facilitate noticing alternative perspectives and finding new meanings of life (Sauer et al. 2012), that it may facilitate proceeding from intrusive ruminations to a deliberate rumination process by ensuring a decrease in the intensity of negative affection (Garland et al. 2015) and therefore may lead to the emergence of the paradoxical thinking process which is necessary for growth (Tedeschi and Blevins 2015; Hanley et al. 2015; Xu et al. 2018).

The aforementioned studies proposed that PTS and PTG are related to core belief disruption (Taku et al. 2015), deliberate and intrusive ruminations (Allbaugh et al. 2016; Valdez and Lilly 2017), and mindfulness (Boelen and Lenferink 2018; Im and Follette 2016; Nitzan-Assayag et al. 2015). To our knowledge, in the literature, only one empirical research studied all these variables together (Hanley et al. 2017). In this study, the researchers found a weak relation between mindfulness and PTG. They proposed that such a weak relationship may be due to subscales, where mindfulness may have differential relationships (positive or negative) with other variables. Therefore, they pointed out that the subscales of mindfulness should be taken into consideration in the relationship between mindfulness, PTS, and PTG.

In the present study, we hypothesized that different levels of mindfulness might interact with rumination processes and affect both stress and growth in different ways. Therefore, we proposed and tested moderated mediation models where the moderator role of mindfulness and its subscales has an indirect effect of core belief disruption on PTS and PTG through ruminations (deliberate and intrusive).

Method

Participants

The sample of the present study consisted of 18-year-old or older individuals with a traumatic experience. The accidental and snowball sampling strategies were utilized as the sampling method. The individuals who were above 18 and had at least one traumatic experience were included in the sample without and other exclusion criteria. The study was advertised on social media platforms and NGOs, which work with disadvantaged groups to recruit sample. The data were collected both online and in-person methods. Since the study aimed to explore traumatic reactions widescale, having taken a diagnosis of posttraumatic stress disorder or whether PTG developed or not after a traumatic event was not taken as a criterion to exclude or include. Two hundred and forty-six individuals ($n = 145$, 59% female; $n = 101$, 41% male) with a traumatic experience participated in the study. The mean age of the sample was 34.50 ranging from 19 to 77. Twenty percent of the sample ($n = 49$) stated that they had a psychiatric diagnosis and received medical ($n = 33$, 67.3%), psychological, or combined treatment ($n = 16$, 32.7%). The sample characteristics are presented in Table 1.

Participants were asked to indicate which traumatic events they had and the event that affected them most (Table 2). The

Table 1 Sample characteristics

	N	%
Marital status		
Married	98	40.0
Single	123	50.0
Engaged	4	1.5
Divorced	21	8.5
Education		
Primary school	13	5.2
High school	21	8.5
University students	51	20.7
University graduates and higher	161	65.4
Working status		
Working	170	69.0
Not working	76	31.0
Chronic physical disturbance		
Yes	69	28.0
No	177	72.0
Psychiatric diagnosis		
Yes	47	20.0
No	199	80.0

participants were asked to answer the following questions by considering the most affected traumatic event. These events are grouped into human-made or natural events. The events such as accidents, sexual and nonsexual violence, and torture were grouped into human-made and life-threatening illnesses and natural disasters into natural events. According to this categorization, 100 participants (40.7%) stated natural traumatic events and 144 participants (58.5%) of human-made events as the most affected events. All these events were consistent with the events stated in the traumatic stressors listed in criterion A for PTSD in DSM-5.

Procedure

Following the approval issued by the Başkent University Institutional Review Board and Ethics Committee, the data were collected by conventional and online methods on a voluntary basis. Regardless of the data collection method, the participants were informed about the purpose of the study, and their informed consent was taken. The average time to fill out questionnaires was about 20 min.

Measures

Demographical Data Form

Participants were requested to state information on age, sex, marital status, educational level, current employment status, the existence of chronic physical and psychiatric disturbances, psychiatric diagnosis, and treatment method by the questions on the Demographical Data Form (DDF).

Traumatic Experience Screening List

The traumatic experience screening list was used to determine the traumatic experiences of participants. This list was derived from the Posttraumatic Stress Diagnostic Scale, developed by Foa et al. (1997) and adapted to Turkish by Işıklı (2006). The

Table 2 The frequency of and the most impacting events in the Traumatic Experience Screening List

Type of traumatic events	Frequency of traumatic events experienced by participants		Frequency of the most impacting events experienced by participants	
	N	%	*N*	%
Accident/fire/blast	94	38.0	33	13.4
Natural disaster	49	19.0	11	4.5
Nonsexual violence by a family member or a known person	25	10.0	9	3.7
Nonsexual violence by an unknown person	30	12.0	8	3.2
Sexual violence by a family member or a known person	19	7.0	13	5.3
Sexual violence by an unknown person	15	6.0	6	2.4
Being in military conflict area	38	15.4	26	14.6
Sexual contact with a 5 years younger person before age 18	25	10.0	8	3.2
Imprisonment	11	4.5	3	1.2
Torture	6	2.4	5	2
A life-threatening illness	31	12.6	10	4.1
Sudden death of a loved one	133	54.0	68	27.6
Other	77	31.0	51	20.7

scale consisted of 13 items that covered traumatic experiences. In addition, participants had a chance to state their traumatic experiences if they had not been covered by these items. After answering these questions, participants stated which event they were affected by the most and the level of impact of the event.

Impact of Event Scale-Revised Form

The Impact of Event Scale (IES), which assesses posttraumatic symptoms, was developed initially by Horowitz et al. (1979), and revised by Weiss and Marmar (the Impact of Event Scale-Revised; IES-R, 1997). Although IES-R has three subscales (intrusion, avoidance, and hyperarousal), total scale scores were used in the present study. IES-R was adapted into Turkish by Çorapçıoğlu et al. (2006). In the adaptation study, the Cronbach alpha internal consistency coefficient of the IES-R was found to be 0.93. In the present study, the Cronbach alpha internal consistency coefficient was found to be 0.94 for the whole scale.

Event-Related Rumination Inventory

The Event-Related Rumination Inventory was developed by Cann et al. (2011), in order to assess two different rumination types, namely "intrusive" (IR) and "deliberate" (DR) rumination. In the findings of the study carried out by Haselden (2014) to adapt the scale into Turkish, the Cronbach alpha internal consistency coefficient was found to be 0.94 for IR, 0.88 for the DR subscale, and 0.94 for the whole scale. In the present study, the Cronbach alpha internal consistency coefficient is again found to be 0.94 for IR and 0.91 for DR.

Core Beliefs Inventory

The Core Beliefs Inventory (CBI) is a measurement tool developed by Cann et al. (2011), which assesses to what extent an event causes an individual to reevaluate core assumptions. CBI was adapted into Turkish by Haselden (2014). The Cronbach's alpha internal consistency coefficient was found to be 0.87 for the whole scale. In the present study, the whole scale was used in order to assess the core belief change, and the Cronbach's alpha internal consistency coefficient for the entire scale was found to be 0.87.

Posttraumatic Growth Inventory

The Posttraumatic Growth Inventory (PTGI) was developed by Tedeschi and Calhoun (1996) to assess changes that individuals undergo following traumatic experiences. The scale consisted of five subscales, namely relations with others, new opportunities, personal potency, spiritual change, and appreciation of life. The study to adapt the scale into Turkish was carried out by Dürü (2006), and Cronbach's alpha internal consistency coefficient of the scale was found to be 0.93. In this study, the total score of the scale was used, and the Cronbach alpha internal consistency coefficient was calculated to be 0.93.

Five Facet Mindfulness Questionnaire

The Five Facet Mindfulness Questionnaire (FFMQ), which assesses mindfulness tendencies of individuals, was developed by Baer et al. (2006). The scale assesses mindfulness as a personality trait (Şahin and Yeniçeri 2015) and consists of five subscales, namely acting with awareness (ACT), nonjudging (NJ), nonreactivity (NR), observing (OBS), and describing (DES). FFMQ was adapted into Turkish by Ayalp and Hisli Şahin (2018), and the original five-facet structure of FFMQ was preserved in the adaptation study. Cronbach's alpha internal consistency coefficient for FFMQ was found to be 0.71 for the entire scale. In the present study, Cronbach alpha internal consistency coefficients were calculated 0.93 for the ACT, 0.85 for NJ, 0.80 for NR, 0.79 for OBS, 0.78 for DES, and 0.83 for the total scale (MF-T).

Data Analyses

Correlations among research variables were calculated by Pearson Product-Moment Correlation analysis. Conditional indirect effect analysis, suggested by Hayes (2015), was used to test the moderated mediation model. The analyses were performed by using Model 14 of PROCESS macro version 3.2 (Hayes 2018). Since it is known that the effects of human-made traumas have more severe effects on individuals compared to natural ones (Bromet et al. 2017; Norris et al. 2002) and that psychiatric disorders may influence posttraumatic experiences of individuals (Clous et al. 2017; Petrakis et al. 2011), the type of trauma and the existence of psychiatric diagnosis were included in the analyses as covariates. However, covariate variables had no significant effects on analyses.

Results

The analyses revealed that correlations among ruminations were very high (0.66). PTS and IR and DR were positively and significantly correlated (0.55 and 0.50, respectively). As for the PTG, it was only correlated with DR (0.31). CBD and IR (0.49), DR (0.57), PTS (0.42), and PTG (0.22) were positively and significantly correlated. Other correlations between the research variables are presented in Table 3.

Two separate models were tested for PTS and PTG. In the first model, the moderating role of mindfulness on the indirect effect of CBD on PTS through IR and DR ruminations was tested. In the second model, PTG was included as the dependent variable by keeping the entire model

Table 3 Correlations, means, and standard deviations of study variables

	1	2	3	4	5	6	7	8	9	10	11
1. CBD	–										
2. IR	0.49**	–									
3. DR	0.57**	0.66**	–								
4. PTS	0.42**	0.55**	0.50**	–							
5. PTG	0.22**	0.10	0.31**	−0.00	–						
6. MF-T	−0.02	−0.21**	−0.06	−0.42**	0.29**	–					
7. ACT	−0.13*	−0.27**	−0.14*	−0.35**	0.15*	0.67**	–				
8. NJ	−0.22*	−0.23**	−0.21**	−0.41**	0.00	0.55**	0.38**	–			
9. NR	0.15*	−0.02	0.08	−0.17**	0.32**	0.58**	0.15*	0.10	–		
10. OBS	0.11	0.04	0.14*	−0.05	0.23**	0.49**	0.02	−0.04	0.26**	–	
11. DES	0.05	−0.10	−0.03	−0.22**	0.17**	0.68**	0.33**	0.17**	0.30**	0.26**	–
M	26.7	19.8	17.4	27.6	46.7	67.2	12.9	13.3	12.6	14.1	14.1
SD	10.7	8.1	7.9	20.3	22.7	10.8	4.1	3.6	3.3	3.5	3.4

$N = 246$

CBD core belief disruption, *IR* intrusive rumination, *DR* deliberate rumination, *PTS* posttraumatic symptoms, *PTG* posttraumatic growth, *MF-T* mindfulness total, *ACT* acting with awareness, *NJ* nonjudging, *NR* nonreactivity, *OBS* observing, *DES* describing

*$p < 0.05$; **$p < 0.01$; ***$p < 0.001$

constant. The total score and subscales of mindfulness were analyzed separately in both models. Statistically significant model findings were reported in the following sections. The moderated mediation model's statistical significance was determined based on the index of moderated mediation (Hayes 2018). A significant index value indicates that for different levels of the moderating variable, the conditional indirect effect differentiates significantly. The evaluation of the conditional indirect effect and the calculation of the index of moderated mediation were obtained by performing the bootstrap technique. The nonexistence of zero within a calculated confidence interval (CI) of 95% denotes a significance of $p < 0.05$ in statistical terms.

Moderated Mediation Model Testing for PTS

The analysis indicated that the indirect effect of CBD on PTS only through IR was moderated by MF-T and NR subscales (Fig. 1). The model testing revealed that MF-T × IR interaction effect (ab3) was statistically significant (index = − 0.01, SE = 0.005, 95% CI − 0.023, − 0.002) (Table 4). However, the interaction effect was significant for only low (95% CI 0.21, 0.60) and medium (95% CI

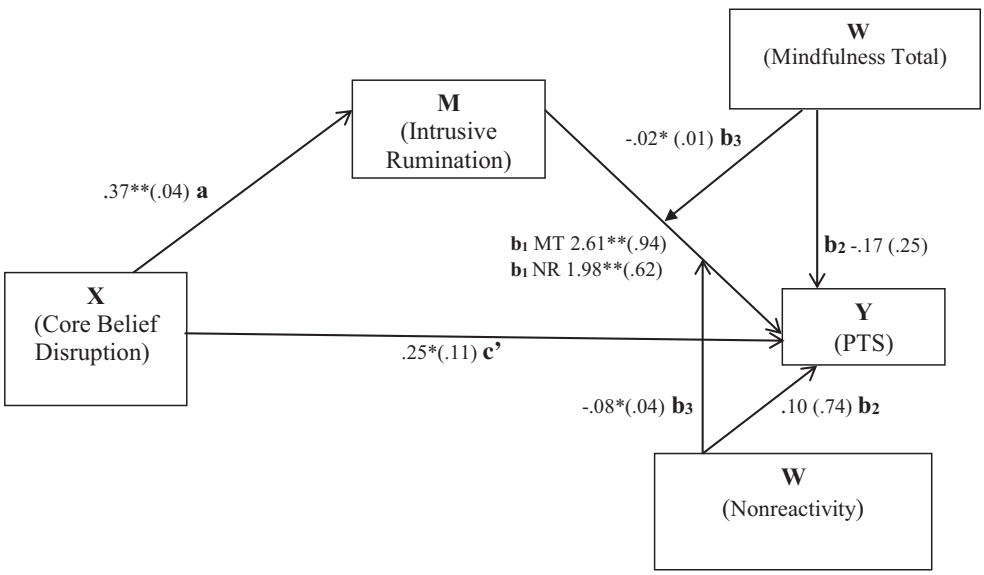


Fig. 1 Moderated mediation model for PTS. *Note*: This figure shows the moderation effect of MT on the direct effect of IR on PTS in the mediated relationship of IR between CBD and PTS. Unstandardized coefficients (with standard errors in parentheses) are reported. *a* is the direct effect of X on M, b_1 is the direct effect of M on Y, b_2 is the direct effect of W on Y, b_3 is the interaction effect of M and W on Y, and *c′* is the effect of X on Y including M. *$p < 0.05$, **$p < 0.01$

Table 4 Moderated mediation analysis for PTS

IV: CBD DV: PTS (measured by IRS-R) Mediator: IR, DR Moderator: MF-T	*B*	SE	*t*	*p*	Model R^2
CBD → IR (a path)	0.37	0.04	7.90	0.00	
CBD → DR (a path)	0.42	0.03	10.67	0.00	
CBD → PTS (c′ path)	0.25	0.11	2.28	0.02	
IR → PTS (b1 path)	2.61	0.94	2.76	0.00	
DR → PTS (b1 path)	− 0.07	0.91	− 0.08	0.93	
MF-T → PTS (b_2 path)	− 0.17	0.25	− 0.68	0.49	
IR × MF-T (b3 path)	− 0.027	0.01	− 2.07	0.03	0.49
Conditional indirect effect CBD → IR → PTS (ab3)	Boot indirect effect/index	Boot SE	95% CI[lower-upper]		
MF-T low	0.39	0.10	[0.21, 0.60]		
MF-T medium	0.28	0.06	[0.15, 0.41]		
MF-T high	0.15	0.08	[− 0.01, 0.30]		
Index	− 0.01	0.005	[− 0.023, − 0.002]		
IV: CBD DV: PTS (measured by IRS-R) Mediator: IR, DR Moderator: NR	*B*	SE	*t*	*p*	Model R^2
CBD → IR (a path)	0.37	0.04	7.90	0.00	
CBD → DR (a path)	0.42	0.03	10.67	0.00	
CBD → PTS (c' path)	0.25	0.11	2.17	0.03	
IR → PTS (b1 path)	1.98	0.62	3.19	0.00	
DR → PTS (b1 path)	− 0.05	0.60	− 0.08	0.93	
NR → PTS (b_2 path)	0.10	0.74	0.13	0.88	
IR × NR (b3 path)	− 0.088	0.04	− 1.93	0.05	0.44
Conditional indirect effect CBD → IR → PTS (ab3)	Boot indirect effect/index	Boot SE	95% CI [lower-upper]		
NR low	0.44	0.10	[0.26, 0.65]		
NR medium	0.31	0.06	[0.18, 0.45]		
NR high	0.21	0.08	[0.03, 0.37]		
Index	− 0.03	0.01	[− 0.071, − 0.003]		

CBD core belief disruption, *IR* intrusive rumination, *DR* deliberate rumination, *PTS* posttraumatic symptoms, *MF-T* mindfulness total, *NR* nonreactivity, *CI* confidence interval

0.15, 0.41) levels of MF-T. As seen in Fig. 2, the low level of MF-T and high IR interaction were related to the highest increment in PTS. It was found that the entire model was significant (R2 = 0.49, F (8, 237) = 29.1, $p < 0.001$).

Similarly, the NR × IR (ab3) interaction effect was statistically significant (index = − 0.03, SE = 0.017, 95% CI − 0.071, − 0.003) (Table 4). The interaction effect was significant for all levels of NR, namely lower (95% CI 0.26, 0.65), medium (95% CI 0.18, 0.45), and higher (95% CI 0.03, 0.37). As seen in Fig. 2, the conditional indirect effect varies for different levels of NR. The highest increment in PTS was observed in the lower level of NR and higher IR combination. Again, the entire model was statistically significant (R2 = 0.44, F (8, 237) = 23.6, $p < 0.001$).

Moderated Mediation Model Testing for PTG

When the model was tested for PTG, it was observed that the indirect effect of CBD on PTG through IR and DR was moderated significantly only for the DES subscale of mindfulness. (Fig. 3). As seen in Table 5, the DES × IR interaction effect (ab3 route) was significant (index = − 0.06, SE = 0.025, 95% CI − 0.120, − 0.023) only for medium (95% CI − 0.35, − 0.00) and higher (95% CI − 0.71, − 0.22) levels of DES. It was also observed that the DES × DR interaction effect (ab3) was significant (index = 0.07, SE = 0.029, 95% CI 0.013, 0.130) only for medium (95% CI − 0.27, − 0.69) and high (95% CI − 0.47, − 1.09) levels of DES. As seen in Fig. 4, PTG increased when DES was high, and IR was low, and when both DES and DR were high. Finally, it is found that that the entire model was significant (R2 = 0.20, F (8, 237) = 7.74, $p < 0.001$).

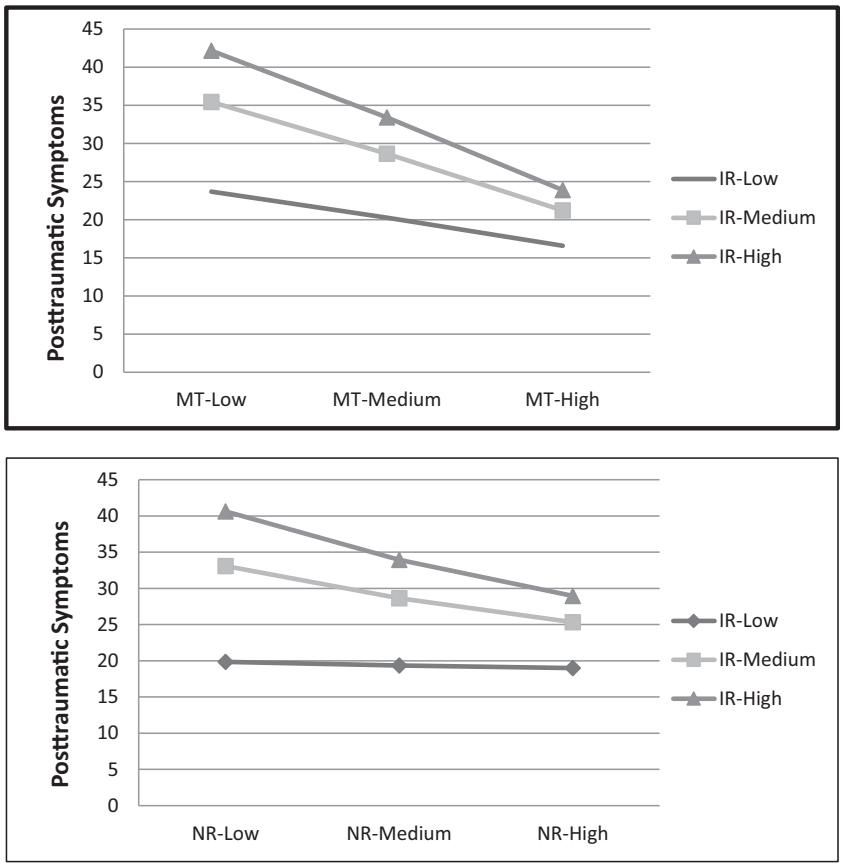


Fig. 2 Graphics of change depending on the levels of MT and NR in the relationship between CBD and PTS through IR. *Note*: IR, intrusive rumination; PTS, posttraumatic symptoms; MT, mindfulness total; NR, nonreactivity

Discussion

In the present study, the moderator role of mindfulness on the indirect effect of core belief disruption on PTS and PTG through ruminations (deliberate and intrusive) was examined by taking types of trauma and the existence of psychiatric diagnosis as covariates. The analyses revealed that the indirect effects both on PTS and PTG are moderated by mindfulness. However, the model testing proposed that the effects of types of rumination and the subscales of mindfulness differed for PTS and PTG.

It was observed that the indirect effect of core belief disruption on posttraumatic symptoms through intrusive ruminations was negatively moderated by the total mindfulness score and nonreactivity subscale. Mindfulness, in interaction with intrusive ruminations, causes a difference in the indirect effect. In other words, core belief disruption emerging following the traumatic experiences of individuals influences the posttraumatic

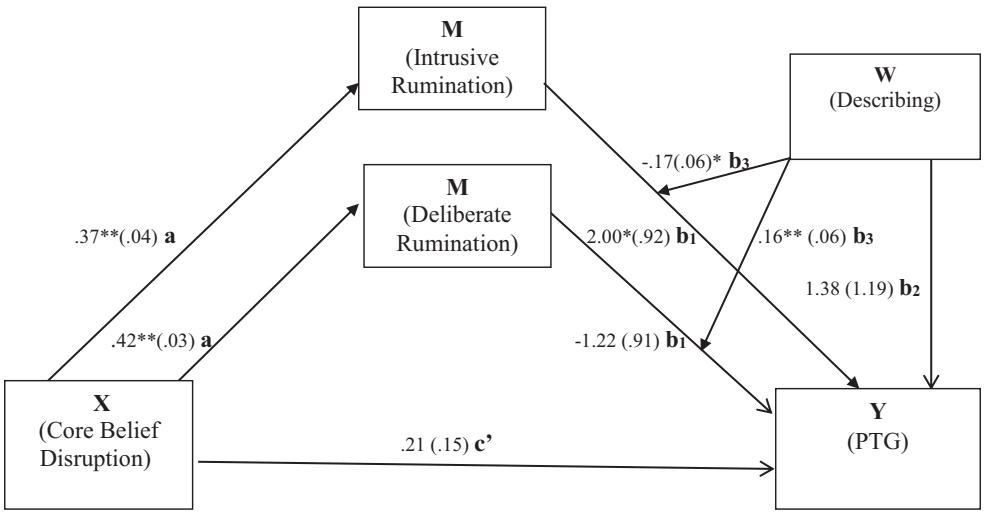


Fig. 3 Moderated mediation model for PTG. *Note*: This figure shows the moderation effect of DES on the direct effect of ruminations on PTG in the mediated relationship of ruminations between CBD and PTG. Unstandardized coefficients (with standard errors in parentheses) are reported. *a* is the direct effect of X on M, b_1 is the direct effect of M on Y, b_2 is the direct effect of W on Y, b_3 is the interaction effect of M and W on Y, and c' is the effect of X on Y including M. $*p < 0.05$, $**p < 0.01$

Table 5 Moderated mediation analysis for PTG

IV: CBD DV: PTG Mediator: IR, DR Moderator: describing	*B*	SE	*t*	*P*	Model R^2
CBD → IR (a path)	0.37	0.04	7.90	0.00	
CBD → DR (a path)	0.42	0.03	10.67	0.00	
CBD → PTG (c′ path)	0.21	0.15	1.38	0.16	
IR → PTG (b1 path)	2.00	0.92	2.17	0.03	
DR → PTG (b1 path)	− 1.22	0.91	− 1.32	0.18	
DES → PTG (b_2 path)	1.38	1.19	1.15	0.24	
IR × DES (b3 path)	− 0.17	0.06	− 2.84	0.00	
DR × DES (b3 yolu path)	0.16	0.06	2.66	0.00	0.20
Conditional indirect effect CBD → IR → PTG (ab3)	Boot indirect effect/index	Boot SE	95% CI [lower-upper]		
DES medium	− 0.16	0.09	[− 0.35, − 0.004]		
DES high	− 0.42	0.13	[− 0.73, − 0.21]		
Index	− 0.06	0.025	[− 0.120, − 0.023]		
Conditional indirect effect CBD → DR → PTG (ab3)	Boot indirect effect/index	Boot SE	95% CI[lower-upper]		
DES medium	0.47	0.11	[0.271, 0.703]		
DES high	0.75	0.16	[0.47, 1.09]		
Index	0.07	0.02	[0.013, 0.130]		

CBD core belief disruption, *IR* intrusive rumination, *DR*: deliberate rumination, *DES* describing, *PTG* posttraumatic growth

symptoms through intrusive ruminations. However, such effect differs according to the mindfulness tendencies of individuals, especially their level of nonreactivity. The nonreactivity refers just to observe thoughts without showing any impulsive reaction

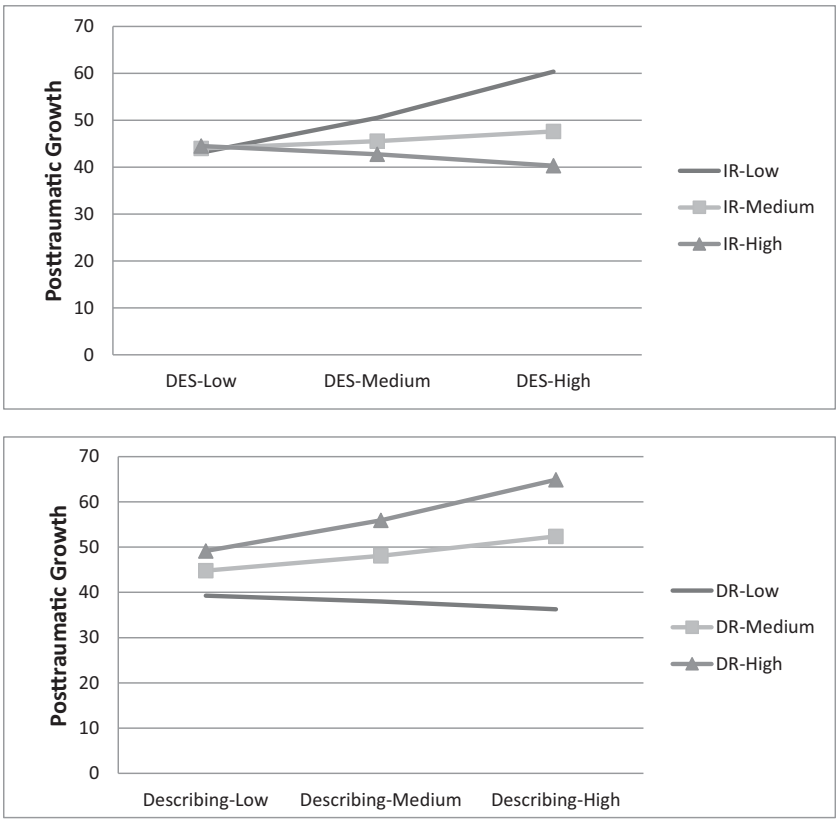


Fig. 4 Graphics of change depending on the levels of DES in the relationship between CBD and PTG through IR and DR. *Note*: IR, intrusive rumination; DR, deliberate rumination

and to allow them to pass instead of seeing them as unchangeable realities. In individuals with a higher tendency of nonreactivity, the possibility of intrusive ruminations caused by the disruption in core beliefs to cause posttraumatic symptoms or to exacerbate them is lower as compared to those individuals who have a lower tendency. It is considered that the mindfulness tendencies of individuals, by acting as a buffer, influence the relation between intrusive ruminations and PTS and severely reduce symptoms.

The relation of thoughts regarding the traumatic event that comes to mind in a repetitive and uncontrolled manner (intrusive) and that have harmful content with PTS has been addressed in other studies as well (e.g., Choi and In 2020; Ogińska-Bulik and Juczyński 2016). Intrusive ruminations may cause a high level of psychological distress in individuals (García et al. 2017), subsequently causing avoidance of negative inner experiences known to increase PTS (Bishop et al. 2018; Thompson and Waltz 2010). As well as avoidance, another characteristic that maintains PTS is that individuals perceive expected and normal reactions to the traumatic event such as hyperarousal, flashbacks, intrusive thoughts, mood changes, and difficulty in concentrating as persistent changes threatening their physical and mental health (Ehlers and Clark 2000). Mindfulness tendency enables an individual to direct one's attention from ruminative thoughts to the present time, to be aware of his/her subjective experiences, and to accept them in a nonjudgemental manner, without giving any reaction (nonreactivity). Thus, the individual, without being under the pressure of repetitive negative thoughts regarding the trauma, may see them as fleeting thoughts due to a negative experience and can evaluate the PTS as temporary reactions to a traumatic event, instead of persistent changes which may last the remaining part of their lives. In this way, the possibility of individuals' contacting negative thoughts and giving more flexible reactions after the trauma increases (Walser and Hayes 2006). Therefore, the need for avoidance decreases parallel to a decrease in inner disturbance caused by intrusive ruminations. In light of these findings, it can be suggested that mindfulness tendencies may prevent the emergence or exacerbation of PTS. Regarding the protective effects of mindfulness, the findings of the present study are consistent with the previous research (Boelen and Lenferink 2018; Im and Follette 2016; Nitzan-Assayag et al. 2015; Vujanovic et al. 2016). The finding that deliberate ruminations were not statistically significant in the model tested in the present study also supports the notion that PTS is mostly predicted by intrusive ruminations (Zhou et al. 2015).

In the model tested for PTG, it was observed that the indirect effect of core belief disruption on PTG through deliberate and intrusive ruminations was only moderated by the describing subscale of mindfulness. In other words, the indirect effect of core belief disruption on PTG through both intrusive and deliberate ruminations differs depending on the individual's level of describing ability. The highest PTG was more likely when intrusive ruminations were low, and the level of describing was high. Tedeschi and Calhoun (2004) also stated that intrusive ruminations only contribute to PTG at a certain level. The findings of the present research support the previous findings and bring a suggestion regarding the conditions of such an effect. A high level of intrusive rumination seemed to be related to PTG. However, it is possible to claim that such an effect is due to the low level of intrusive rumination and high level of describing tendency. Therefore, for PTG, not only the rumination process but also having a describing skill is necessary.

Another important finding of this study was that there was a positive interaction effect for the medium and high level of describing tendency and deliberate ruminations on PTG even though the direct effect of deliberate ruminations on PTG was not significant. This result is considered to bring an explanation to previous findings on the positive effect of deliberate ruminations on PTG (Allbaugh et al. 2016) and on the predictive role of core belief disruption in PTG through deliberate ruminations (Zhou et al. 2015). It seemed that individuals' deliberately thinking of the event to make sense of it contributes to the growth process only when they identify the quality of their experience and emotions.

The describing dimension of mindfulness refers to the ability to define inner experiences through words and to name them (Baer et al. 2006). It is known that the effects of becoming aware of and naming the emotion on the emergence of negative emotions such as anxiety and fear decrease the activation of the amygdala (Van der Kolk 2014). That is, the impact of the negative emotion reduces with the decrease in amygdala activation (Creswell et al. 2007), and therefore, naming emotions plays an emotion regulation function. Cann et al. (2011) stated that the transition to a deliberate rumination process where new meanings can be drawn is only possible when the negative emotional burden and psychological distress caused by intrusive ruminations are reduced to a certain level. The result of the present study is consistent with this finding. Individuals were having the skill to name their emotions to contribute to regulating negative emotions caused by event-related thoughts that come to mind, and thus, individuals may experience a deliberate rumination process to derive new meanings instead of repetitively experiencing negative thought loops. This process helps individuals to experience positive changes in areas such as themselves, others, life, and spirituality and allows them to create a consistent life story covering before, during, and after the trauma period (Tedeschi and Calhoun 2004). The finding that mindfulness may increase the possibility of experiencing deliberate ruminations is also consistent with the findings of previous studies (Garland et al. 2015; Tedeschi and Blevins 2015).

In addition to the positive qualities above, mindfulness creates a metacognitive awareness that allows perceiving disturbing emotions and thoughts as temporary mental activities instead of unchangeable realities (Garland et al. 2015).

Such metacognitive awareness allows the individual's scope of attention to expand to cover meaningful and positive events instead of getting stuck in disturbing emotions and thoughts (Tedeschi and Blevins 2015). Thus, the individual's possibility to consider alternative perspectives by paying attention to contextual clues that were not remarked before and to reinterpret life as meaningful and purposeful increases.

Limitations and Future Research Directions

The present study has some limitations. Firstly, the data in this study were collected retrospectively. Unfortunately, literature does not provide robust findings on how soon ruminations emerge after the traumatic event, how long they last, and what type of a route they follow. The present study also has such a limitation. A similar limitation is also related to the development of PTG. It is well presented in the literature that in order for PTG to take place, a period of time should pass after the traumatic experience (Morgan and Desmarais 2017; Tedeschi and Calhoun 2004). Although it was not the main question of this study, the time passes after the traumatic events were questioned. However, many participants left this question unanswered, and some of them also provided incompatible answers with their age. For this reason, we did not include this variable in the analyses. Therefore, for a better understanding of PTS and PTG, longitudinal study designs are recommended for future studies. Second, being diagnosed with posttraumatic stress disorder was not a criterion for the sampling of the present research, and posttraumatic symptoms at every level were included in the study. Third, it should be reminded that this study is a correlational study and no causation can be inferred from findings. Finally, all the data in the present study were collected by self-rating scales which may cause common method bias.

In the light of present findings, several recommendations can be made for future research. Mindfulness is conceptualized as a personality trait, as well as a skill that can be improved through various exercises (Vago and Silbersweig 2012). The findings of the present study propose that ruminations emerging after a traumatic event with positive and negative outcomes and the interaction of ruminations with different dimensions of mindfulness may be functional in determining the content of intervention programs. Specifically, it can be suggested that, in individuals with a history of trauma, developing skills to become aware of and name emotions triggered by the agonizing memories of the traumatic event and to let them go instead of seeing them as issues to go into action, to change, or to fight against will be effective in decreasing negative outcomes and in increasing positive changes after a traumatic event. Traumatic experiences destroy individuals' symbolization capacities and the capacity to verbalize their inner experiences (Herman 2015). The inability of individuals to name their inner experiences or to distinguish the emotion they are experiencing causes them to perceive their inner worlds as chaotic and to detach from their emotions in a dissociative manner, which may exacerbate the symptoms (Briere and Scott 2014). It can be asserted that research on understanding and resolving the inner experiences of trauma survivors may help them in (a) reducing uncertainty, fear, and need for avoidance; (b) preventing the exacerbation of symptoms; and (c) reinforcing cognitive processes towards reinterpreting experience and creating new meanings. Therefore, future research may focus on integrating mindfulness components, especially describing and nonreactivity, into intervention programs and testing their efficacy on trauma treatment by experimental methodologies. However, there are studies indicating that increasing mindfulness tendencies may not be appropriate especially immediately after a traumatic event and in the presence of severe symptoms (Briere and Scott 2014). Thus, future studies may take the time passed after the traumatic event and severity of symptoms into consideration.

There are also studies indicating that trauma types may result in different levels of PTS and PTG (e.g., Cloitre et al. 2014; Shuwiekh et al. 2018). Therefore, PTS and PTG should be explored according to trauma type in future studies. In addition, it will be worthwhile to explore PTS and PTG comparatively with clinical and subclinical populations in future studies.

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Author Contributions AH and OCÇ developed the study concept and design. AH collected all the data and performed statistical analyses under the supervision of OCÇ. Both authors collaborated in the writing of the manuscript and approved the final version of the manuscript before submission.

Compliance with Ethical Standards

Ethical Approval All procedures performed were in accordance with the ethical standards of the Başkent University Institutional Review Board and Ethics Committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Informed Consent Informed consent was obtained from all individual participants included in the study.

Conflict of Interest The authors declare that they have no conflict of interest.

References

Allbaugh, L. J., Wright, M. O. D., & Folger, S. F. (2016). The role of repetitive thought in determining posttraumatic growth and distress following interpersonal trauma. *Anxiety, Stress, & Coping, 29*(1), 21–37.

American Psychiatric Association. (2013). *Diagnostic and statistical manual of mental disorders- fifth edition (DSM 5)*. Washington, DC: American Psychiatric Publishing.

Ayalp, H. D., & Hisli Şahin, N. (2018). Turkish adaptation of the Five Facet Mindfulness Questionnaire - Short Form (FFMQ-S). *Journal of Clinical Psychology Research, 2*(3), 117–127.

Baer, R. A., Smith, G. T., Hopkins, J., Krietemeyer, J., & Toney, L. (2006). Using selfreport assessment methods to explore facets of mindfulness. *Assessment, 13*(1), 27–45.

Banks, K., Newman, E., & Saleem, J. (2015). An overview of the research on mindfulness-based interventions for treating symptoms of posttraumatic stress disorder: a systematic review. *Journal of Clinical Psychology, 71*, 935–963.

Bishop, L. S., Ameral, V. E., & Palm Reed, K. M. (2018). The impact of experiential avoidance and event centrality in trauma-related rumination and posttraumatic stress. *Behavior Modification, 42*(6), 815–837.

Boelen, P. A., & Lenferink, L. I. (2018). Experiential acceptance and trait-mindfulness as predictors of analogue post-traumatic stress. *Psychology and Psychotherapy: Theory, Research and Practice, 91*(1), 1–14.

Briere, J. N., & Scott, C. (2014). *Principles of trauma therapy: a guide to symptoms, evaluation, and treatment (DSM-5 update)*. Thousand Oaks: Sage Publications.

Bromet, E. J., Atwoli, L., Kawakami, N., Navarro-Mateu, F., Piotrowski, P., King, A. J., et al. (2017). Post-traumatic stress disorder associated with natural and human-made disasters in the world mental health surveys. *Psychological Medicine, 47*(2), 227–241.

Calhoun, L. G., & Tedeschi, R. G. (1999). *Facilitating posttraumatic growth: a clinician's guide*. New York: Routledge.

Calhoun, L. G., Cann, A., & Tedeschi, R. G. (2010). The posttraumatic growth model: sociocultural considerations. In T. Weiss & R. Berger (Eds.), *Posttraumatic growth and culturally competent practice: lessons learned from around the globe* (pp. 1–14). Hoboken: Wiley.

Cann, A., Calhoun, L. G., Tedeschi, R. G., Kilmer, R. P., Gil-Rivas, V., Vishnevsky, T., & Danhauer, S. C. (2010). The core beliefs inventory: a brief measure of disruption in the assumptive world. *Anxiety, Stress & Coping, 23*(1), 19–34.

Cann, A., Calhoun, L. G., Tedeschi, R. G., Triplett, K. N., Vishnevsky, T., & Lindstrom, C. M. (2011). Assessing posttraumatic cognitive processes: the Event Related Rumination Inventory. *Anxiety, Stress, & Coping, 24*, 137–156.

Choi, S., & In, H. (2020). Paths from core belief disruption to post-traumatic stress symptoms and post-traumatic growth among Korean undergraduates: the mediating role of rumination. *International Journal of Psychology, 55*(2), 215–223.

Chopko, B., & Schwartz, R. (2009). The relation between mindfulness and posttraumatic growth: a study of first responders to trauma-inducing incidents. *Journal of Mental Health Counseling, 31*(4), 363–376.

Cloitre, M., Garvert, D. W., Weiss, B., Carlson, E. B., & Bryant, R. A. (2014). Distinguishing PTSD, complex PTSD, and borderline personality disorder: a latent class analysis. *European Journal of Psychotraumatology, 5*(1), 25097.

Clous, E., Beerthuizen, K., Ponsen, K. J., Luitse, J., Olff, M., & Goslings, C. (2017). Trauma and psychiatric disorders: a systematic review. *Journal of Trauma and Acute Care Surgery, 82*(4), 794–801.

Çorapçıoğlu, A., Yargıç, İ., Geyran, P., & Kocabaşoğlu, N. (2006). Validity and reliability of Turkish version of Impact of Event Scale-Revised (IES-R). *Yeni Symposium: A Journal of Psychiatry, Neurology, and Behaviroral Sciences, 44*(1), 14–22.

Creswell, J. D., Way, B. M., Eisenberger, N. I., & Lieberman, M. D. (2007). Neural correlates of dispositional mindfulness during affect labeling. *Psychosomatic Medicine, 69*(6), 560–565.

Dürü, Ç. (2006). *Exploring posttraumatic stress symptoms and posttraumatic growth with respect to some variables and proposing a model* (unpublished doctoral dissertation). Ankara: Hacettepe University.

Ehlers, A., & Clark, D. M. (2000). A cognitive model of posttraumatic stress disorder. *Behaviour Research and Therapy, 38*(4), 319–345.

Foa, E. B., Cashman, L., Jaycox, L., & Perry, K. (1997). The validation of a self-report measure of posttraumatic stress disorder: The Posttraumatic Diagnostic Scale. *Psychological Assessment, 9*(4), 445–451.

García, F. E., Cova, F., Rincón, P., & Vázquez, C. (2015). Trauma or growth after a natural disaster? The mediating role of rumination processes. *European Journal of Psychotraumatology, 6*. https://doi.org/10.3402/ejpt.v6.26557.

García, F. E., Duque, A., & Cova, F. (2017). The four faces of rumination to stressful events: a psychometric analysis. *Psychological Trauma: Theory, Research, Practice, and Policy, 9*(6), 758–765.

Garland, E. L., Farb, N. A., Goldin, R., & Fredrickson, B. L. (2015). Mindfulness broadens awareness and builds eudaimonic meaning: a process model of mindful positive emotion regulation. *Psychological Inquiry, 26*(4), 293–314.

Hallam, W., & Morris, R. (2014). Post-traumatic growth in stroke carers: a comparison of theories. *British Journal of Health Psychology, 19*(3), 619–635.

Hanley, A. W., Peterson, G. W., Canto, A. I., & Garland, E. L. (2015). The relationship between mindfulness and posttraumatic growth with respect to contemplative practice engagement. *Mindfulness, 6*(3), 654–662.

Hanley, A. W., Garland, E. L., & Tedeschi, R. G. (2017). Relating dispositional mindfulness, contemplative practice, and positive reappraisal with posttraumatic cognitive coping, stress, and growth. *Psychological Trauma: Theory, Research, Practice, and Policy, 9*(5), 526–536.

Haselden, M. (2014). *Exploring various variables as predictors of posttraumatic growth on university students in Turkish and American cultures: a model proposal* (unpublished doctoral dissertation). Hacettepe University, Ankara.

Hayes, A. F. (2015). An index and test of linear moderated mediation. *Multivariate Behavioral Research, 50*(1), 1–22.

Hayes, A. F. (2018). *İntroduction to mediation, moderation, and conditional process anaylsis: a regression- based approach* (2nd ed.). New York: Guilford Press.

Herman, J. L. (2015). *Trauma and recovery: the aftermath of violence–from domestic abuse to political terror*. London: Hachette UK.

Horowitz, M., Wilner, N., & Alvarez, W. (1979). Impact of event scale: a measure of subjective stress. *Psychosomatic Medicine, 41*(3), 209–218.

Im, S., & Follette, V. M. (2016). Rumination and mindfulness related to multiple types of trauma exposure. *Translational Issues in Psychological Science, 2*(4), 395–407.

Işıklı, S. (2006). *Relations between attentional bias regarding the incident, peritraumatic dissociation and working memory span in Individuals with posttraumatic stress symptoms* (unpublished doctoral dissertation). Ankara: Hacettepe University.

Janoff-Bulman, R. (2004). Posttraumatic growth: three explanatory models. *Psychological Inquiry, 15*(1), 30–34.

Jazaieri, H., McGonigal, K., Jinpa, T., Doty, J. R., Gross, J. J., & Goldin, P. R. (2014). A randomized controlled trial of compassion cultivation training: effects on mindfulness, affect, and emotion regulation. *Motivation and Emotion, 38*(1), 23–35.

Kabat-Zinn, J. (1991). *Full catastrophe living: using the wisdom of your body and mind to stress, pain and illness*. New York: Delacorte Press.

Martin, C. E., Bartlett, B. A., Reddy, M. K., Gonzalez, A., & Vujanovic, A. A. (2018). Associations between mindfulness facets and PTSD symptom severity in psychiatric inpatients. *Mindfulness, 9*(5), 1571–1583.

Morgan, J. K., & Desmarais, S. L. (2017). Associations between time since event and posttraumatic growth among military veterans. *Military Psychology, 29*(5), 456–463.

Nitzan-Assayag, Y., Aderka, I. M., & Bernstein, A. (2015). Dispositional mindfulness in trauma recovery: prospective relations and mediating mechanisms. *Journal of Anxiety Disorders, 36*, 25–32.

Norris, F. H., Friedman, M. J., Watson, P. J., Byrne, C. M., Diaz, E., & Kaniasty, K. (2002). 60,000 disaster victims speak: Part I. An empirical review of the empirical literature, 1981–2001. *Psychiatry: Interpersonal and Biological Processes, 65*(3), 207–239.

Ogińska-Bulik, N., & Juczyński, Z. (2016). Ruminations as predictors of negative and positive effects of experienced traumatic events in medical rescue workers. *Medycyna Pracy, 67*(2), 201–211.

Petrakis, I. L., Rosenheck, R., & Desai, R. (2011). Substance use comorbidity among veterans with posttraumatic stress disorder and other psychiatric illness. *The American Journal on Addictions, 20*(3), 185–189.

Şahin, N. H., & Yeniçeri, Z. (2015). Three assessment scales on awareness: Psychological Mindedness, Integrative Self Knowledge and Toronto Trait Mindfulness Scales. *Turkish Journal of Psychology, 30*(76), 48–64.

Sauer, S., Lemke, J., Wittmann, M., Kohls, N., Mochty, U., & Walach, H. (2012). How long is now for mindfulness meditators? *Personality and Individual Differences, 52*(6), 750–754.

Shuwiekh, H., Kira, I. A., & Ashby, J. S. (2018). What are the personality and trauma dynamics that contribute to posttraumatic growth? *International Journal of Stress Management, 25*(2), 181–194.

Soo, H., & Sherman, K. A. (2015). Rumination, psychological distress and post-traumatic growth in women diagnosed with breast cancer. *Psycho-Oncology, 24*(1), 70–79.

Taku, K., Cann, A., Tedeschi, R. G., & Calhoun, L. G. (2015). Core beliefs shaken by an earthquake correlate with posttraumatic growth. *Psychological Trauma: Theory, Research, Practice, and Policy, 7*(6), 563–569.

Tedeschi, R. G., & Blevins, C. L. (2015). From mindfulness to meaning: implications for the theory of posttraumatic growth. *Psychological Inquiry, 26*(4), 373–376.

Tedeschi, R. G., & Calhoun, L. G. (1996). The posttraumatic growth inventory: measuring the positive legacy of trauma. *Journal of Traumatic Stress, 9*(3), 455–471.

Tedeschi, R. G., & Calhoun, L. G. (2004). Posttraumatic growth: conceptual foundations and empirical evidence. *Psychological Inquiry, 15*(1), 1–18.

Thompson, B. L., & Waltz, J. (2010). Mindfulness and experiential avoidance as predictors of posttraumatic stress disorder avoidance symptom severity. *Journal of Anxiety Disorders, 24*(4), 409–415.

Vago, D. R., & Silbersweig, D. A. (2012). Self-awareness, self-regulation, and selftranscendence (S-ART): a framework for understanding the neurobiological mechanisms of mindfulness. *Frontiers in Human Neuroscience, 6*, 296. https://doi.org/10.3389/fnhum.2012.00296.

Valdez, C. E., & Lilly, M. M. (2017). Posttraumatic rumination: content, correlates, and processes. *Journal of Clinical Psychology, 73*(6), 707–721.

Van der Kolk, B. A. (2014). *The body keeps the score: brain, mind, and body in the healing of trauma*. New York: Penguin Books.

Vujanovic, A. A., Niles, B. L., & Abrams, J. L. (2016). Mindfulness and meditation in the conceptualization and treatment of posttraumatic stress disorder. In E. Shonin, W. Van Gordon, & M. D. Griffiths (Eds.), *Mindfulness and Buddhist-derived approaches in mental health and addiction* (pp. 225–245). Cham: Springer.

Walser, R. D., & Hayes, S. C. (2006). Acceptance and commitment therapy in the treatment of posttraumatic stress disorder: theoretical and applied issues. In V. M. Follette & J. I. Ruzek (Eds.), *Cognitive-behavioral therapies for trauma* (pp. 146–172). New York: Guildfor Press.

Weiss, D. S., & Marmar, C. R. (1997). *The impact of event scale—revised, assessing psychological trauma and PTSD*. New York: Guilford Press.

Xu, W., Ding, X., Goh, P. H., & An, Y. (2018). Dispositional mindfulness moderates the relationship between depression and posttraumatic growth in Chinese adolescents following a tornado. *Personality and Individual Differences, 127*, 15–21.

Zhang, J. Y., Zhou, Y. Q., Feng, Z. W., Fan, Y. N., Zeng, G. C., & Wei, L. (2017). Randomized controlled trial of mindfulness-based stress reduction (MBSR) on posttraumatic growth of Chinese breast cancer survivors. *Psychology, Health & Medicine, 22*(1), 94–109.

Zhou, X., Wu, X., Fu, F., & An, Y. (2015). Core belief challenge and rumination as predictors of PTSD and PTG among adolescent survivors of the Wenchuan earthquake. *Psychological Trauma: Theory, Research, Practice, and Policy, 7*(4), 391–397.

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