Negative Affective Stress Reactivity and its Association with Stressful Life Events and Trait Positive Reappraisal

Master Thesis

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Abstract

Background: There is evidence that negative affective stress can lead to somatic, psychological, and psychosomatic disorders such as psychosis, depression, gastrointestinal disturbances, and cardiovascular diseases. Existing studies indicated that the frequent exposure to stressful life events might sensitise individuals to a stronger negative affective reactivity toward minor stressors. Hereby, habitually reinterpreting stressors positively (i.e., trait positive reappraisal) was suggested to mitigate this effect. However, existing studies omitted to test these associations in a controlled laboratory environment but primarily examined minor stressors and vulnerable samples. ***Aim:*** The purpose of the current study was to assess whether a higher number of stressful life events heightens negative affective stress reactivity as well as a potentially moderating role of trait positive reappraisal in an experimental laboratory environment. ***Methods:*** In a laboratory session, acute stress was induced using the repeated Montreal Imaging Stress Test. Self-reported frequency of stressful life events, trait positive reappraisal, and negative affect was examined. ***Results:*** The sample demonstrated that the number of stressful life events had a positive influence on negative affective stress reactivity. Trait positive reappraisal did not moderate this association. ***Conclusion:*** The present study was able to experimentally point out the impact of frequent stressful life events in healthy individuals and underscored the importance of timing regarding the effectiveness of positive reappraisal (i.e., state positive reappraisal). To promote health and well-being in a healthy population, it is important to reduce stressful life events and develop stress resilience.

Keywords: Stress; stressful life events; affective stress reactivity; trait positive reappraisal; laboratory stress task

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Negative Affective Stress Reactivity and its Association with Stressful Life Events and Trait Positive Reappraisal

According to the WHO, stress is one of the biggest somatic, psychosomatic, and psychological dangers to health today (Heinrichs et al., 2015; Seaward, 2017). Among adults, 43 percent suffer health complaints that are stress-related (Seaward, 2017). To decrease the harm that high levels of stress can result in, it is crucial to identify which factors influence it. Previous daily-life studies indicate that prolonged exposure to stressors sensitises the stress system (Vaessen et al., 2015). This in turn increases the vulnerability to experiencing negative affective reactions already when facing a minor stressor and consequently, makes one more prone to develop mental disorders (Harkness et al., 2015; Vaessen et al., 2015). In addition, research suggests that individual differences in the affective reaction to stressors are explained by emotional regulation strategies like positive reappraisal (Schlotz, 2013). Nevertheless, more attention needs to be paid to the suggested link between stressful life events and affective reactivity as well as the potentially mitigating effects of adaptive emotion regulation.

Stressful Life Events

Gerber et al. (2014) describe the term 'stress' as the imbalance between a perceived burdensome challenge and the available resources to deal with it. The complex construct includes an unconsciously or consciously perceived triggering or demanding event, called a stressor, as well as the psychological and/or physiological reaction to it (Crampton et al., 1995; Heinrichs et al. 2015). Stressors commonly take the form of a type of challenging life event (Crosswell & Lockwood, 2020). Generally, life events are adaptations to one's current life that are episodic and limited in duration but can become chronic if they are prolonged and challenging (Crosswell & Lockwood, 2020).

Based on this, stressful life events, such as accidents or the death of a loved one, are "undesirable, unscheduled, and/or uncontrollable discrete, observable events that signify major life changes" (Carlson, 2014; Schwarzer & Luszczynska, 2013). They must not be confused with daily hassles which are defined as frequent and rather minor routine difficulties in daily living like work deadlines or being stuck in traffic (Crosswell & Lockwood, 2020). At a more distal level, stressful life events can be hindering an individual's psychological and physiological functioning (Crosswell & Lockwood, 2020; Wong et al., 2012). More precisely, the exposure to multiple

stressful life events is associated with decreased psychological health and an increase in mortality because of the development of cardiovascular diseases and cancer (Chida et al., 2008; Cohen et al., 2007).

Negative Affective Stress Reactivity

Encountering challenging life events oftentimes results in the experience of stress reactions (Skoluda et al., 2015). Stress reactivity describes the propensity to respond to a stressor in a cognitive, behavioural, emotional, and/or physiological manner (Schlotz, 2013). A common form is affective stress reactivity which means that a person reacts to a stressor by changing their emotion (Du et al., 2018; Sin et al., 2015). More precisely, this reaction to stressors includes associated negative feelings like restlessness, pressure, tenseness, fear, and anger (Crampton et al., 1995). Repeated or enduring affective stress responses reduce the quality of life and increase the risk of developing mental disorders (e.g., psychosis, depression, anxiety), chronic physical disorders (e.g., cardiovascular diseases, cancer), psychosomatic disorders (e.g., gastrointestinal disturbances, ulcers), and mortality (Epel et al., 2018; Quick et al., 1987; Sin et al., 2015; Van Praag, 2004).

The variability in negative affective stress reactivity can be attributed to an individual's sensitisation toward a stressor (Vaessen et al., 2015). More precisely, the theory of stress sensitisation shows that in vulnerable and healthy individuals, repeated exposure to stressors leads to a sensitised stress system, resulting in a stronger negative affective reaction to stressors of the same or even lower magnitude (Collip et al., 2008; Vaessen et al., 2017). Consequently, already the sensitivity to daily hassles induces physical responses and mood disturbances that can become chronic health conditions over time (Bale, 2006; Piazza et al., 2013). Moreover, previous exposures to major life changes (e.g., childhood trauma) heighten the sensitivity toward stressful events (Collip et al., 2008).

Stress responses can be effectively measured in controlled laboratory settings (Crosswell & Lockwood, 2020). Thereby, affective stress reactivity that follows an acute stress task can be studied by manipulating the stress induction, using self-report measures for the stress reaction, and comparing the stress level to the control condition (Cohen et al., 1983). For instance, existing laboratory research found a decrease in mood as a response to acute social-evaluative stress tests in healthy populations based on subjective mood ratings that were obtained before and after the

tasks (e.g., Krkovic et al., 2018; McRae et al., 2006). Experimental laboratory studies offer a concrete insight into the stress reaction at a specific time point.

Existing daily-life studies have primarily investigated the link between daily hassles and affective stress reactivity. For example, a daily diary study by Mroczek and Almeida (2004) demonstrated that there is an association between daily stressors and heightened negative affect. They explain that a lifetime of frequent negative affect increases the susceptibility and sensitivity to stimuli that evoke such adverse affects. Other studies that utilized the Experience Sampling Methodology (ESM) also demonstrated that the sensitivity to daily hassles increased negative affect (e.g., Marco et al., 1999; Mying-Germeys et al., 2003; Peeters et al., 2003; Van Eck et al., 1998). Research findings regarding the heightened reactivity to daily hassles and predicted development of poorer health outcomes in the future (Piazza et al., 2013) highlight the importance of scientifically substantiating whether this link does also apply to the impact of stressful life events on affective stress reactivity. Additionally, besides ESM studies, there are almost no experimental laboratory studies that focus on this association despite the promising assessment of affective reactivity using a controlled acute stress task.

Trait Positive Reappraisal

Carlson (2014) explained that people with more coping strategies experience less negative affective reactivity induced by stressful events. A coping style that is linked to a decrease in affective stress reactions is the individual use of emotion regulation (Krkovic et al., 2018; Lewis et al., 2018). Meaning, by exerting control over shaping situation-dependent emotions (i.e., occurrence, timing, nature, experience, expression), a person consciously or implicitly up- or down-regulates their either positive or negative emotions (Gross, 1998; McRae & Gross, 2020).

In perceived uncontrollable situations, emotion-focused coping like reappraisal is considered as most effective strategy (Roos, 2021). The Transactional Theory of Stress and Coping by Lazarus and Folkman (1984) explains that an internal appraisal of a stressor can influence an affective reaction because two appraisal processes conclude whether an event is stressful. A negative affective stress reaction is induced by the primary appraisal that an event is potentially harmful. Secondary appraisal then focuses on whether one can cope with the situation. Accordingly, appraisal can also be utilized functionally in reducing affective stress reactions if a situation is appraised in a positive light and not as a challenge (Lazarus & Folkman, 1984; Roos,

2021). Positive reappraisal encompasses a positive reinterpretation of an initially perceived negative event, thought, or emotion (Gross, 2013). More specifically, it is an adaptive process of reconstruing an adverse situation as "benign, valuable, and beneficial" (Garland et al., 2009).

Positively reappraising adverse situations appears most effective when it is an individual's trait because habitual implementers are accustomed to the construct and thus, demand less cognitive effort. In contrast, for people who reappraise only momentarily, more cognitive efforts might be required and the reappraisal process is perceived as difficult which magnifies a stress reaction (Gross & John, 2003). Experimental laboratory results on utilizing trait positive reappraisal when being exposed to an acute stressor demonstrated an association with reduced experiences of negative emotions (e.g., Carlson et al., 2012; Garnefski et al., 2001; Gross & John, 2003; Mauss et al., 2007; Memedovic et al., 2010). A study by Ford et al. (2017) showed that the frequent positive reappraisal of several stressful life events has led to a reduction of depressive symptoms. Further, it is suggested that trait positive reappraisal can buffer against affective reactions towards daily hassles (Roos, 2021). Resultantly, it is proposed that compared to people who do not tend to use positive reappraisal, individuals who experienced stressful life events and positively reappraise them on a trait level, show a decreased affective stress reactivity. While there are numerous laboratory studies on the main effect of trait positive reappraisal on affective stress reactivity following acute stressors, past research does not provide a full understanding of the potentially mitigating role of the trait between stressful life events and negative affective stress reactivity.

The Present Study

The current study aimed to test the link between the number of experienced stressful life events and negative affective stress reactivity. Additionally, it was investigated if trait positive reappraisal mitigates this potential association. Therefore, an experimental laboratory stress task was utilized to examine an individual's affective stress response. To answer the research question of this study: "What is the association between the number of experienced stressful life events and momentary negative affective stress reactivity and does trait positive reappraisal play a moderating role in this association?", two hypotheses were formulated in line with previous research:

1. Individuals that experienced a higher number of stressful life events show stronger levels of negative affective stress reactivity.
2. For individuals that utilize the trait positive reappraisal, the association between stressful life events and negative affective stress reactivity is less strong than in individuals without the trait.

Methodology

Design

The present study encompassed a secondary analysis of data from an experimental laboratory study by De Calheiros Velozo et al. (2021). The original study utilized the repeated Montreal Imaging Stress Test (rMIST), which is an adapted version of a common experimental psychosocial stress task. Therein, habituation, sensitisation, and anticipation effects of an acute stress task were tested to reproduce the same pattern of reactivity within two different studies. To test the current hypotheses, the present study comprised the data from the first of those studies which was a single-run (i.e., one acute stress exposure) and within-subjects study design.

Participants

The recruitment took place via convenience sampling by spreading flyers in the city and on the internet. The study was only intended for participants from the general community between the age of 18 to 35. They were required to have at least sufficient skills in the Dutch language, so they are able to fill in the various self-report measures and to understand and sign the informed consent. They were excluded when they showed a history of endocrine or cardiovascular diseases, and chronic or ongoing use of medications except for the birth control pill. In addition, they were excluded if they used illicit drugs in the past three months, were allergic to certain patches or conductive gels, and worked night shifts. Before starting the study, the participants were required to sign an informed consent. They received 30€ per session. The study was approved by the Sociaal-Maatschappelijke Etische Commissie of KU Leuven.

Procedure

The participants were unaware of the purpose of the study and were told that it is about mental effort including a highly effortful task as stress condition and a low effortful task. Figure 1 (De Calheiros Velozo et al., 2021, p. 3) shows that during the first 25 minutes after their arrival,

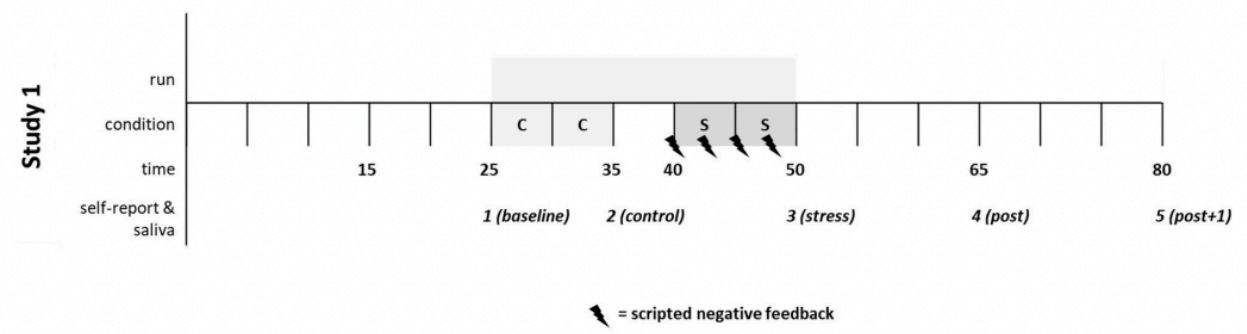
the participants were asked to fill in a baseline questionnaire assessing demographics, stressful life events, and trait positive reappraisal.

Afterwards, the testing phase started which encompassed two five-minute blocks of the control condition, a five-minute break, and two five-minute blocks of the stress period. Additionally, after the baseline, control, and stress condition, the participants were asked to fill in a mood questionnaire in which they indicated their current negative affect. After the control condition in which they were not induced to a stress task yet, the rMIST was utilized to induce psychosocial stress exposure (De Calheiros Velozo et al., 2021). The rMIST encompasses a laboratory arithmetic task via a computer application at which participants feel compelled to perform well (Dedovic et al., 2005). Besides the task, the participants were able to use a button to enter the solution, a text box including whether the solution was correct, incorrect or the time is out. Additionally, there were two performance indicators present that showed the participant's performance as well as the performance of all participants on average (Dedovic et al., 2005).

In this study, two participants met briefly before the task and were tested simultaneously but in different rooms. Based on this, the participants were instructed to compete against each other even though there was no competition in reality. They did not know about the competition until they were requested to compete. A bar upside the screen illustrated the performance compared to the other participant by labeling the arrows with names. The task was manipulated so each participant fared worse than the other. The competition aspect was intended to make the participants engage with greater mental effort. During the stress condition, scripted negative feedback on the performance was given by the experimenter to encourage a better performance. Each laboratory session included four times of feedback (De Calheiros Velozo et al., 2021).

Figure 1

Procedure of Original rMIST Study



Note. C=control condition, S=stress condition, with the time from arrival in minutes, the five sampling measures of self-reported stress, and the moments feedback was given. From "The repeated Montreal imaging Stress Test (rMIST): Testing habituation, sensitization, and anticipation effects to repeated stress induction," by J. De Calheiros Velozo, T. Vaessen, J. Pruessner, I. Van Diest, S. Claes, and I. Myin-Germeys, 2021, *Psychoneuroendocrinology*, *128*(105217), p. 3 (https://doi.org/10.1016/j.psyneuen.2021.105217), Copyright 2021 by Elsevier Ltd.

Measures

Negative Affective Stress Reactivity

To measure negative affective stress reactivity, the participants filled in two self-reported mood questionnaires about negative affect (NA) after the control and after the stress condition. The questionnaire assessed NA with items that were scored on a 7-point Likert scale (i.e., 1 – *not at all* to 7 – *extremely*). The average of the five items "at the moment, I feel… down, tensed, restless, under pressure, annoyed" formed NA. Negative affective stress reactivity was computed by firstly, using the average score of the mood questionnaire that was taken right after the stress condition. Secondly, the average of NA during the control condition was subtracted. Finally, the difference showed how much the negative affect value varied after being exposed to the stress task. A positive value indicated an increased negative affective stress reactivity after the stress task compared to the control condition. The reliability of the scale was assessed by computing Cronbach's alpha for all items (Ursachi et al., 2015). The mood questionnaire showed good reliability in the current study (Cronbach's α=0.83).

Stressful Life Events

To investigate the number of stressful life events, the Life Events and Difficulties Schedule (LEDS) by Brown and Harris (1978) was part of the baseline questionnaire that was filled in. The respondents were asked to indicate which of the 61 life events of different magnitude they have experienced during the past six to over 24 months (e.g., death of a child, financial problems, failed exam). They also had the option to indicate the valence of the event on a scale ranging from "very unpleasant" to "very pleasant". Five events that were rated as neutral or pleasant by all participants in this study were excluded as those were not experienced as stressful life events. In addition, individual participants that rated an item as neutral or positive were recoded as not having experienced the stressful life event. The total number of experienced events per person was then used to account for the frequency of stressful life events. In the present study, the internal consistency of the scale was good (Cronbach's α=0.80).

Trait Positive Reappraisal

The Cognitive Emotion Regulation Questionnaire (CERQ) investigates trait emotion regulation and its subscales (Feliu-Soler et al, 2017). To measure trait positive reappraisal, the average of the subscale positive reappraisal in the baseline questionnaire was assessed. The subscale consists of the four items "I think I can learn something from the situation", "I think that I can become a stronger person as a result of what has happened", "I think that the situation also has its positive sides", and "I look for the positive sides to the matter" which were answered on a 5-point Likert scale (i.e., 1 – "almost never" to 5 – "almost always"). The reliability of the scale was evaluated as good in this study (Cronbach's α=0.86).

Statistical Analysis

All data analyses were performed using SPSS version 25. Firstly, the dataset was examined for missing data. To create an overview of the participants, a descriptive statistics analysis was implemented for the demographics (i.e., number and percent of respondents) and the study variables (i.e., mean, standard deviation, range). To statistically show whether the manipulation (i.e., stress task) was successful in significantly changing the negative affect of the participants compared to the control condition, a paired-samples t-test was conducted. Thereby, the mean

values of NA during the control and stress conditions were compared. As a basis for testing the hypotheses, the assumptions of a multiple linear regression needed to be tested.

To check the first hypothesis, a regression analysis was conducted including the independent variable stressful life events and the dependent variable negative affective stress reactivity. Lastly, to investigate the second hypothesis, a multiple linear regression analysis was implemented. Therefore, the main effect of trait positive reappraisal and of stressful life events as well as the standardized interaction effect of trait positive reappraisal and stressful life events were included. To control for the potential confounding effects of age and gender, they were taken into account as covariates in both multiple regression analyses.

Results

Descriptive Statistics

The total sample consisted of 58 participants. Five participants that did not rate their negative affective state were excluded. Resultantly, the final study sample was composed of 53 healthy participants in the age range of 19 to 35 with a mean age of 23.94. The additional sample description can be found in table 1. The participants experienced on average 3.42 stressful life events (SD = 3.07) with a range from zero to 16 events. The participants presented an average extent of 3.31 of trait positive reappraisal (SD = 1.05, $Min.$ = 1.25, $Max.$ = 5.00). Compared to the mean NA of 2.12 in the control condition (SD = .92, $Min.$ = 1.00, $Max.$ = 4.80), the sample displayed an average NA of 3.70 (SD = 1.47, $Min.$ = 1.00, $Max.$ = 6.80) in the stress condition. Hence, on average a 1.58 times higher negative affective stress reactivity (SD = 1.16, $Min.$ = -.80, $Max.$ = 4.60) was shown. Based on this, the manipulation check revealed a significant difference in NA during the control condition and stress condition, $t(52) = -9.86$, $p < .001$. Resultantly, the population reported higher levels of NA after the stress condition compared to after the control condition.

Table 1

Overview Characteristics of the Study Group (N=53).

Participant Characteristic	N (%)	M (SD)
Age		23.94 (3.02)
Sex		
Male	7 (13.2)	
Female	46 (86.8)	
Nationality		
Belgian	46 (86.8)	
Dutch	3 (5.7)	
Greek	1 (1.9)	
Other	3 (5.7)	
Marital Status		
Single	12 (22.6)	
Relationship/Married	40 (75.5)	
Occupation		
Employed	21 (39.6)	
Students	32 (58.5)	

Note. N = number of respondents, M = mean of respondents, SD = standard deviation of respondents, % = percentage of respondents, Other = No answer

Assumptions Testing

Negative affective stress reactivity was normally distributed. Table 2 illustrates that there was a moderate positive correlation between negative affective stress reactivity and stressful life events (r = .35, $p<0.01$). No correlation was demonstrated between negative affective stress reactivity and trait positive reappraisal. Lastly, there was a weak negative association between stressful life events and trait positive reappraisal (r = -.24, $p>0.05$). Hence, there was no strong interdependence and the assumption of multicollinearity was met as well. The linearity between negative affective stress reactivity, stressful life events, and trait positive reappraisal was met. Finally, the assumption of homoscedasticity was not violated.

Table 2

Bivariate Pearson Correlation for Stressful Life Events, Trait Positive Reappraisal, Negative Affective Stress Reactivity.

Variable	1	2	3
1. Stressful life events	1		
2. Trait positive reappraisal	-.24*	1	
3. Negative affective stress reactivity	.35**	.01 (.46)	1

Note. **. Correlation is significant at the 0.01 level (2-tailed), *. Correlation is significant at the 0.05 level (2-tailed), parentheses show the p-value of the items that do not correlate significantly

Hypotheses Testing

As displayed in table 3, a multiple linear regression analysis showed that stressful life events significantly predict negative affective stress reactivity (B = .12, SE = .05, p<.05). Meaning, the more stressful life events were experienced by the participants, the higher was the level of negative affective stress reactivity following the stress task.

Table 3

Regression Analysis for Dependent Variable Negative Affective Stress Reactivity and the Predictors Stressful Life Events and Covariates (N = 51).

			95% CI		
Effect	Estimate	SE	Lower	Upper	p
Constant	.34	1.22	-2.11	2.80	.778
Age	.03	.05	-.06	.13	.518
Gender	-.03	.44	-.81	-.92	.852
Stressful life events	.12	.05	.02	.22	.013

Note. Model Significance: $F(3, 48) = 2.92$, $p = .070$, $R^2 = .13$

As shown in table 4, a second multiple linear regression indicated that trait positive reappraisal did not significantly moderate the association between stressful life events and negative affective stress reactivity (B = .04, SE = .19, p =.806).

Table 4

Moderation Analysis for Dependent Variable Negative Affective Stress Reactivity and the Predictors Stressful Life Events, Positive Reappraisal, Interaction Effect, and Covariates (N = 51).

			95% CI		
Effect	Estimates	SE	Lower	Upper	p
Constant	.05	1.39	-2.76	2.87	.969
Age	.03	.05	-.08	.14	.590
Gender	-.07	.45	-.99	.84	.869
Stressful life events	.14	.05	.02	.25	.016
Positive reappraisal	.10	.16	-.21	.43	.515
Interaction effect	.04	.19	-.34	.44	.806

Note. Model Significance: $F(5, 46) = 1.54$, $p = .195$, $R^2 = .14$

Discussion

The present study aimed to examine the association between the number of experienced stressful life events and momentary negative affective stress reactivity and whether trait positive reappraisal plays a moderating role in this association. It was indicated that participants that were exposed to a higher number of stressful life events showed heightened levels of negative affective stress reactivity following the stress task. The utilization of trait positive reappraisal did not moderate this association significantly.

Stressful Life Events and Affective Stress Reactivity

Despite their difference in frequency and intensity, the current study confirmed that findings regarding the impact of daily hassles (e.g., Vaessen et al., 2019) can be applicable to stressful life events. Compared to a study by Almeida (2005) that revealed that at least one daily hassle is experienced on 40% of the days, on average three stressful life events were experienced in the current study. Thus, this applicability might be achieved because the by definition more severe intensity of stressful life events compensates for the more frequent exposure to daily hassles. Moreover, the fact that sensitised individuals demonstrate a heightened negative affective

stress reaction to minor events is in line with a study by Wong et al. (2012) which elaborates that effects of daily hassles might be magnified by the occurrence of stressful life events.

Secondly, other studies primarily used the ESM technique (e.g., Myin-Germeys et al., 2003; Peeters et al., 2003; Ruscio et al., 2015) but the current findings reveal that laboratory studies are able to show an effect between stressful life events and affective stress reactivity. This adds that due to their infrequent and unscheduled nature, stressful life events are not limited to being examined via daily life assessment but can be investigated through retrospective self-reports in experimental studies. This also means that the impact of experienced stressful life events is strong enough to be evoked by a laboratory-induced acute stressor. Thereby, the opportunity is offered to expose individuals with the same standardized acute stressor and thus, to make meaningful and generalizable comparisons.

Next, the present findings contribute to a better understanding of the stress sensitisation mechanism in relation to stressful life events and negative affective stress reactivity. The diagnosis of post-traumatic stress disorder shows that the impact of traumatic and extremely stressful events leads to long-lasting difficulties in affective recovery (Hathaway et al., 2010; Tosevski & Milovancevic, 2006). This suggests that a lacking stress recovery and unresolved affective issues might also play a role in becoming sensitised to frequent less traumatic but still severe life stressors. In other words, experiencing a stressful life event and not having fully recovered yet but already experiencing more of such events could sensitise the stress system.

Fourthly, previous work mainly focused on the finding that vulnerable samples such as those with affective or psychotic disorders experienced a stronger negative affective stress response than healthy volunteers (e.g., Myin-Germeys et al., 2003; Peeters et al., 2003; Vaessen et al., 2019). Nonetheless, the current study suggests that the mechanism of stress sensitisation applies, at least to a certain degree, to both groups. Hence, the findings regarding the impact of stressful life events should not only target vulnerable people. Instead, they can contribute to detecting and stepping into the process early on. Thereby, it should be prevented that healthy people become at risk of developing a sensitisation toward stress to increase or maintain mental health and well-being. For example, a study by Chiesa and Serretti (2009) gave evidence for the effectiveness of stress reduction techniques in healthy populations.

Generally, preventive measures can contribute to avoiding or decreasing stressors and stress reactions so that individuals are able to autonomously deal with stress (Werdecker & Esch,

2019). One option for intervention is to adapt the precipitator of the mechanism as there is evidence for the effectiveness of minimizing the stressfulness of the environment (Lazarus & Cohen, 1977; Leff, 1994). However, the uncontrollability of stressful life events underlines the importance of adjusting the affective response by building a buffering stress resilience (Carlson, 2014; Kunzler et al., 2018). Findings support an association between low affective reactivity and stress resilience in people who are in a high at-risk group like early psychosis (Vaessen et al., 2017). Additionally, healthy samples demonstrated that through being stress resilient, they maintained a positive attitude, and experienced fewer negative emotions and less stress despite the stressors they were facing compared to those that did not show stress resilience (Keye & Pidgeon, 2013; Kunzler et al., 2018).

The Role of Positive Reappraisal

It was a surprising finding that the outcome of the current study did not confirm that individuals who reinterpret adverse events as benign on a trait level show a lower affective reaction towards the induced stressor. However, some previous laboratory studies did not find a direct effect of positive reappraisal on stress reactivity based on an induced acute stressor (e.g., Denson et al., 2014; Lam et al., 2009). According to Denson et al. (2014), a reason for this variability might be the different procedure (e.g., speech, conversation, arithmetic task) as, for example, studies that found an association also included an anger-inducing context (e.g., Mauss et al., 2007; Memedovic et al., 2010).

Another explanation might be the importance of the regulatory timing of reappraisal (i.e., state positive reappraisal). Several questionnaires omit to measure positive reappraisal within the brief timepoint of a stress reaction (Vaessen et al., 2015). According to the process model of emotion regulation, positive reappraisal is considered an antecedent-focused strategy that is effective in reducing negative affect when it is applied in advance to negative emotions (Gross, 1998). However, positive reappraisal was assessed before the stress induction, so it was only accounted for the general trait level of positive reappraisal instead of the time point of application in the assessment. This can lead to the "point of no return" when the affective response might be too advanced to decrease to a lower level via positive reappraisal (Sheppes & Meiran, 2007). Moreover, other research findings demonstrated that changes in affect are linked to the appraised intensity and controllability of an event, underscoring that positive reappraisal is more situation-

dependent (Van Eck et al., 1998). By knowing this, it might be of value to assess trait positive reappraisal beforehand and state level during different time points of the stress induction task.

A further point of consideration is that the results have demonstrated a weak negative correlation between the association of trait positive reappraisal and stressful life events. This could mean that people who experience more stressful life events tend to use less trait positive reappraisal. That stressful life events can lead to negative feelings and even to the development of affective disorders like depression in which people commonly experience automatic negative thoughts (Yavuzer & Karatas, 2017), might indicate that the frequent experience of such events contributes to a negative response tendency.

Furthermore, contradictory to the first hypothesis, empirical evidence indicates a U-shaped relationship between stressors as well as mental health and well-being (Seery, 2011). This suggests that experiencing stressful life events offers to learn how to apply emotion regulation and to "toughen" (i.e., perceiving adverse situations as manageable) under the premise that there was the possibility for recovery in between (Dienstbier, 1989; Seery, 2011). According to the theory of stress inoculation, this effect occurs if stressful events are experienced in graduated practice or small doses (Ashokan et al., 2016; Jaremko & Meichenbaum, 2013). The heightened affective stress reaction that was demonstrated in this study, however, indicates that the individuals might not have experienced this optimum level to handle stress better.

Limitations and Future Research Directions

The current study comes with a variety of strengths. Firstly, to the researcher's knowledge, this was one of few studies to focus on the association of stressful life events and negative affective stress reactivity as well as a potential moderating effect of trait positive reappraisal in a laboratory setting. The focus on a healthy sample offered to consider preventive implications regarding detrimental health outcomes. Further, the controlled laboratory setting had the benefit of tighter control of confounding variables as well as a precise investigation of the reaction to a standardized stress stimulus (Chida & Hamer, 2008). Next, the participants were unaware of the purpose of the study which reduced a change in their behaviour. Also, more influencing stressful life events were included because the variable was assessed on a broad timespan in contrast to typical ESM studies.

Nevertheless, conclusions based on this study should be drawn with caution. Only short-term stress was induced and the dynamics of affective processing that occur in real life were not

captured. Besides, it is important to consider that the study took place in an artificial environment so inferences about daily stressors and stress reactions are restricted (Chida & Hamer, 2008). Henceforth, laboratory settings can include an impact of the researcher-participant interaction like a social desirability bias or gestures and articulation of the researcher (e.g., when giving instructions) that could influence the participant's perception of the task (De Calheiros Velozo et al., 2021; Nederhof, 1985). Moreover, the utilized retrospective self-reports might have been prone to recall errors and biases (Weltz et al., 2016).

Further, the variable stressful life events might not have been measured thoroughly enough. More precisely, childhood adversities were not assessed despite the evidence that shows its impact on later affective stress sensitisation (e.g., Grasso et al., 2013; Infurna et al., 2015; Weltz et al., 2016). Additionally, the perceived severity of the life events was not addressed and the broad timespan could result in including stressors that are misleading for interpretations (Bifulco et al., 2019). Alternatively to utilizing a checklist approach, a standardized semi-structured interview such as the Bedford College Life Events and Difficulties Schedule can be conducted (Carnegie Mellon University, n.d.) for deeper insights into the severity, on- and offset, emotional significance, etc.

Another aspect is that the sample is considered as homogeneous as it consists of 53 mainly female, well-educated, Belgian young adults. Studies show that females are more prone to respond to psychological stress with negative affect and that young adults experience more daily stressors and generally feel a stronger negative affect than older adults (Kelly et al., 2008; Stawski et al., 2008). This makes it difficult to draw conclusions on healthy and unhealthy stress sensitisation (Stawski et al., 2008). It would be of interest to assess a more heterogenous and representative sample (e.g., include more males and a bigger age range) to make precise predictions.

Conclusion

This study aimed to explore what enhances and buffers negative affective stress reactivity in a controlled laboratory setting. The results suggest that a higher number of stressful life events is associated with heightened affective responsiveness when being exposed to an acute stressor. Hence, frequent exposure sensitises the stress system to react emotionally stronger towards minor stressors. Further, trait positive reappraisal does not reduce this association and thus, does not buffer an individual from becoming sensitised towards stressful life events. This indicates that

state positive reappraisal might be decisive in being a functional emotion regulation strategy. Future research should use more sensitive measures of stressful life events and positive reappraisal. Nonetheless, the findings could increase awareness in becoming sensitised towards stress which puts people at risk for developing detrimental physical and mental health, and well-being effects. This might stimulate prevention measures and the development of stress resilience already in healthy individuals.

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