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Experiential acceptance and trait-mindfulness as predictors of analogue post-traumatic stress

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Objectives. Experiential acceptance and trait-mindfulness are associated with post-traumatic stress disorder (PTSD) after traumatic events. This study was a preliminary attempt to examine (1) associations of experiential acceptance and trait-mindfulness with post-traumatic stress (PTS) associated with negative, but not necessarily traumatizing, life events ('analogue' PTS), (2) the role of these variables in the context of neuroticism as well as worry and rumination – two other regulatory strategies associated with PTS, and (3) the impact of pre-trauma tendencies towards experiential acceptance and mindfulness on analogue PTS.

Design. Data were obtained from two distinct student samples. A first sample provided cross-sectional data. In a second sample, indices of acceptance, mindfulness, neuroticism, worry, and rumination were tapped at inclusion into the study, and analogue PTS and confrontation with stressful life events were subsequently assessed 1 year later.

Results. In the cross-sectional sample, higher acceptance and mindfulness were associated with lower analogue PTS, even when controlling for neuroticism, worry, and rumination. In the prospective sample, pre-trauma mindfulness (but not experiential acceptance, neuroticism, worry, and rumination) assessed at baseline predicted levels of analogue PTS 1 year later.

Conclusions. Findings suggest that experiential acceptance and trait-mindfulness are incrementally related to PTS beyond neuroticism, worry, and rumination and that pre-trauma trait-mindfulness may be a resilience factor protecting against severe PTS.

Practitioner points

- We examined associations of experiential acceptance and trait-mindfulness with post-traumatic stress (PTS) associated with negative life events ('analogue' PTS).
- Experiential acceptance and trait-mindfulness were associated with concurrent analogue PTS, over and above neuroticism, worry, and rumination.
- Pre-trauma trait-mindfulness (but not pre-trauma experiential acceptance) significantly predicted analogue PTS in prospective analyses.
- Enhancing mindfulness skills could be a useful tool to reduce the risk of PTS in trauma-exposed samples.

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Symptoms of post-traumatic stress disorder (PTSD) affect a significant minority of individuals exposed to traumatic events (APA, 2000, 2013; Kilpatrick *et al.*, 2013). Both diagnosable (full blown) and subclinical PTSD are associated with a host of negative outcomes (Brancu *et al.*, 2016; Pietrzak, Goldstein, Malley, Johnson, & Southwick, 2009). Although effective treatments for post-traumatic stress (PTS) exist, there is a continued need to refine treatment options (Cukor, Difede, Rothbaum, & Rizzo, 2009). There is growing interest in mindfulness-based and acceptance-based approaches to the treatment of PTSD. The rationale for the application of these approaches is that experientially avoiding and disengaging from psychological reactions to traumatic events may exacerbate intrusive images, avoidance, numbing, and other symptoms of PTSD, whereas experientially accepting and mindfully paying attention to these phenomena reduces the chance that these symptoms exacerbate and become chronic (Thompson, Arnkoff, & Glass, 2011; Vujanovic, Niles, & Abrams, 2016). Specifically, experiential acceptance and trait-mindfulness are assumed to promote resilient outcomes by maintaining engagement with distressing emotions, and, thereby, blocking avoidant tendencies and the formation of negative cognitions (Smith *et al.*, 2011).

There is evidence that healthy engagement with trauma-related thoughts, emotions, and memories, including experiential acceptance as defined within Acceptance and Commitment Therapy (ACT; Hayes, Wilson, Gifford, Follette, & Strohsahl, 1996) and trait-mindfulness, defined as the willingness to attend to present events and experiences, are indeed related to lower PTS. For instance, several studies with non-clinical samples have shown elevated experiential acceptance – assessed with the Acceptance and Action Questionnaire (AAQ; Hayes *et al.*, 2004) – to be associated with lower PTS, both concurrently (Thompson *et al.*, 2011) and prospectively (Marx & Sloan, 2005). In addition, Smith *et al.* (2011) found higher trait-mindfulness – assessed with the Mindful Attention Awareness Scale (MAAS; Brown & Ryan, 2003) – to be related with lower PTS severity in urban firefighters. Two other studies found higher mindfulness assessed with the Kentucky Inventory of Mindfulness Skills (Baer, Smith, & Allen, 2004) to be associated with lower PTS in veterans in treatment for PTSD (Owens, Walter, Chard, & Davis, 2012) and trauma-exposed community members (Vujanovic, Youngwirth, Johnson, & Zvolensky, 2009). Thompson and Waltz (2010) found higher mindfulness, tapped using the Five Facet Mindfulness Questionnaire (Baer, Smith, Hopkins, Krietemeyer, & Toney, 2006) to be associated with lower PTS in a student sample.

Although this research suggests that experiential acceptance and trait-mindfulness affect responses to trauma, there are several unexplored issues. First, it is important to enhance knowledge about the importance of experiential acceptance and trait-mindfulness in contributing to PTS symptoms, given that these are similar yet not fully overlapping constructs. Mindfulness refers to the ability to focus on the present moment, to attend to bodily sensations, and present experiences, while letting go of distracting thoughts entering awareness (Bishop *et al.*, 2004). Experiential acceptance (as defined in ACT and the AAQ) also refers to the ability to be fully present with one's experiences, but also encompasses more deliberate cognitive ('When I evaluate something negatively, I usually recognize that this is just a reaction, not an objective fact') and behavioural ('I am able to take action on a problem even if I am uncertain what is the right thing to do') aspects of self-regulation (Hayes *et al.*, 1996, 2004). A second unexplored issue is the importance of experiential acceptance and trait-mindfulness in the context of neuroticism, worry, and rumination. Neuroticism refers to the predisposition to experience negative emotions and is associated with an

increased liability for internalizing disorders (Kendler & Prescott, 2006). There is evidence from prospective studies that it is a critical risk factor for PTS following traumatic events (Breslau & Schultz, 2013). Worry and rumination are regulatory strategies which have been found to be associated with PTS in prior research (Ehring, Frank, & Ehlers, 2008; Spinhoven, Penninx, Krempeniou, van Hemert, & Elzinga, 2015), with worry referring to maladaptive repetitive thinking about uncertain future situations and rumination referring to repetitive thinking about past traumatic events and their consequences. It is relevant to examine associations of experiential acceptance and trait-mindfulness with PTS while taking into account neuroticism, worry, and rumination because these phenomena are all involved in the regulation of emotions – with experiential acceptance and trait-mindfulness referring to acceptance of emotionally arousing material, and neuroticism, worry, and rumination being associated with attempts to control such material (cf. Giorgio *et al.*, 2010). Examining these variables together furthers our knowledge about key processes involved in PTS. Thirdly, it is still unclear whether tendencies towards experiential acceptance and mindfulness as present *before* traumatic events affect the severity of PTS *after* such events (Thompson *et al.*, 2011).

The current study was a preliminary attempt to explore these issues. We collected data from two non-overlapping student samples. The first (cross-sectional) sample was invited to complete measures tapping experiential acceptance and trait-mindfulness, together with measures of neuroticism, worry, and rumination, and PTS associated with the most distressing event experienced during the preceding year. The second (prospective) sample completed measures of experiential acceptance, trait-mindfulness, neuroticism, worry, and rumination at inclusion into the study (at Time 1); 1 year later (at Time 2), they were instructed to complete a measure of PTS associated with the most distressing event during the interval year. We collected data from students, most of whom were expected not to be confronted with traumatic events as defined in formal PTSD criteria (APA, 2000, 2013). Therefore, we felt that the PTS symptoms assessed were best referred to as symptoms of 'analogue PTS'. Aims of this study were to (1) examine the strengths of the associations of experiential acceptance and trait-mindfulness with analogue PTS symptoms, (2) to examine these associations while taking into account neuroticism, worry, and rumination, and (3) to examine the prospective linkage of experiential acceptance and trait-mindfulness assessed at baseline (Time 1) with analogue PTS 1 year later (Time 2) associated with a stressful life event experienced after baseline (between Time 1 and Time 2), while taking into account neuroticism, worry, and rumination (tapped at Time 1). We were mainly interested in overall analogue PTS, that is, the summed score of different PTS items; however, because research exploring experiential acceptance and trait-mindfulness in PTS is so limited, relationships of experiential acceptance and trait-mindfulness with specific clusters of analogue PTS symptoms were also examined in an exploratory manner (following other researchers, e.g., Thompson & Waltz, 2010). The reason for including both cross-sectional and prospective analyses was that we wished to examine to what extent prior findings of concurrent associations of trait-mindfulness and experiential acceptance and PTS generalized across different samples, and to what extent trait-mindfulness and experiential acceptance were pre-trauma vulnerability factors for PTS. We hypothesized that increased acceptance and mindfulness would predict lower analogue PTS, beyond neuroticism, worry, and rumination, both cross-sectionally and prospectively.

Method

Participants and procedure

Data were available from students from Utrecht University participating in an internet-based survey study addressing cognitive behavioural variables in depression and anxiety symptoms. The survey study included a Time 1 (T1) measurement and a Time 2 (T2) measurement, 1 year after T1. Participants were recruited via posters and announcements on the university Internet website. At T1, participants participated in return for course credits. At T2, participants received €5 financial compensation. All participants provided informed consent. Over 900 students were enrolled into the study between 2008 and 2014. Measures of stressful life events and associated PTS were added to the T1 and T2 measures, when the study was already running for over a year.

For this study, we selected two samples. The first was a *cross-sectional sample* including participants with complete data at T1, who were unavailable for completion of questionnaires at T2. The second was a *prospective sample* including participants with complete data both at T1 *and* T2. Participants included in the 'prospective sample' were not included in the 'cross-sectional sample'. Consequently, the samples were distinct, non-overlapping samples. Participants who reported that they had experienced no stressful life event during the preceding year on the Life Events Scale (described below) were not included in the analyses. This study's cross-sectional sample included 314 students with a mean age of $M = 21.8$ ($SD = 2.7$) years ($n = 275$ [87.6%] women). This study's prospective sample included 205 students with a mean age of $M = 21.3$ ($SD = 2.0$) years, including 185 (90.2%) women.

Measures

Acceptance and Action Questionnaire-9 (AAQ-9)

The AAQ-9 (Hayes *et al.*, 2004) is a 9-item questionnaire that measures the tendency to avoid or accept negative psychological experiences (e.g., 'When I feel depressed or anxious, I am unable to take care of my responsibilities'). Items are scored on 7-point scales (1 = *never true*, to 7 = *always true*) and summed (after reversing some of the item-scores) such that higher scores represent stronger 'experiential acceptance'. The original English (Hayes *et al.*, 2004) and Dutch versions (Boelen & Reijntjes, 2008) have good psychometric properties, including strong temporal stability and concurrent validity. The internal consistencies (α's) in the cross-sectional and prospective sample were .67 and .60, respectively.

Mindful Attention Awareness Scale (MAAS)

The MAAS (Brown & Ryan, 2003) is a 15-item questionnaire tapping a person's awareness and attention to present events and experiences (e.g., 'I find it difficult to stay focused on what is happening in the present'; reverse scored). Items are scored on 6-point scales (1 = *almost always*, to 6 = *almost never*) and summed such that higher scores indicate greater trait-mindfulness. The original (English) MAAS has sound psychometric properties, including strong construct and predictive validity (Brown & Ryan, 2003). Likewise, the Dutch version has been found to have strong internal consistency and construct validity (Schroevers, Nyklicek, & Topman, 2008). Internal consistencies (α's) were .89 and .88 in the cross-sectional and prospective sample, respectively.

Penn State Worry Questionnaire-Abbreviated (PSWQ-A)
The Penn State Worry Questionnaire-Abbreviated (PSWQ-A; Hopko *et al.*, 2003) is a measure of worry, instructing respondents to indicate to what extent eight items (e.g., 'I am always worrying about something') are typical of them on five-point scales (1 = *not at all typical of me*, to 5 = *very typical of me*). Items are summed such that higher scores indicate stronger worry. Research has shown that the measure has high internal consistency, adequate test–retest reliability, and good convergent and divergent validity (Hopko *et al.*, 2003). Internal consistencies in the cross-sectional and prospective sample were .92 and .93, respectively.

Ruminative Response Scale Brooding scale (RRS Brooding)
The Ruminative Response Scale (RRS; Nolen-Hoeksema, Larson, & Grayson, 1999) is a 22-item measure of depressive rumination. In the present study, we used its 'Brooding' scale as an index of rumination. This scale includes five items tapping unconstructive pondering (e.g., 'I think "Why do I always react this way?"') in response to a sad/depressed mood. Items are rated on 4-point scales (1 = *almost never,* to 4 = *almost always*); the summed items reflect stronger brooding. English (Treynor, Gonzalez, & Nolen-Hoeksema, 2003) and Dutch studies (Schoofs, Hermans, & Raes, 2010) have shown that the RRS, including its Brooding scale, has good psychometric properties, including strong internal consistency and convergent and divergent validity. The α's were .75 and .76 in the cross-sectional and prospective sample, respectively.

Neuroticism Scale of the Short-Scale version of the Revised Eysenck Personality Questionnaire (EPQ-R-N)
The EPQ-R-N is a brief measure of neuroticism (Eysenck, Eysenck, & Barrett, 1985). It includes 12 dichotomously (0 = *no*, 1 = *yes*) rated manifestations of neuroticism (e.g., 'Does your mood often go up and down?') summed such that higher scores indicate stronger neuroticism. English (Eysenck *et al.*, 1985) and Dutch versions (Sanderman, Arrindell, Ranchor, Eysenck, & Eysenck, 1995) have good psychometric properties, including strong internal consistency, temporal stability, and associations with related measures. The α's were .76 and .78 in the cross-sectional and prospective samples, respectively.

Life Events Scale
The Life Events Scale, developed by Garnefski and Kraaij (2001), lists different negative life events commonly reported by community members (e.g., divorce, confrontation with violence, traffic accident). Respondents are instructed to rate whether they experienced these events (1) before the age of 16, and/or (2) between the age of 16 and 1 year ago, and/or (3) in the previous year, or (4) never. We added events deemed relevant to students including relationship break-up, interpersonal conflict, and academic problems. For some events, participants were instructed to rate whether these had happened to themselves as well as whether these had happened to close relatives; for instance, participants were asked to rate whether they had encountered severe physical health problems themselves and were also asked to rate whether their mother/father and their (possible) brother/sister had encountered such problems. In the cross-sectional sample, participants completed

the Life Events Scale at T1. In the prospective sample, participants completed this measure at T2.

Post-traumatic Symptom Scale Self-Report version (PSS-SR)

Analogue PTS was assessed using the PSS-SR (Foa, Riggs, Dancu, & Rothbaum, 1993), a 17-item measure of PTSD symptoms as defined in DSM-IV (APA, 2000). It instructs respondents to keep in mind a distressing event and to rate how much each of 17 symptoms bothered them in the preceding month, on 4-point scales (0 = *not at all*, to 3 = *five or more times per week/almost always*). Items are summed such that higher scores represent more severe PTS. The PSS-SR provides an index of overall PTS severity and indices of the DSM-IV-based symptom clusters of re-experiencing, avoidance, and hyperarousal. English (Foa *et al.*, 1993) and Dutch (Engelhard, Arntz, & van den Hout, 2007) versions have yielded adequate psychometric properties, including strong internal consistency, predictive, and discriminative validity. In the cross-sectional sample (α = .87), participants completed the PSS-SR keeping in mind the most upsetting event they experienced during the preceding year, reported on the Life Events Scale. In the prospective sample (α = .87), participants completed the PSS-SR at T2 keeping in mind the most distressing event they experienced in the year between T1 and T2, as reported on the Life Events Scale administered at T2.

Statistical analyses

The cross-sectional sample completed measures of experiential acceptance, trait-mindfulness, neuroticism, worry, and rumination, and analogue PTS associated with the most distressing event experienced during the preceding year. The prospective sample completed measures of experiential acceptance, trait-mindfulness, neuroticism, worry, and rumination at T1. At T2, they completed a measure of analogue PTS associated with the most distressing event experienced between T1 and T2. First, descriptive data were examined, focusing on the life events experienced and the intensity of analogue PTS symptoms in both samples. Second, correlations between variables were calculated. Third, hierarchical regression analysis was used to further examine associations of experiential acceptance and trait-mindfulness with analogue PTS. In a first series of regression analyses, with data from the cross-sectional sample, the dependent variable was analogue PTS. Independent variables were entered in three consecutive blocks, including age and gender (Step 1), neuroticism, worry, and rumination (Step 2), and experiential acceptance and mindfulness (Step 3). In the second series of regression analyses using data from the prospective sample, the dependent variable was analogue PTS assessed 1 year after the assessment of the predictor variables. We used the same order of entry of variables as in the cross-sectional sample. As a fourth and final step in our analyses, we repeated the hierarchical regression analyses with symptom clusters of analogue PTS as consecutive dependent variables. Variance inflation factors (1.01–2.84) did not point at problematic collinearity in any of the regression analyses conducted for this study.

Results

Descriptive data

As noted, the cross-sectional and prospective samples were distinct samples; none of the participants were included in both samples. Frequencies of negative life events endorsed

and index events kept in mind while completing the PSS-SR are shown in Table 1. Both in the cross-sectional sample ($N = 314$) and the prospective sample ($N = 205$), the most common events were mental or physical illness of others, relationship break-up, serious interpersonal conflict, and miscellaneous events (e.g., death of family member).

The total score on the PSS-SR in the cross-sectional sample was $M = 9.8$ ($SD = 7.2$); this score was significantly higher than a reference group of students included in a study by Engelhard *et al.* (2007), $M = 9.8$ versus $M = 2.5$, $t(313) = 18.14$, $p < .001$, and lower compared to a clinical sample from that same study, $M = 9.8$ versus $M = 27.0$, $t(313) = -42.40$, $p < .001$. The mean PSS-SR in the prospective sample was $M = 9.6$ ($SD = 7.3$); this score was also higher compared to the score of Engelhard *et al.*'s student sample, $t(204) = 13.88$, $p < .001$, and lower compared to their clinical sample, $t(204) = -33.92$, $p < .001$. The prevalence of probable PTSD was 5.1% in the cross-sectional sample and 5.9% in the prospective sample, using the conservative DSM-IV-based scoring rule that symptom scores were at least 2 (*two to four times a week/half of the time*) for at least one re-experiencing symptom, three avoidance symptoms, and two hyperarousal symptoms (cf. Brewin, Andrews, & Rose, 2000). Importantly, these

Table 1. Frequency of negative life events

	Cross-sectional sample ($N = 314$)		Prospective sample ($N = 205$)	
	Endorsement frequency, N (%)	Index event frequency, N (%)	Endorsement frequency, N (%)	Index event frequency, N (%)
Parental divorce	6 (1.9)	3 (1.0)	2 (1.0)	2 (1.0)
Relationship break-up	63 (20.1)	48 (15.3)	43 (21.0)	24 (11.7)
Physical illness of others	61 (19.4)	35 (11.1)	32 (15.6)	26 (12.7)
Physical illness of self	18 (5.7)	10 (3.2)	19 (9.3)	11 (5.4)
Death of close others	20 (6.4)	17 (5.4)	12 (5.9)	8 (3.9)
Mental illness of others	93 (29.6)	55 (17.5)	55 (26.8)	30 (14.6)
Mental illness of self	14 (4.5)	15 (4.8)	12 (5.9)	13 (6.3)
Suicide attempts of close others	21 (6.7)	7 (2.2)	10 (4.9)	5 (2.4)
Suicide attempts of self	0	0	1 (0.5)	0
Witnessing/experiencing interpersonal violence	17 (5.4)	7 (2.2)	4 (2.0)	3 (1.5)
Alcohol/drug abuse among close others	27 (8.6)	11 (3.5)	14 (6.8)	7 (3.4)
Unwanted pregnancy (self)	2 (0.6)	1 (0.3)	0	0
Serious interpersonal conflict	46 (14.6)	27 (8.6)	31 (15.1)	26 (12.7)
Confrontation with crime	13 (4.1)	5 (1.6)	2 (1.0)	0
Witnessing/experiencing traffic accident	7 (2.2)	2 (0.6)	3 (1.5)	3 (1.5)
Sexual abuse	3 (1.0)	1 (0.3)	2 (1.0)	0
Academic problems	18 (5.7)	11 (3.5)	6 (1.9)	8 (3.4)
Miscellaneous	108 (34.4)	59 (18.7)	64 (31.2)	39 (19.0)

Note. Endorsement frequency refers to whether respondents ever encountered the event regardless of their subjective response to the event. Index event frequency refers to the assessment of the respondents of the worst event that they have experienced out of all events encountered.

numbers only provide an indication of PTSD caseness because, as expected, for most participants, the distressing events experienced did not qualify as Criterion A 'trauma' as per DSM-IV (APA, 2000). None of the variables assessed demonstrated unacceptable levels of skewness or kurtosis.

Correlations between variables

As shown in Table 2, in the cross-sectional sample, symptom levels of analogue PTS were significantly correlated with concurrently assessed neuroticism, worry, rumination, acceptance, and mindfulness. In the prospective sample, neuroticism, worry, rumination, acceptance, and mindfulness assessed at T1 were significantly associated with analogue PTS at T2 (1 year later). Correlations between acceptance and mindfulness in the cross-sectional and prospective samples were $r = .32$ and $r = .31$, respectively, confirming that they are related, yet not fully overlapping constructs. Correlations were significant, even at a conservative Bonferroni-corrected p-level of $(.05/30 =) < .002$.

Regression analyses with concurrent analogue PTS as dependent variable

Results of the hierarchical regression with concurrent analogue PTS as dependent variable are summarized in Table 3. In Step 1, age and gender did not explain a significant amount of variance in analogue PTS. In Step 2, neuroticism, worry, and rumination added 25.6% to the explained variance. In Step 3, experiential acceptance and trait-mindfulness added a further 4.6% to the explained variance in concurrently assessed analogue PTS. The final model was significant, $F(7, 311) = 19.85, p < .001$, and explained 31.4% of the variance in analogue PTS. Neuroticism, experiential acceptance, and trait-mindfulness explained a unique proportion of variance.

Table 2. Correlations between measures in cross-sectional and prospective samples

Measures	M	SD	1	2	3	4	5	6
			Cross-sectional sample (N = 314)					
1. PSS-SR	9.8	7.2	–	.50	.42	.37	−.44	−.39
2. EPQ-R-N	5.2	2.9		–	.75	.56	−.66	−.40
3. PSWQ-A	23.2	7.4			–	.48	−.61	−.35
4. RRS Brooding	9.4	3.1				–	−.55	−.35
5. AAQ-9	40.5	6.2					–	.32
6. MAAS	61.3	11.7						–
			Prospective sample (N = 205)					
1. PSS-SR	9.6	7.3	–	.32	.28	.26	−.26	−.24
2. EPQ-R-N	5.8	3.0		–	.75	.57	−.58	−.31
3. PSWQ-A	24.4	7.4			–	.52	−.54	−.26
4. RRS Brooding	9.6	3.1				–	−.47	−.32
5. AAQ-9	39.8	5.6					–	.31
6. MAAS	60.2	11.5						–

Notes. Correlations were significant at a Bonferroni-corrected p-level of $(.05/30 =) < .002$.
AAQ-9 = Acceptance and Action Questionnaire-9; EPQ-R-N = Neuroticism Scale of the Short-Scale version of the Revised Eysenck Personality Questionnaire; MAAS = Mindful Attention Awareness Scale; PSS-SR = Post-traumatic Symptom Scale Self-Report version; PSWQ-A = Penn State Worry Questionnaire-Abbreviated; RRS = Ruminative Response Scale.

Table 3. Summary of hierarchical regression analysis predicting post-traumatic stress at T1

	B	SE B	β
Step 1			
Gender (0 = man, 1 = woman)	2.36	1.24	.11
Age	0.08	0.16	.03
Step 2			
Gender (0 = man, 1 = woman)	0.24	1.10	.01
Age	0.24	0.14	.09
Neuroticism (T1)	0.87	0.19	.36***
Worry (T1)	0.10	0.07	.10
Rumination (T1)	0.29	0.14	.13*
Step 3			
Gender (0 = man, 1 = woman)	−0.05	1.07	<−.01
Age	0.20	0.14	.07
Neuroticism (T1)	0.63	0.20	.26**
Worry (T1)	0.05	0.07	.05
Rumination (T1)	0.12	0.14	.05
Acceptance (T1)	−0.18	0.08	−.16*
Mindfulness (T1)	−0.12	0.03	−.20***

Notes. R^2 = .012 for Step 1; ΔR^2 = .256 for Step 2 ($p < .001$); ΔR^2 = .046 for Step 3 ($p < .001$).
*$p < .05$; **$p < .01$; ***$p < .001$.

Regression analyses with analogue PTS after 1 year as dependent variable

Results of the hierarchical regression predicting analogue PTS 1 year after T1 are summarized in Table 4. In Step 1, age and gender explained 6.8% of the variance in analogue PTS severity at T2. In Step 2, neuroticism, worry, and rumination added 9.6% to the explained variance. In Step 3, experiential acceptance and trait-mindfulness added 2.2% to the explained variance in analogue PTS. The final model was significant, $F(7, 204) = 6.41$, $p < .001$, predicting 18.6% of the variance in analogue PTS at T2; gender, age, and trait-mindfulness tapped at T1 were the only variables explaining a unique proportion of the variance in analogue PTS at T2.

Regression analyses with symptom clusters of analogue PTS

In our final rounds of analyses, we repeated the analyses with symptom clusters of analogue PTS as consecutive dependent variables. In the cross-sectional sample, significant models emerged when all seven independent variables were entered to the regression models predicting concurrent levels of re-experiencing, $F(7, 311) = 7.77$, $p < .001$, $R^2 = 15.2\%$; avoidance, $F(7, 311) = 13.0$, $p < .001$, $R^2 = 23.0\%$; and hyperarousal, $F(7, 311) = 21.84$, $p < .001$, $R^2 = 33.5\%$. Neuroticism was the only variable explaining unique variance in re-experiencing, $\beta = .23$, $p < .05$. Mindfulness, $\beta = −.18$, $p < .01$, and neuroticism, $\beta = .21$, $p < .05$, explained unique variance in avoidance. Age, $\beta = .11$, $p < .05$, acceptance, $\beta = −.16$, $p < .05$, mindfulness, $\beta = −.25$, $p < .001$, plus neuroticism, $\beta = .22$, $p < .01$, explained unique variance in hyperarousal.

Similar analyses were run in the prospective sample. Significant models emerged when all seven independent variables were entered to the regression models predicting re-experiencing, $F(7, 204) = 4.09$, $p < .001$, $R^2 = 35.6\%$; avoidance, $F(7, 204) = 4.15$,

Table 4. Summary of hierarchical regression analysis predicting post-traumatic stress at T2

	B	SE B	β
Step 1			
Gender (0 = man, 1 = woman)	5.66	1.68	.23**
Age	0.52	0.25	.14*
Step 2			
Gender (0 = man, 1 = woman)	4.25	1.67	.17*
Age	0.57	0.24	.16*
Neuroticism (T1)	0.53	0.25	.22*
Worry (T1)	0.01	0.10	.01
Rumination (T1)	0.29	0.19	.12
Step 3			
Gender (0 = man, 1 = woman)	4.71	1.67	.19**
Age	0.51	0.24	.14*
Neuroticism (T1)	0.44	0.26	.18
Worry (T1)	−0.01	0.10	−.01
Rumination (T1)	0.19	0.20	.08
Acceptance (T1)	−0.06	0.11	−.05
Mindfulness (T1)	−0.10	0.05	−.15*

Notes. R^2 = .068 for Step 1 ($p < .01$); ΔR^2 = .096 for Step 2 ($p < .001$); ΔR^2 = .022 for Step 3 ($p = .07$). *$p < .05$; **$p < .01$; ***$p < .001$.

$p < .001$, R^2 = 35.8%; and hyperarousal, $F(7, 204)$ = 7.21, $p < .001$, R^2 = 45.2%, at T2. Gender, β = .16, $p < .05$, and – at a trend level – age, β = .13, p = .06, and mindfulness, β = −.12, p = .09, predicted unique variance in re-experiencing symptoms. Gender, β = .14, $p < .05$, and age, β = .14, $p < .05$, predicted unique variance in avoidance. Gender, β = .21, $p < .01$, mindfulness, β = −.16, $p < .05$, plus neuroticism, β = .29, $p < .01$, predicted unique variance in hyperarousal.

Discussion

This study investigated (1) the importance of experiential acceptance and trait-mindfulness in affecting analogue PTS after a stressful life event, (2) the degree to which these constructs explained variance in analogue PTS beyond neuroticism, worry, and rumination, and (3) the linkage of pre-trauma levels of experiential acceptance and trait-mindfulness with analogue PTS associated with life events occurring *after* the assessment of experiential acceptance and trait-mindfulness. Data were available from two non-overlapping student samples, one providing cross-sectional data and a second providing prospective data.

Zero-order correlations showed that neuroticism, worry, rumination, acceptance, and mindfulness were significantly associated with analogue PTS assessed concurrently and assessed 1 year later. These findings accord with prior evidence (e.g., Breslau & Schultz, 2013; Ehring *et al.*, 2008; Spinhoven *et al.*, 2015). Correlations between acceptance and mindfulness were moderate indicating that these are related but largely non-overlapping concepts (Thompson *et al.*, 2011).

In the cross-sectional sample, regression analyses showed that both experiential acceptance and trait-mindfulness explained a unique proportion of variance in levels of

analogue PTS, even when taking into account neuroticism, worry, and rumination. These findings accord with prior evidence that acceptance and mindfulness affect PTS (e.g., Smith *et al.*, 2011; Vujanovic *et al.*, 2009). Our findings extend prior research by showing that experiential acceptance and trait-mindfulness explain variance in levels of analogue PTS beyond the general disposition to experience negative thoughts and feelings (i.e., neuroticism) as well as worry and rumination – two regulatory strategies associated with PTS (Ehring *et al.*, 2008) that, different from acceptance and mindfulness, are both strategies to control emotionally arousing material. In the prospective sample, regression analyses showed that trait-mindfulness, but not experiential acceptance, was associated with analogue PTS 1 year after baseline, when taking into account neuroticism, worry, and rumination. These findings suggest that a greater awareness of, and openness to, current emotional experiences (implicated in elevated trait-mindfulness) play a more significant role in alleviating distress following negative life events than refraining from cognitive and behavioural control attempts (implicated in elevated experiential avoidance). Trait-mindfulness possibly has its protective effects by increasing the ability to tolerate distressing thoughts and memories, thereby fostering the integration of these thoughts and memories with existing autobiographical knowledge (Thompson *et al.*, 2011).

A further finding was that both the cross-sectional and prospective analyses pointed in the direction of trait-mindfulness (and, to a lesser extent, experiential acceptance) being more strongly associated with the analogue PTS symptom cluster of hyperarousal than with re-experiencing and avoidance symptoms. It has been postulated that hyperarousal is central to PTS – serving to initiate attentional bias to threat, intrusive memories, and avoidance behaviours (Conoscenti, Vine, Papa, & Litz, 2009). Our findings of particular strong associations of experiential acceptance and trait-mindfulness with hyperarousal attest to the importance of these resilience factors in recovery from stressful events. That said, given that hyperarousal may also reflect general distress more than distress specifically linked with the negative life event, findings could also reflect an association between elevated mindfulness and lower levels of such distress.

There are several limitations to this study. First and foremost, data were obtained from students, most of whom were exposed to relatively mild stressful life events. Therefore, we felt it was appropriate to refer to the PTS symptoms associated with these event as 'analogue PTS'. Participants mostly reported low-to-moderate levels of PTS. Accordingly, conclusions about the associations of trait-mindfulness and other variables that we assessed with PTS should remain tentative pending replication of the current study in samples confronted with more severe stressful events and more severe psychopathology. That said, the restriction of range in symptom severity may well have resulted in an underestimation of the correlations between the variables assessed and therefore not necessarily invalidates the current findings. Second, the design of the study precluded controlling for baseline PTS in the prospective sample; although we did control for baseline neuroticism, it would be interesting for future studies to control for baseline levels of distress. Third, all data were gathered using self-report measures. This may have inflated correlations between variables. In addition, our reliance on self-report did not allow identifying people with full PTSD because that is preferably done using clinical interviews. Fourth, we used a measure of DSM-IV-based criteria for PTS. Consequently, the results do not necessarily generalize to DSM-5-based criteria for PTS. Fifth, the internal consistency of the AAQ-9 tapping experiential acceptance was low. This problem also emerged during the development of the AAQ-9 (Hayes *et al.*, 2004) and in other studies using the AAQ-9 (Bond *et al.*, 2011). One of the explanations for this low alpha level is the

complex phrasing (e.g., double negative) of some of the items. A revised version of the AAQ (i.e., AAQ-II) has been developed showing better psychometric properties (Bond *et al.*, 2011). Unfortunately, this AAQ-II was not yet available when the current study started. The low reliability of the AAQ limits the generalizability of the current findings and underscores the importance of replication studies, preferably using the AAQ-II to tap experiential avoidance. Sixth, the AAQ and MAAS offer limited operationalizations of experiential acceptance and trait-mindfulness. Future research might use other measures of these constructs to more comprehensively determine associations with (analogue) PTS. Finally, given the paucity of research exploring mindfulness and acceptance following stressful life events, we did not want to reduce statistical power to detect informative effects and, therefore, did not use Bonferonni corrections to control for type I errors in our regression analyses (see also Gelman, Hill, & Yajima, 2012); however, associations of trait-mindfulness and acceptance with PTS were relatively small and, consequently, the theoretical and clinical significance of these associations warrants further scrutiny.

Notwithstanding these considerations, the present study is important in indicating that both experiential avoidance and trait-mindfulness are incrementally related to analogue PTS beyond neuroticism, worry, and rumination and that pre-trauma mindfulness is a resilience factor protecting against PTS. These findings have clinical implications, provided that they are replicated in more severely traumatized samples. For instance, the findings underline the usefulness of including interventions improving mindfulness skills in the treatment of PTS. There is increasing evidence that these interventions are indeed useful (Owens *et al.*, 2012; Vujanovic *et al.*, 2016).

Acknowledgments

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