



## Dampening of positive affect is associated with posttraumatic stress following stressful life events

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### ABSTRACT

**Background:** Treatments for posttraumatic stress (PTS) are effective for many but not all people. There is a continued need to further our understanding of psychological mechanisms involved in the development and maintenance of PTS. Research has examined dysregulation of negative affect (NA) in PTS but relatively little attention has been paid to the role of dysregulation of positive affect (PA) in PTS.

**Objective:** The current study sought to examine the incremental role of PA dysregulation – specifically self-focused and emotion-focused rumination (strategies to upregulate PA) and dampening (a strategy downregulating PA) in explaining variance in PTS, while taking into account neuroticism, plus more often-researched processes of NA regulation (i.e. brooding and reflection) and experiential acceptance and mindfulness – broader regulatory styles involved in PTS.

**Method:** Data were available from 473 students who completed measures about stressful life events experienced, PTS, and measures of PA dysregulation and all other variables of interest.

**Results:** Zero order correlations showed that dampening of PA but not self-focused and emotion-focused regulation of PA were associated with PTS total scores and PTS clusters of re-experiencing, avoidance, and hyperarousal. Multiple regression analyses revealed, among other things, that dampening of PA, neuroticism, brooding, and mindfulness (but not emotion-focused and self-focused rumination about PA, reflection, and experiential acceptance) explained unique proportions of variance in PTS when taking into account the shared variance between these variables.

**Conclusions:** Future research may continue addressing difficulties in regulating PA alongside difficulties regulating NA to improve the understanding of mechanisms maintaining PTS and to examine the usefulness of interventions improving PA regulation in the treatment of PTS.

### La amortiguación del afecto positivo está asociada con estrés postraumático posterior eventos estresantes de la vida.

**Antecedentes:** los tratamientos para el estrés postraumático (EPT) son eficaces para muchas personas, pero no para todas. Existe una necesidad continua de ampliar nuestra comprensión de los mecanismos psicológicos implicados en el desarrollo y mantenimiento de EPT. La investigación ha examinado la desregulación del afecto negativo (AN) en EPT, pero se ha prestado relativamente poca atención al papel de la desregulación del afecto positivo (AP) en EPT.

**Objetivo:** El estudio actual buscó examinar el rol incremental de la desregulación de AP, específicamente la rumiación centrada en uno mismo y en la emoción (estrategias para regular hacia arriba el AP) y la amortiguación (una estrategia que regula a la baja el AP) para explicar la varianza en el EPT, mientras se tiene en cuenta el neuroticismo, además de los procesos de regulación del AN más frecuentemente investigados (es decir, incubación y reflejo) y aceptación experiencial y atención plena, estilos de regulación más amplios involucrados en EPT.

**Método:** Se dispuso de datos de 473 estudiantes que completaron medidas sobre eventos vitales estresantes experimentados, EPT y medidas de desregulación de AP y todas las demás variables de interés.

**Resultados:** Las correlaciones de orden cero mostraron que la amortiguación del AP, pero no la regulación autoenfocada y centrada en la emoción del AP, se asociaron con las puntuaciones totales de EPT y los núcleos EPT de reexperimentación, evitación e hiperreactividad. Los análisis de regresión múltiple revelaron, entre otras cosas, que la amortiguación de AP, el neuroticismo, la incubación y la atención plena (pero no la rumiación centrada en las emociones y en uno mismo sobre el AP, el reflejo y la aceptación de la experiencia) explicaba proporciones únicas de varianza en EPT al tomar en cuenta la varianza compartida entre estas variables.

**Conclusiones:** La investigación futura puede continuar abordando las dificultades en la regulación del AP junto con las dificultades en la regulación del AN para mejorar la

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### 关键词

创伤后应激; 情绪调节; 抑制;  
沉思; 接纳; 正念

### HIGHLIGHTS

- We studied dysregulation of Positive Affect (PA) in posttraumatic stress (PTS).
- Dampening of PA (but not positive rumination about PA) explained variance in PTS.
- Dampening contributed to PTS beyond neuroticism, NA dysregulation, mindfulness, and experiential avoidance.

comprensión de los mecanismos que mantienen el EPT y para examinar la utilidad de las intervenciones que mejoran la regulación del AP en el tratamiento del EPT.

### 积极情感的抑制与创伤性生活事件后的创伤后应激有关

**背景:** 创伤后应激障碍 (PTS) 的治疗对许多人有效, 但并不是所有人。依然需要我们进一步了解PTS发展和维持相关心理机制。研究已经考查了PTS的消极情绪 (NA) 失调, 但很少关注PTS积极情绪 (PA) 失调的作用。

**目的:** 本研究旨在考查PA失调的增强作用, 特别是在解释PTS变异时的以自我为中心和以情绪为中心的反刍 (上调PA的策略) 和抑制 (下调PA的策略), 同时考虑到神经质, 以及更常被研究的NA调节 (即沉思和反思) 和体验式接纳与正念等PTS相关更广泛的调节风格。

**方法:** 数据来自473名学生, 他们完成了所经历的应激性生活事件, PTS和PA失调以及所有其他感兴趣变量的测量。

**结果:** 零阶相关表明, PA的减弱与PTS总得分和PTS再体验, 回避和高唤起症状簇有关, 而PA的自我调节和情绪调节则不相关。多元回归分析显示, 在其他减弱PA的因素中, 当考虑到神经质, 沉思和正念 (但不含PA相关的以自我为中心和以情绪为中心的反刍, 反思和体验式接纳) 之间的共享变异时解释PTS中独特变异的比列。

**结论:** 未来的研究可能会继续致力于解决调节PA和调节NA的困难, 以提高对PTS维持机制的理解, 并考查在PTS治疗中改善PA调节的干预作用。

## 1. Introduction

A significant minority of individuals exposed to traumatic events develops symptoms of posttraumatic stress disorder (PTSD; APA, 2000, 2013; Kilpatrick et al., 2013) – including intrusive images, effortful avoidance of trauma-related cues, and negative alterations in mood and cognitions. Although PTSD is mostly studied and observed after life-threatening events, milder negative life events (other than traumatic events as per DSM-IV (American Psychiatric Association, 2000) and DSM-5 (2013)) can give rise to the same, and similarly intense symptoms of posttraumatic stress (PTS) symptoms as traumatic events (Anders, Frazier, & Frankfurt, 2011; Mol et al., 2005). Both clinical (or full) and subclinical (or partial) PTSD is associated with different negative outcomes, including mental health and psychosocial impairments (Branču et al., 2016; Pietrzak, Goldstein, Southwick, & Grant, 2011).

Treatments for PTS are effective for many but not all people with PTS (Cukor, Spitalnick, Difede, Rizzo, & Rothbaum, 2009). Therefore, there is a continued need to further our understanding of psychological mechanisms underlying the development, persistence, and exacerbation of PTS to inform the refinement of preventative and curative treatments. The current study was concerned with the role of dysregulation positive affect (PA) in PTS. Emotional dysregulation refers to difficulties that people may have in processes used to maintain, increase, or decrease their emotions (Carl, Soskin, Kerns, & Barlow, 2013; Gross, 2015). Research has shown that emotion dysregulation contributes to PTS. For instance, drawing from Gratz and Roemer's (2004) conceptualization, several studies have shown that PTS is associated with lack of awareness, understanding, and acceptance of negative emotions, difficulties controlling behaviours when distressed, inability to use situationally appropriate

emotion regulation strategies, and unwillingness to experience distress when pursuing meaningful activities (Lilly & Lim, 2013; Tull, Barrett, McMillan, & Roemer, 2007).

Relatively much research attention has been paid to the dysregulation of negative affect (NA) in PTS (e.g. Ehring & Quack, 2010). However, there is growing evidence that dysregulation of PA also contributes to PTS. PA dysregulation can take various forms; it may occur in processes associated with the emergence of PA ('antecedent-focused processes' such as decreased engagement in potentially positive activities) and processes associated with the modulation of emotions ('response-focused processes' including non-attendance to, and negative appraisals of positive emotions). Furthermore, PA dysregulation may include both *too little upregulation* and *too much downregulation* of PA and may consider stable, trait-like proclivities as well as temporary, state-based responses (Carl et al., 2013; Dornbach-Bender et al., 2020). Although studies indicated that PTS is not associated with an inability to experience PA per se (Dornbach-Bender et al., 2020), there is gradually growing evidence that the dysregulation of PA does contribute to PTS. For instance, in a study among women exposed to domestic violence, Weiss, Dixon-Gordon, Peasant, and Sullivan (2018) found that higher levels of non-acceptance of positive emotions, difficulties engaging in goal-directed behaviours, and difficulties to control impulsive behaviours when experiencing positive emotions were related to more severe PTS. In a further study, PA dysregulation was found to predict PTS, when controlling NA dysregulation (Weiss, Nelson, Contractor, & Sullivan, 2019). The connection between PA dysregulation and PTS may be bi-directional. For instance, non-acceptance of PA may fuel negative alterations in cognition and mood (and vice versa). Further, reduced awareness of PA and difficulties to pursue meaningful activities when experiencing PA may block engagement

in activities that might promote recovery. In addition, elevated responsiveness to environmental stimuli may cause PA to be perceived as aversive and, consequently, to be blocked (cf. Contractor et al., 2018; Weiss et al., 2018, 2019).

The current study sought to further our understanding of PA dysregulation in PTS. This was deemed relevant, considering the growing acknowledgement in theorizing and research that the dysregulation of positive processes, including memories, thoughts, and feelings plays an important role in PTS and that targeting positive processes may have incremental utility for interventions for PTS (Contractor et al., 2018; Dornbach-Bender et al., 2020). We sought to expand prior work in a number of ways. First, whereas several recent studies examining PA dysregulation and PTS focused on relatively severely traumatized samples, we studied a sample of students exposed to relatively mild adverse events. As such, the current study allowed to examine the degree to which prior evidence that PA dysregulation contributes to PTS generalizes to less severely traumatized samples. Moreover, because exposure to potentially traumatic events is common in young adults and associated with significant distress (e.g. Cusack et al., 2019), it was considered relevant to study variables influencing the consequences of these events in this group.

Secondly, whereas prior studies (cf. Contractor et al., 2018; Weiss et al., 2018, 2019) focused on dimensions of emotion regulations distinguished by Gratz and Roemer (2004), this study focused people's reactions to PA (i.e. 'response styles to PA') as tapped by the Responses to Positive Affect questionnaire (RPA; Feldman, Joormann, & Johnson, 2008). The RPA assesses three types of responses that people may have when experiencing PA. Two of these are responses that can be used to upregulate PA, namely *self-focused positive rumination* (e.g. "Think 'I am achieving everything'"), and *emotion-focused positive rumination* (e.g. "Think about how happy you feel"); the third is a response that downregulates PA, coined *dampening* (e.g. "Remind yourself these feelings won't last"). The RPA is a parallel measure to the Ruminative Response Scale (RRS; Treynor, Gonzalez, & Nolen-Hoeksema, 2003), a frequently used measure tapping into ruminative responses to NA, including brooding (dwelling on one's NA) and reflection (analysing reasons for one's NA), respectively.

As a third addition to prior research, we examined the incremental role of PA dysregulation in PTS, above and beyond brooding and reflection, as well as neuroticism, experiential acceptance, and mindfulness. Brooding maintains depression (Watkins & Roberts, 2020) and has also been found to contribute to PTS after traumatic

events (Wu, Zhang, Liu, Zhou, & Wei, 2015). The role of reflection is unclear. In depression, some studies (e.g. Schoofs, Hermans, & Raes, 2010), but not other studies (e.g. Arditte & Joormann, 2011), found elevated reflection to be associated with lower depression over time. In trauma research, there is preliminary evidence that both brooding *and* reflection predict elevated PTS (García, Duque, & Cova, 2017). Neuroticism, a personality trait referring to a tendency to experience negative thoughts and feelings, is an established correlate of PTS (Breslau & Schultz, 2013; Perrin et al., 2014). Experiential acceptance and mindfulness are both psychological processes affecting attentional deployment and, as such, influence the increase, decrease, or maintenance of emotional responses (Gross, 2001; Quidbach, Mikolajczak, & Gross, 2015). In the face of traumatic events, both strategies may foster the elaboration and mitigation of memories, thoughts, and feelings connected with the event. Indeed, there is increasing evidence that both processes confer recovery from traumatic events (Boelen & Lenferink, 2018; Thompson, Arnkoff, & Glass, 2011).

In sum, this study used data from a large Dutch student sample to examine the incremental role of PA dysregulation – specifically self-focused and emotion-focused rumination (strategies to upregulate PA) and dampening (a strategy downregulating PA) – in explaining variance in PTS while taking into account neuroticism, plus more often-researched processes of NA regulation (i.e. brooding and reflection) and experiential acceptance and mindfulness – broader regulatory styles involved in both PA and NA regulation. We anticipated that PA regulation would explain incremental variance in PTS severity, beyond the variance accounted for by these other variables. We focused on DSM-IV based criteria for PTS (American Psychiatric Association, 2000) and, accordingly, also considered PTS clusters of re-experiencing, avoidance, and hyperarousal. We were unable to examine DSM-5 based PTSD (APA, 2013) because data collection started before DSM-5 came out. Given the scarcity of research in this area, we had no specific hypotheses about which element of PA regulation (i.e., self-focused or emotion-focused positive rumination, or dampening) would be most strongly linked with PTS total and cluster scores.

## 2. Method

### 2.1. 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. Students

participated in return for course credits. After applying for participation, students were referred to a secured website where more information about the study was given, type-written informed consent could be offered, and all questionnaires could be completed. On completion of the questionnaires, course credits were assigned. Apart from the fact that the survey was only accessible for students from Utrecht University and only those who understood Dutch, no inclusion or exclusion criteria were applied. In total, 622 participants started completion of the questionnaires; data from  $n = 32$  students who were over 30 years of age were not used (to increase the homogeneity of the sample), as well as data from  $n = 30$  students who started but not finished completion and  $n = 87$  students who noted that they had not experienced a distressing event during the preceding year. The final sample included 473 students with a mean age of  $M = 21.40$  ( $SD = 1.89$ ) years;  $n = 418$  (88.4) were women. A local institutional review board approved the study.

## 2.2. Measures

### 2.2.1. Life events scale

Participants completed an adjusted version of the Life Events Scale (Garnefski & Kraaij, 2001) to map stressful life events. The Life Events Scale lists negative events commonly reported by community members (e.g. divorce, confrontation with violence, traffic accidents). Participants are instructed to indicate whether they experienced these events (i) before the age of 16, and/or (ii) between the age of 16 and one year ago, and/or (iii) in the previous year, or (iv) never. As in prior studies (Boelen & Lenferink, 2018) we added events considered relevant to students, including relationship break-up, interpersonal conflict, and academic problems. For some events (e.g. experiencing mental or physical health complaints) participants indicated whether these had happened to themselves as well as to close relatives (e.g. parents, siblings). In the current study, we only focused on events that occurred in the year prior to data collection; participants were asked to select the most distressing event from all these events, as anchor event for the measure of PTS.<sup>1</sup>

### 2.2.2. Posttraumatic symptom scale self report version (PSS-SR)

PTS symptoms were assessed using the PSS-SR (Foa, Riggs, Dancu, & Rothbaum, 1993). Participants were instructed to rate the presence of symptoms during the preceding month, on 4-point scales (0 = 'not at all', to 3 = 'five or more times per week/almost always') while keeping in mind the most upsetting event experienced

during the preceding year as reported on the Life Events Scale. The PSS-SR provides an index of overall PTS severity and indices of DSM-IV-based (American Psychiatric Association, 2000) 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. In this study, the  $\alpha$ 's were .79 (re-experiencing), .80 (avoidance), .78 (hyperarousal), and .92 (total scale).

### 2.2.3. Response to positive affect questionnaire (RPA)

The RPA is a 17-item measure developed by Feldman et al. (2008) for the assessment of responses to PA. Participants are instructed to rate what they generally do when they feel happy, excited, or enthused on a 4-point scale ranging from 1 ('almost never') to 4 ('almost always'). It taps into three strategies, self-focused positive rumination (4 items, e.g. "Think 'I am achieving everything'"), emotion-focused positive rumination (5 items, e.g. "Think about how happy you feel"), and 'dampening' (8 items, e.g. "Remind yourself these feelings won't last"). English (Feldman et al., 2008) and Dutch versions (Raes, Daems, Feldman, Johnson, & Van Gucht, 2009) have good psychometric properties. In the Dutch version, one dampening item was not included because of its very low factor-loading. In the current study, Cronbach's alphas were .85, .72, and .75 for the self-focused rumination, emotion-focused rumination, and dampening scales, respectively.

### 2.2.4. Ruminative response scales (RRS) brooding and reflection scales

The RRS is 22-item measure assessing how participants tend to respond when they feel sad or down (Nolen-Hoeksema & Morrow, 1991). Treynor et al. (2003) removed items overlapping with depressive symptoms and identified two 5-item subscales, one tapping into brooding (the tendency to dwell on negative consequences of one's depression; e.g. 'I think 'Why do I always react this way?') and the second measuring reflection (attempts to understand the reasons for one's dysphoric mood, e.g. 'Analyse recent events to try to understand why you are depressed'). Items are rated on 4-point scales (1 = 'almost never', to 4 = 'almost always'). English (Treynor et al., 2003) and Dutch studies (Schoofs et al., 2010) have shown that the brooding and reflection scales have good psychometric properties. In the current study, the  $\alpha$ 's were .59 and .56 for brooding and reflection, respectively.

### 2.2.5. Acceptance and action questionnaire-9 (AAQ-9)

The AAQ-9 (Hayes et al., 2004) is a 9-item measure designed to assess people's tendencies to avoid or accept unwanted thoughts, feelings, and memories, in

accord with the concept of experiential avoidance and acceptance as defined in Acceptance and Commitment Therapy (Hayes, Wilson, Gifford, Follette, & Strosahl, 1996). Items (e.g. ‘When I feel depressed or anxious, I am unable to take care of my responsibilities’) 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’. Psychometric properties of the English (Hayes et al., 2004) and Dutch (Boelen & Reijntjes, 2008) versions are adequate. In the present sample the  $\alpha$  was .72.

### 2.2.6. Mindful attention awareness scale (MAAS)

The MAAS is a 15-item questionnaire, developed by Brown and Ryan (2003) to measure dispositional mindfulness, encompassing receptive attention to and awareness of present experiences. Items (e.g. ‘I find it difficult to stay focused on what is happening in the present’ (reverse scored) are scored on 6-point scales (1 = ‘almost always’, to 6 = ‘almost never’) and summed with higher scores indicating stronger mindfulness. English (Brown & Ryan, 2003) and Dutch (Schroevens, Nyklicek, & Topman, 2008) versions have good psychometric properties. In the present sample the  $\alpha$  was .90.

### 2.2.7. Neuroticism scale of the short-scale version of the revised Eysenck personality questionnaire (EPQ-R-N)

The EPQ-R-N is a 12-item measure of neuroticism (Eysenck, Eysenck, & Barrett, 1985). Items (e.g. ‘Does your mood often go up and down?’) are scored dichotomously, with anchors 0 = ‘no’ and 1 = ‘yes’, and summed such that higher scores indicate stronger neuroticism.

English (Eysenck et al., 1985) and Dutch (Sanderman, Arrindell, Ranchor, Eysenck, & Eysenck, 1995) versions have good psychometric properties. The  $\alpha$  was .80 in the present study.

## 2.3. Statistical analyses

Descriptive statistics were used to map out events participants had been exposed to during the previous year and to describe the level of distress in the sample. Then, zero order correlations between the study variables were calculated. Next, we performed four regression analyses with the total score and sub-scale scores of the PSS-SR consecutively included as dependent variables and emotion-focused and self-focused positive rumination, dampening, neuroticism, brooding, reflection, acceptance, and mindfulness, entered as independent variables.

## 3. Results

Table 1 lists events experienced during the previous year, as reported on the Life Event Scale. Events rated separately for different relatives (e.g. parents and siblings) were collapsed into one category. The second column of Table 1 shows that mental illness of others, relationship break-up, and physical illness of others were endorsed most. Participants could also write down miscellaneous events experienced. Next, participants were asked to select the most distressing event from all events experienced in the prior year. The third column of Table 1 lists events that participants selected as the most distressing events from the prior year; miscellaneous events were selected most. To obtain a more specific view of events experienced, we carefully explored all miscellaneous

**Table 1.** Frequency of negative life events (N = 473).

	Experienced in the past year (N (%))	Most distressing event (N (%))	Most distressing event after categorisation of miscellaneous events (N (%))
Parental divorce	10 (2.1)	7 (1.5)	12 (2.5)
Relationship break-up	73 (15.4)	50 (10.6)	61 (12.9)
Physical illness of others	62 (13.1)	28 (5.9)	58 (12.3)
Physical illness of self	25 (5.3)	14 (3.0)	32(6.8)
Death of close others	19 (4.0)	13 (2.7)	82 (17.3)
Mental illness of others	121 (25.6)	50 (10.6)	65 (13.7)
Mental illness of self	40 (8.5)	24 (5.1)	45 (9.5)
Suicide attempts of close others	29 (6.1)	10 (2.1)	10 (2.1)
Suicide attempts of self	2 (0.4)	-	-
Witnessing/experiencing interpersonal violence	25 (5.3)	8 (1.7)	8 (1.7)
Alcohol/drug abuse among close others	27 (5.7)	3 (0.6)	3 (0.6)
Unwanted pregnancy (self)	1 (0.2)	1 (0.2)	1 (0.2)
Serious interpersonal conflict	59 (12.5)	12 (2.5)	55 (11.6)
Confrontation with crime	14 (3.0)	4 (0.8)	7 (1.5)
Witnessing/experiencing traffic accident	9 (1.9)	1 (0.2)	4 (0.8)
Sexual abuse	9 (1.9)	4 (0.8)	6 (1.3)
Academic problems	18 (3.8)	6 (1.3)	12 (2.5)
Miscellaneous events		238 (50.3)	12 (2.5)

Note. ‘Experienced in the past year’ refers to whether the individual has encountered the event during the year prior to the data collection. ‘Most distressing event’ refers to the participant’s selection of the most distressing event experienced during the previous year. ‘Most distressing event after categorisation of miscellaneous events’ refers to the most distressing events with miscellaneous events divided among the other categories.

events and categorized these with the other events as much as possible. For instance, many miscellaneous events were deaths or mental illness or physical illness of people who were less close than first degree relatives (e.g. death of grandparent or illness of an aunt); these events were categorized as 'death of close other', 'mental illness of others', and 'physical illness of others', respectively. The righter column of Table 1 shows the final list of events following this categorization. Deaths, mental illness of close others, and relationship break-ups were the three distressing events reported most frequently.

The total score on the PSS-SR in the cross-sectional sample was  $M = 10.57$  ( $SD = 8.47$ ). This score was significantly higher than a reference-group of students included in a study by Engelhard et al. (2007);  $M = 10.6$  vs.  $M = 2.5$ ,  $t(471) = 20.71$ ,  $p < .001$ , and lower compared to a clinical sample from that same study;  $M = 10.6$  vs.  $M = 27.0$ ,  $t(471) = -42.13$ ,  $p < .001$ . The prevalence of probable PTSD was 7.8%, 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).

### 3.1. Correlations between variables

Table 2 shows correlations between study variables. We only considered correlations at a Bonferroni corrected  $p$ -level of  $(.05/66 =) p < .001$ . Symptom levels of total PTS and PTS clusters were significantly correlated with all other variables, except with emotion- and self-focused positive rumination. In fact, apart from a strong correlation between each other ( $r = .56$ ), emotion- and self-focused rumination about PA were only weakly associated with the other variables.

### 3.2. Regression analyses

Table 3 summarizes the regression models. The first three columns display Bs, SEs, and  $\beta$ s, respectively, of the eight independent variables when these were entered to the regression models simultaneously. The fourth column shows the  $\Delta R^2$  for each variable when entered as a first step to the equation and thus represents the percentage of variance in the dependent variable explained by this independent variable, when not taking into account the variance explained by the other variables in the equation. The fifth column shows the  $\Delta R^2$  for each variable when entered as a last step to the equation and thus represents the percentage of variance in the dependent variable explained by this independent variable, after controlling for the variance explained by the other variables in the equation.

The model with PTS total as dependent variable was significant ( $F(8, 455) = 24.00$ ,  $p < .001$ ,  $R^2 = .30$ ). All variables except self-focused positive rumination explained variance in PTS total scores, when not considering the other variables. When considering the overlap between independent variables, it was found that stronger dampening, neuroticism, and brooding, and lower mindfulness made unique contributions to the explained variance in PTS total scores. Most unique variance was explained by neuroticism and dampening. The model with PTS re-experiencing as dependent variable was also significant ( $F(8, 455) = 8.21$ ,  $p < .001$ ,  $R^2 = .13$ ). All variables, except emotion-focused and self-focused positive rumination, explained variance in re-experiencing when not considering the other variables; dampening, neuroticism, and brooding explained unique variance when the shared variance between the independent variables was considered. The model with PTS avoidance as dependent variable was also significant ( $F(8, 454) = 17.20$ ,  $p < .001$ ,  $R^2 = .23$ ). All variables, except self-focused

**Table 2.** Zero order correlations ( $N = 473$ ).

Measures	M	SD	1	2	3	4	5	6	7	8	9	10	11
1. PSS-SR total	10.57	8.47											
2. PSS-SR re-experiencing	3.08	2.77	.85***										
3. PSS-SR avoidance	4.09	3.84	.92***	.70***									
4. PSS-SR hyperarousal	3.42	3.03	.85***	.58***	.68***								
5. RPA emotion-focused positive rumination	14.60	2.53	-.10*	.00	-.10*	-.15**							
6. RPA self-focused positive rumination	9.66	2.75	-.07	-.02	-.07	-.09*	.56***						
7. RPA dampening	11.23	3.20	.39***	.27***	.35***	.42***	-.17***	-.13**					
8. EPQ-R-N	5.65	3.12	.49***	.29***	.43***	.55***	-.22***	-.22***	.47***				
9. RRS brooding	11.06	2.68	.33***	.24***	.30***	.34***	.11*	.05	.39***	.43***			
10. RRS reflection	9.72	2.74	.33***	.22***	.30***	.35***	.04	-.02	.47***	.54***	.64***		
11. AAQ-9	39.20	6.77	-.40***	-.26***	-.35***	-.43***	.20***	.19***	-.49***	-.69***	-.32***	-.50***	
12. Mindful Attention	60.06	12.61	-.33***	-.17***	-.31***	-.37***	.20***	.11*	-.33***	-.39***	-.26***	-.33***	.42***

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 = Posttraumatic Symptom Scale Self Report version. RPA = Responses to Positive Affect. RRS = Ruminative Response Scales.

\*  $p < .05$ . \*\*  $p < .01$ . \*\*\*  $p < .001$ .

**Table 3.** Summary of regression analyses predicting posttraumatic stress total and cluster scores.

	<i>B</i>	<i>SE B</i>	$\beta$	$\Delta R^2$ when entered as first step	$\Delta R^2$ when entered as last step
DV = Posttraumatic stress total					
Emotion focused positive rumination	0.037	0.164	.011	.010*	.000
Self-focused positive rumination	0.075	0.147	.025	.005	.000
Dampening	0.420	0.127	.161**	.154***	.017**
Neuroticism	0.847	0.162	.314***	.236***	.042***
Brooding	0.390	0.165	.126*	.112***	.009*
Reflection	-0.186	0.177	-.061	.111***	.002
Acceptance	-0.055	0.072	-.044	.159***	.001
Mindfulness	-0.087	0.030	-.132**	.110***	.013**
DV = Posttraumatic stress re-experiencing					
Emotion focused positive rumination	0.084	0.060	.079	.000	.004
Self-focused positive rumination	<0.001	0.053	.000	.000	.000
Dampening	0.112	0.046	.133*	.070***	.012*
Neuroticism	0.148	0.059	.169*	.085***	.012*
Brooding	0.119	0.060	.118*	.058***	.008*
Reflection	-0.074	0.064	-.075	.047***	.003
Acceptance	-0.032	0.026	-.081	.070***	.003
Mindfulness	-0.009	0.011	-.041	.030***	.001
DV = Posttraumatic stress avoidance					
Emotion focused positive rumination	-0.012	0.078	-.008	.010*	.000
Self-focused positive rumination	0.032	0.070	.023	.005	.000
Dampening	0.154	0.060	.130*	.119***	.011*
Neuroticism	0.313	0.077	.255***	.183***	.028***
Brooding	0.158	0.079	.112*	.089***	.007*
Reflection	-0.049	0.084	-.035	.092***	.001
Acceptance	-0.022	0.034	-.039	.126***	.001
Mindfulness	-0.042	0.014	-.141**	.098***	.015**
DV = Posttraumatic stress hyperarousal					
Emotion focused positive rumination	-0.034	0.057	-.029	.021**	.001
Self-focused positive rumination	0.044	0.051	.041	.009*	.001
Dampening	0.154	0.044	.164***	.175***	.018***
Neuroticism	0.387	0.056	.400***	.302***	.069***
Brooding	0.110	0.057	.099	.113***	.005
Reflection	-0.061	0.061	-.055	.123***	.001
Acceptance	<0.001	0.025	-.001	.181***	.000
Mindfulness	-0.035	0.010	-.147***	.134***	.017***

DV = Dependent variable.

\*  $p < .05$ . \*\*  $p < .01$ . \*\*\*  $p < .001$ .

positive rumination, explained variance in PTS avoidance when not considering the other variables; dampening, neuroticism, brooding, and mindfulness explained unique proportions of variance. Finally, the model with PTS hyperarousal as dependent variable was also significant ( $F(8, 454) = 31.40, p < .001, R^2 = .36$ ). All variables explained variance in hyperarousal when not considering the other variables; dampening, neuroticism, and mindfulness explained unique variance when the shared variance between the independent variables was considered. There were no influential datapoints. For all regression analyses assumptions of normality, linearity, and homoscedasticity were met. Variance inflation factors (1.31–2.33) did not point at problematic collinearity.

#### 4. Discussion

The present study sought to broaden our knowledge about the role of PA regulation in PTS following stressful life events. Specifically, we examined if self-focused and emotion-focused rumination about PA (strategies upregulating PA) and dampening (a strategy downregulating PA) were incrementally related to PTS, beyond neuroticism, brooding and reflection (both NA regulation strategies), and acceptance and mindfulness. In so doing, we

focused on DSM-IV based (APA, 2000) levels of PTS symptoms, plus PTS clusters of re-experiencing, avoidance, and hyperarousal. Data were obtained from a student sample, most of whom were not exposed to traumatic events involving actual or threatened death, serious injury or sexual violence (as defined in the DSM-IV A1 criterion for PTSD). Notably though, there is evidence from studies in the general population (e.g. Anders et al., 2011; Mol et al., 2005) and student samples (e.g. Anders, Frazier, & Shallcross, 2012; Cusack et al., 2019; Lancaster, Melka, Rodriguez, & Bryant, 2014) that exposure to non-criterion A1 events may also lead to severe PTS. When looking at the events our sample reported as most distressing, the death of someone from the social network, relationship break-ups, and mental or physical illness of close others were most frequently reported. Although these were not severe (criterion A1) events, almost 8% endorsed PTS symptoms at a level that is indicative of probable PTSD. These findings mirror prior findings that PTS is prevalent among young adults (e.g. Anders et al., 2012; Cusack et al., 2019; Lancaster et al., 2014) and highlight the importance of options for screening and treatment of distress among students exposed to stressful life events. That deaths of a loved one, mental illness of close others,

and relationship break-ups were frequently mentioned and connected with PTS accords with prior research. For instance, Mol et al. (2005) studied PTS among people exposed to DSM-IV criterion A1 events (e.g. accidents, war, abuse) and people who experienced other negative (non-criterion A1) life events. Interestingly, in this last group, death of a loved one, (chronic) illness of a loved one, and relational problem were the three most frequently endorsed events and connected with levels of PTS equal to distress reported by people exposed to criterion A1 events.

Our key aim was to investigate the role of PA regulation in PTS, beyond neuroticism, brooding and reflection, experiential acceptance and mindfulness. Zero order correlations showed a number of notable outcomes. First, PTS total and cluster scores were significantly associated with dampening of PA, but not with emotion-focused and self-focused positive rumination. This indicates that PA regulation is indeed involved in traumatic stress following stressful life events, but more in the form of *too much downregulation* of PA, than *too little upregulation* of PA. Correlations of dampening of PA with emotion-focused and self-focused positive rumination were weak (Table 2), indicating that these forms of downregulation and upregulation of PA are independent constructs more than extremes of a single dimension. Zero order correlations of PTS with the other constructs were statistically significant and, as such, mirrored prior evidence that PTS is associated with neuroticism (Perrin et al., 2014), brooding and reflection (García et al., 2017), and acceptance and mindfulness (e.g. Boelen & Lenferink, 2018; Smith et al., 2011; Vujanovic, Youngwirth, Johnson, & Zvolensky, 2009).

Next, we conducted four regression analyses in which PTS total and cluster scores were consecutively considered as dependent variables and the three forms of PA regulation plus the other variables were entered as independent variables. Concerning overall PTS, it was found that dampening of PA, neuroticism, brooding, and mindfulness all contributed unique proportions of variance to the variance explained by all variables together. Importantly, and as anticipated, these findings confirm that PA regulation contributes to individual differences in PTS following stressful life events, beyond the variance accounted for by neuroticism (the broader vulnerability to think and feel negatively), brooding and reflection (strategies to regulate NA), and acceptance and mindfulness (two broader regulatory strategies conferring resilience following adversity; Thompson et al., 2011). Dampening of PA but not emotion-focused and self-focused positive rumination about PA explained variance in PTS; this mirrors prior evidence that too much downregulation of PA is more critical for the development of psychopathology than too little upregulation of PA (e.g. Raes et al., 2014). Our finding that mindfulness also explained unique variance in PTS corroborates prior

evidence that the ability to engage in the present moment, to experience thoughts, memories, and feelings without judgement while recognizing their transient nature alleviates distress following adversity (Smith et al., 2011; Thompson et al., 2011).

Looking at the three DSM-IV based PTS clusters, we found that dampening, neuroticism, and brooding explained unique variance in PTS re-experiencing. Neuroticism, dampening of PA, brooding, and (lower) mindfulness explained unique variance in PTS avoidance. Finally, dampening, neuroticism, and (lower) mindfulness explained unique variance in PTS hyperarousal. That brooding continued to explain variance in PTS total scores and two of three symptom clusters accords with prior work showing that depressive rumination maintains PTS after stressful life events (Ehring, Frank, & Ehlers, 2008). Reflection only had a univariate relationship with PTS and was not significant in the regression models. Although there is still a paucity of research on brooding and reflection in PTS, this echoes prior evidence that reflection is less of a maladaptive strategy compared to brooding (Schoofs et al., 2010).

Notably, as with overall PTS, increased downregulation of PA (dampening) was more strongly connected with PTS clusters than decreased upregulation of PA (positive rumination). How might dampening contribute to PTS? Also considering evidence that PTS does not coincide with an inability to experience PA *per se* (Dornbach-Bender et al., 2020), it seems that difficulties maintaining PA (occurring later in the emotion-generation time line) is more strongly connected with PTS than difficulties experiencing PA in the first place (occurring earlier in the emotion-generation time line). Speculatively, it is possible that dampening of PA contributes to re-experiencing because it limits the interruption of (and hence strengthens) the activation of images of the negative event on confrontation with event-related cues, contributes to avoidance because it blocks the broadening of (and thus narrows) one's thought-action repertoire needed to confront situations reminding of the event, and maintains arousal and other signs of hypervigilance by diminishing health-protective biological responses (Dornbach-Bender et al., 2020; Tugade & Fredrickson, 2004). Future preferably longitudinal research is needed to further examine the linkage of dampening with different symptom clusters of PTS and mechanisms mediating this linkage.

The current study findings must be considered in light of several limitations. First, most participants were confronted with relatively mild adverse events that cannot be considered as Criterion A events as per DSM-criteria for PTSD (APA, 2000, 2013). Accordingly, it is conceivable that the symptoms of re-experiencing, avoidance, and hyperarousal connected with these events were less intense and debilitating than PTSD connected with typical Criterion A events. As a result, caution must be applied in generalizing the findings to samples exposed



to more severe traumatizing events, including people with clinical levels of PTSD. Notably, PA dysregulation has been found to contribute to PTS in more severely traumatized samples (e.g. Weiss et al., 2018, 2019) but the role of self-focused and emotion-focused rumination about PA and dampening in such samples still warrant further scrutiny. A second and related limitation is that we do not know to what extent the linkage of PA and NA regulation with PTS observed in this study reflected associations with general anxiety or traumatic stress in a narrower sense. Notably, we controlled for neuroticism in our analyses to examine the association of PA regulation with PTS beyond its association with the general tendency to experience negative thoughts and feelings. However, it would be relevant for future studies to explore the role of PA regulation in contributing to PTS as well as general anxiety and other indices of distress, to enhance knowledge about the specificity of PA regulation to PTS in the face of negative life-events. Thirdly, because data collection for this study started before DSM-5 (APA, 2013) came out, we examined DSM-IV (APA, 2000) based symptoms of PTS. One major change in criteria is that DSM-5 criteria include a cluster of 'negative alterations in cognitions and mood' that was not included in the DSM-IV criteria; considering that this cluster includes symptoms such as negative emotional state and loss of interest, it is conceivable that PA regulation influences the symptoms from this cluster. Although our findings with regard to re-experiencing, avoidance, and hyperarousal may generalize well to DSM-5 based PTSD (in which similar clusters are distinguished), the relationship of PA regulation (as tapped with the RPA) with the negative alterations in cognitions and mood cluster needs to be studied in future work. Fourth, the cross-sectional design rules out conclusions about the temporal order of variables – let alone causality. So, although our cross-sectional findings are valuable in this early stage of research on PA regulation in PTS, longitudinal and experimental research should examine if PA dysregulation maintains PTS over time. Fifth, women were over-represented in this study. There is some evidence that women tend to use more different emotion regulation strategies and more flexibly implement strategies (Goubet & Chrysikou, 2019). It would be interesting for future research to examine the potential moderating role of gender in the linkage of PA dysregulation and PTS.

Notable too is that alphas of the RRS Brooding and Reflection scales were low. Although this is partially due to both scales including only five items, higher alphas for these scales have been reported in prior work (e.g. Schoofs et al., 2010) and it, therefore, is relevant to replicate the current analyses with longer, more internally consistent measures of brooding and reflection. Furthermore, all data were gathered using self-report measures and shared method variance may have inflated correlations between variables. Finally, our reliance on self-report did not allow

identifying people with full PTSD because that is preferably done using clinical interviews.

Notwithstanding these considerations, the current findings extend the slowly growing evidence that difficulties regulating positive emotions are involved in PTS. This has relevance for research and clinical practice. Difficulties regulating negative thought, memories, and feelings have received most attention in research and practice, but difficulties regulating PA are relevant also. Although the role of dampening of PA and other PA regulation strategies in PTS needs to be more thoroughly examined in future studies, our findings suggest that it may be useful to incorporate interventions to improve the upregulation of PA and (perhaps even more relevant, considering the present findings) to limit the downregulation of PA in the treatment for PTS (cf. Quoidbach et al., 2015; Weiss et al., 2019). Heightened downregulation of PA may be counteracted using strategies to savour PA, such as mindfully focussing attention on PA (and diverting attention away from thoughts unrelated to the PA) and stepping back from the present experience to mentally travel through time to remember or anticipate positive events (cf., Quoidbach, Berry, Hansenne, & Mikolajczak, 2010). In addition, PA dysregulation may be targeted by increasing emotional acceptance of positive emotions and reducing maladaptive cognitions about PA. It is relevant for future research to continue addressing difficulties in regulating PA alongside difficulties regulation NA to improve the understanding of mechanisms maintaining PTS and to examine the usefulness of interventions focused on maintaining and increasing PA in the treatment of PTS.

## Note

1. We expected that several participants would not have experienced severe events but, instead, more mild events (e.g., conflict, study problems). In order to prevent participants from taking events in mind of which memories had faded and, accordingly, to ensure that participants scored their distress in relation to events that were still fairly sharp in mind, we chose to limit the time frame to one year.

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## Data availability statement

The data that support the findings of this study are available on request from the corresponding author, PB. The data are not publicly available due to their containing information that could compromise the privacy of research participants.

## Disclosure statement

The author declares to have no conflict of interest.

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