Forschung

Do Emotion Regulation Strategies Moderate the Influence of Stress-Induced Depressive Mood?

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Abstract **Die vorliegende Studie untersucht, ob verschiedene Strategien zur Emotions-Regulation die Beziehung zwischen chronischem Stress und depressiver Stimmung moderieren. Dazu beantworteten 299 Rekruten während ihres Militärdienstes subjektive Fragebögen zu chronischem Stress, Depression und ihren Regulations-Strategien. Die Strategie der Neubewertung (Veränderung der Denkweise), so das Ergebnis der Studie, wurde negativ mit chronischem Stress und depressiver Stimmung assoziiert. Die Strategie der Unterdrückung (Veränderung der Reaktion) wurde weder mit chronischem Stress noch mit depressiver Stimmung assoziiert. Rekruten mit einer starken Neubewertung entwickelten weniger stressinduzierte Symptome als solche mit einer schwachen Neubewertung. Das deutet darauf hin, dass Neubewertung bei hohem Stress als Puffer dient. Unterdrückung war kein Moderator zwischen chronischem Stress und depressiver Stimmung. Dies stimmt mit den Befunden bisheriger Forschung überein, dass Strategien nicht als generell adaptiv oder maladaptiv betrachtet werden können.**

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Abstract

Chronic stress is associated with depressive symptoms and several personality differences have been found to moderate this interaction. Up to now, it has remained unclear, whether different emotions regulation strategies would affect this as well. Therefore, this study analyzed the interaction of chronic stress and emotion regulation strategies in the development of depressed mood. A total of 299 recruits were examined during their basic military training and answered subjective questionnaires about chronic stress, depression and emotion regulation strategies. The strategy of reappraisal (changing the way of thinking) has been shown to be negative related to chronic stress and depressed mood, whereas the strategy of suppression (changing the method of response) was unrelated to both. Additionally, results show that high reappraisers are less likely to develop stress-induced depressive symptoms than low reappraisers. This finding indicates that reappraisal acts as a partial buffer in condition of high chronic stress. Surprisingly suppression did not act as a moderator between chronic stress and depressed mood. This finding underlies previous research, that different strategies are not considered universally (mal-) adaptive. Implications of the present findings for research and military basic training are discussed.

The impact of chronic stress on health

Not only in daily life but also in science, chronic stress has received plenty of attention for decades. In particular, investigations considering the influence of chronic distress on health has increased. For example, studies showed that distress is related to myocardial infarction in parents who lost a child (Li, Hansen, Mortensen, and Olsen 2002), to a faster progression of clinical AIDS condition after several critical life events (Leserman et al. 2002) or to slower wound healing in woman caring for relatives suffering dementia (Kiecolt-Glaser et al. 1995). Chronic stress can provoke an imbalance of neural circuitry as well, which under persistence can lead to maladaptation in systemic physiology (McEwen 2017). The effect of chronic distress is not simply an impact on physical but also on mental health. Notably its relationship to symptoms of depression has been confirmed in numerous studies. Chronic stress, such as an extended period of financial difficulty, marital conflict or physical illness, can increase depressive symptoms (McGonagle and Kessler 1990). Further predictors of an increased number of depressive symptoms are long-term daily hassles (Hutchinson and Williams 2007) and unfavorable working conditions (Cohidon et al. 2010), as well as caregiving (Schulz et al. 2008) and undefined chronic stress (Zawadzki 2015).

«The effect of chronic distress is not simply an impact on physical but also on mental health.»

Numerous studies have investigated these issues, including McEwen (1998), who used the allostatic load model to describe the effects of chronic stress on health and disease. This model postulates that in distress the body tries to keep or rebuild homeostasis. This process of keeping or rebuilding leads to physiological costs (allostatic loads). Dependent of the duration of distress and accumulation of allostatic loads, the consequences are physical diseases and/or mental disorders. The physiological reactions towards stress are reliant on the intensity of the stressor, as well as on the subjective evaluation of the person who experiences the situation. The latter is determined by individual experiences and differences. Coping mechanisms and psychosocial skills play an important role (Ehlert 2011). Based on this model, a non-linear relation between chronic stress and psychological symptoms is assumed, which seems to be influenced by individual differences.

Individual differences as moderator

Previous studies have focused on the nonlinear relation of chronic stress and psychological symptoms, especially depressive symptoms, and have researched different factors influencing this relation. Hutchinson and Williams (2007) found that neuroticism moderates the relation of chronic stress and depressive symptoms. Highly neurotic persons developed more depressive symptoms in conditions of high daily distress in contrast to non-neurotic persons. Extraversion, in contrast, does not moderate the effect of chronic stress on depressive symptoms (Uliaszek et al. 2012). Further moderating effects on the relation of distress and depressive symptoms were found for external and internal locus of control (Johnson and Sarason 1978; Sandler and

Lakey 1982), optimism (Chang 1998; Chang and Sanna 2003) and resilience (Hjemdal et al. 2006).

Interestingly, up to now the impact of emotion regulation strategies on the relationship of chronic stress and depressed mood remains unclear although it would be of interest because emotion regulation strategies influence the process of dealing with distress (Jamieson, Mendes, and Nock 2013; Naragon-Gainey, McMahon, and Chacko 2017).

Theoretical model of emotion regulation

The interest in emotion regulation has recently grown rapidly in various fields across psychology, such as social, biological, cognitive and developmental (Gross 2015). The impact of emotion regulation is summarized in the process model described by Gross (2015). This process model specifies a timeline for different strategies to regulate emotions. It predicts that different strategies lead to different consequences for how a person thinks, feels and acts; these responses can happen instantly and over time (Gross 2015). Emotion regulation strategies can be distinguished with a primary focus on the two specific strategies of cognitive *reappraisal* and *emotion suppression*. Reappraisal is a strategy wherein an emotion-eliciting situation is reinterpreted into a non-emotional one; this is used before emotion response tendencies have become fully activated. In contrast, the suppression strategy is used if these response tendencies have already been generated and implies the inhibition of actual emotional behavior (Gross 2015).

Emotion regulation strategies

The two emotion regulation strategies are considered personality traits and differ in their effects (Gross 2002). Reappraisal count to adaptive, whereas suppression assigns to maladaptive emotion regulations strategies (Aldao 2013). Therefore, the different strategies have different affective, cognitive and social consequences (Gross 2002; Nezlek and Kuppens 2008). Whereas reappraisers express and experience more positive and less negative emotions, suppressors report fewer positive emotions (Gross and John 2003). Cognitive consequences were found for suppression, including memory impairment, whereas reappraisal actually improves memory (Richards and Gross 2000; Hayes et al. 2011). Suppressors seem to have less social contact and support (Gross 2002), feel less authentic, and are introverted and pessimistic, whereas reappraisers are more satisfied with their lives, have better self-esteem and are optimistic (Gross and John 2003). Using reappraisal has cumulative benefits (Brockman et al. 2017) whereas using of suppression has cumulative cost on wellbeing (Nezlek and Kuppens 2008). Furthermore both strategies are associated with psychopathology (Aldao, Nolen-Hoeksema, and Schweizer 2010). The impact of the different strategies depends as well on the person using them, the situation in which they are used (Kashdan and Rottenberg 2010; Gross 2015) and the goals that the person has in the particular situation (Gross 2015). One study found that reappraisal is adaptive when the stressor is uncontrollable and maladaptive if the stressor can be controlled (Troy, Shallcross, and Mauss 2013).

«Reappraisal and suppression have also been linked to chronic stress.»

Reappraisal and suppression have also been linked to chronic stress (Gross and John 2003; Zawadzki 2015) and depressive symptoms (Aldao, Nolen-Hoeksema, and Schweizer 2010; Gross and John 2003; Berking and Wupperman 2012). In stressful situations, reappraisers take an optimistic attitude, reinterpret the stressor and strive actively for mood improvement. Suppressors, however, disguise their feelings, ruminate and are not effective in mood improvement (Gross and John 2003). Similar to the relation to chronic stress, reappraisal is negatively linked to depressed mood whereas suppression is positively linked (Abler and Kessler 2009; Gross and John 2003; Moore, Zoellner, and Mollenholt 2008; Wiltink et al. 2011). Furthermore, depressive or recovered-depressed people use more suppression as an emotion regulation strategy than healthy people (Campbell-Sills et al. 2006; Ehring et al. 2010).

The present study

The use of reappraisal and suppression has different affective, cognitive and social consequences, and is linked to stress and depressed

mood. Past research suggests that different emotion regulation strategies could moderate the link between chronic stress and depression, but no study has tested this suggestion yet. The present study aims to close this gap and examine the effects of reappraisal and suppression on stress-induced depression. In the current study, chronic stress, depressed mood and emotion regulation strategies were examined to test three hypotheses. First, the influence of chronic stress on depressed mood should be replicated (Hypothesis 1). Secondly, based on the literature mentioned above we expected moderator effects of reappraisal and suppression on the relation of chronic stress and depressed mood. Therefore, we postulated that reappraisal diminishes the relation of chronic stress and depressed mood (Hypothesis 2) whereas suppression strengthens it (Hypothesis 3).

Participants and procedure

This study was part of a larger project on mental and physical health during military service (Boesch et al. 2014; Wyss & Annen 2012) and received ethical approval from the Ethics Committee of the Canton of Aargau, Switzerland. Subjects were 299 German-speaking male recruits during their basic training in the infantry troops of the Swiss Armed Forces Infantry School.

Participants completed four assessments (baseline, week four, week seven, and week eleven) during their basic military training. The self-report measures were completed online in a controlled setting and were randomized. The present study focuses on data from week seven.

The responses provided by 60 participants were dropped from the study because they had not signed the consent declaration (N = 6), or they were either incomplete (N = 41) or not answered seriously (N = 13). The latter was defined by means of standard deviations of 0 for equidistant items, with the risk of the exclusion of false positives. Hence, the responses provided by the remaining 239 (79.93% from baseline) participants were used. The mean age for this sample was 20 years (M = 20.39, SD = 0.99) with a range from 18 to 25 years. The level of education completed ranged from 38.5% lower secondary school, 40.6%% upper secondary school and 15.9% academic high school. 32.2% of participants were employed, 0.8% self-employed and 55.2% unemployed.

Measures

Chronic stress was measured with the German version of the perceived stress questionnaire (PSQ). The PSQ is a self-report measure designed to assess the actual and subjective perceived pressure of the previous four weeks (for example "You feel that too many demands are being made on you"). The scale consists of 20 items, which represent four 5-item factor scales (worries, tension, joy, demands) and an overall score. Respondents are asked to rate the extent of their agreement to these items across a 4-point Likert scale ranging from 1 (almost never) to 4 (usually). Higher overall scores reflect greater perceived stress in the previous four weeks. The scale has been demonstrated to have a satisfactory construct validity (Fliege et al. 2001). Cronbach's alpha for the current sample was .88 (overall score).

Depressed mood was assessed with the depression subscale of the German version of the brief symptom inventory (BSI). It involves six items reflecting common symptoms associated with depression. The respondents are asked to rate the extent to which they have been bothered in the past week (for example "During the past 7 days, how much were you distressed by feeling hopeless about the future") on a 5-point Likert scale ranging from 0 (not at all) to 4 (extremely). Higher scores reflect a higher depressed mood during the past week. The scale discriminates well between clinical patients and healthy people and has been demonstrated to have a satisfactory construct validity (Franke, 2000). The Cronbach's alpha was .90 for the present sample.

Emotion regulation strategies were assessed with the German version of the emotion regulation questionnaire (ERQ). Ten items determine the individual's tendency to use either reappraisal or suppression as an emotion regulation strategy. Six items contain reappraisal (for example "When I'm faced with a stressful situation, I make myself *think about* it in a way that helps me stay calm") and four items suppression (for example "When I am feeling *negative* emotions, I make sure not to express them"). Respondents are asked to rate their agreement on a 7-point Likert scale ranging from 1 (strongly disagree) to 7 (strongly agree). The two scales are unrelated and have shown satisfactory convergent validity (Abler and Kessler 2009). Cronbach's alphas for the current sample were .70 (suppression) and .86 (reappraisal).

Statistical analyses

All statistical analyses were performed using SPSS® 19.0 (IBM Corporation, Armonk NY, USA) for Windows XP®. Two separate hierarchical regression analyses were conducted to evaluate the moderation effect of reappraisal and suppression on the relation of chronic stress and depressed mood. Chronic stress and the moderator variable were entered in the first step, followed by the multiplication of these in the second step. Once the interaction is a significant predictor for depressed mood, the moderation hypothesis receives full support. To prevent multicollinearity all independent variables were centered. None of the calculations harmed the criteria (Field 2009) for multicollinearity and autocorrelation.

To illustrate the moderation effect of the emotion regulation strategies on the relation of chronic stress on depressed mood, regressions at high and low levels in the moderator variable were plotted. Consistent with guidelines (Aiken and West 1992; Holmbeck 2002) simple slopes were conducted by using high (one standard deviation above the mean) and low (one standard deviation below the mean) values for chronic stress and moderator variables.

Results

Correlations between all study measures, means and standard deviations are presented in Table 1. The associations between depressed mood, chronic stress and reappraisal were significant. Reappraisal was negatively correlated with depressed mood and chronic stress. As expected, depressed mood and chronic stress were positively related. Suppression was uncorrelated with depressed mood and chronic stress, but positively correlated with reappraisal.

Table 1
Means, standard deviations and Pearson correlation (1-tailed) for all study measures

	M	SD	n	1	2	3	4
1. Depressed mood	0.50	.74	239	--			
2. Chronic stress	40.46	15.62	239	.48***	--		
3. Reappraisal	4.63	1.04	237	-.29***	-.26***	--	
4. Suppression	4.12	1.04	237	-.04	.08	.19**	--

Note. **p < .01. ***p < .001

To test whether chronic stress predicts higher depressed mood a linear regression analysis was conducted. The overall stress score showed significant effect on depressed mood ($\beta = .48$, $p < .001$) and accounted for 23.4% of its variance ($R^2 = .234$, $p < .001$). Therefore, hypothesis 1 can be confirmed.

Reappraisal as moderator

To analyze the impact of reappraisal as a moderator between chronic stress and depressed mood a hierarchical regression analysis was conducted. In the first step, chronic stress and reappraisal were entered. Both variables showed significant effect ($\beta_{stress} = .44$, $p < .001$; $\beta_{reappraisal} = -.18$, $p < .01$) and account together for 26.1% of the variance in depressed mood ($R^2 = .261$, $p < .001$). In the second step, the interaction between chronic stress and reappraisal was entered. The interaction term was a significant predictor for depressed mood ($\beta = -.19$, $p < .01$) and accounted for additional variance of 3.4% ($\Delta R2 = .034$, $p < .01$) even after partialling out variance accounted for by stress and reappraisal. It is important to note that interactions are difficult to detect and that additional accounted variance over 1% should be considered as a relevant finding (Evans, 1985).

Post-hoc conducted simple slope tests showed two significant relations between depressed mood and chronic stress for high ($\beta = .28$, $p < .001$) and low reappraisal ($\beta = .56$, $p < .001$). As shown in Figure 1, high reappraisers had depressed mood means of 0.13 for low stress and 0.54 for high stress conditions. Whereas low reappraisers had depressed mood means of 0.21 for low stress and 1.02 for high stress conditions. Hypothesis 2 therefore receives full support. Reappraisal acts as a significant moderator between chronic stress and depressed mood.

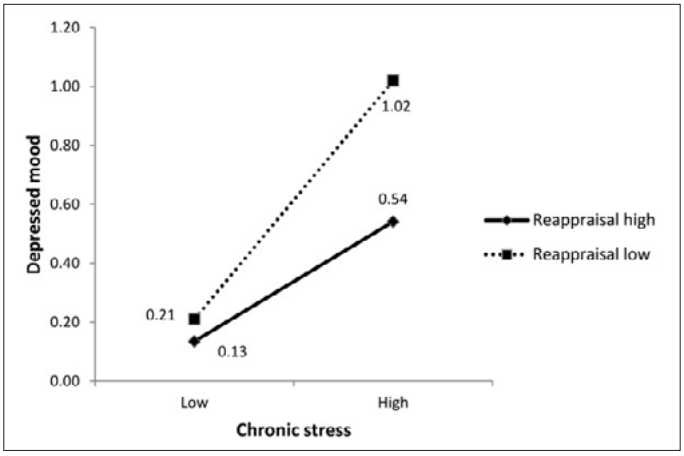

Figure 1. Simple slopes for the relations of chronic stress and depressed mood for high and low reappraisal.

Suppression as moderator

Linear regression analyses showed that suppression was not a predictor for depressed mood (β = -.04, p = .567) or for chronic stress (β = .08, p = .234). To test moderation hypothesis a significant relation between predictor and dependent variable is not required (Baron & Kenny, 1987). Hence, a hierarchical regression analysis was conducted to analyze the impact of suppression as a moderator between chronic stress and depressed mood. Chronic stress and suppression were entered as the first step. Chronic stress showed significant effect on depressed mood (β = .49, p < .001), whereas suppression was not significant (β = -.08, p = .189). In the second step, the interaction between chronic stress and suppression was entered. The interaction term was not a significant predictor for depressed mood (β = -.08, p = .196) and did not account for additional variance. Therefore, hypothesis 3 must be rejected. Suppression does not act as a moderator between chronic stress and depressed mood.

Discussion

The current study aimed to provide an understanding about the extent to which emotion regulation strategies moderate the influence of chronic stress on depressed mood. As expected, chronic stress is a significant predictor for depressed mood. This finding is in line with previous investigations that have shown that chronic stress has a negative impact on health and can induce depressive symptoms (for example Cohidon et al. 2010; McGonagle and Kessler 1990; Schulz et al. 2008).

The important role of reappraisal

In line with previous findings, the current study suggests that reappraisal is negatively related to chronic stress and depressed mood (Gross and John 2003; Wiltink et al. 2011). In addition, the current study showed that reappraisal has a direct impact on developing a depressed mood. This result is in line with previous studies, which found that a deficit in emotion regulation, such as negative mood regulation (Kassel, Bornovalova, and Mehta 2007) or maladaptive cognitive coping styles (Kraaij, Pruymboom, and Garnefski 2002), could predict depressive symptoms. Furthermore, as predicted reappraisal acts as a moderator between chronic stress and depressed mood. High reappraisers are less likely to experience a depressed mood under conditions of high chronic stress than those who did not use reappraisal under similar stress condition.

Simple slopes analyses have shown that reappraisal operates as a partial distress-buffering factor at the time of high stress. In high chronic stress situations, reappraisers suffer depression at nearly half the rate as persons with a low use of reappraisal. However, a high use of reappraisal cannot completely diminish the negative impact of chronic stress on depressed mood.

The result indicates the importance of using reappraisal to handle chronic stress situations. Efficiently modifying a potentially emotion-eliciting situation in a way that changes it in a non-emotional one provides a protective effect towards the consequences of chronic stress. This finding is in line with the process model of Gross (2002) postulating reappraisal as a trait whereby daily positive effects of using reappraisal can be cumulated. It would be interesting to investigate the relationship in a sample of women (in contrast to the present male sample), since studies found a moderating effect of gender on the relationship of emotion regulation and depressive symptoms (Duarte, Matos, and Marques 2015).

Suppression of emotions

Suppression is correlated neither with chronic stress, nor with depressed mood and has no impact on these variables. Likewise, suppression does not act as a moderator between chronic stress and depressed mood. In previous research, suppression has been positively linked with chronic stress as well as with depressive symptoms (Ehring et al. 2010; Moore et al. 2008). Thus, the present findings are unexpected.

Gross and John (2003) noticed that the suppression of emotions is not always harmful, but can be an important function in maintaining communications and relationship to others. The results of the current study could be a further indication, that in specific situations and life circumstances the masking of emo-

«The current study showed that reappraisal has a direct impact on developing less depressed mood in chronic stress situations.»

tions could be useful. In basic military training pressure to perform and peer pressure is common (Burchett et al., 2016). Because of this, one could argue that emotions were demonstrated less frequently, because they are associated with weakness. People who normally do not use suppression were constrained to do so because of the specific situation. Thereby it could be that the ERQ in basic military training measures a situational and not habitual suppression. For this assumption we point out the higher average of suppression in the current study (M = 4.12) compared to the validation study (M = 3.4; Abler & Kessler 2009). In this case, cumulative negative time dependent effects of suppression as postulated by Gross (2002) cannot be determined. This could be an explanation of the missing significant associations. Considering this theory of situational suppression, we speculate that it may be possible to suppress emotions for a limited period, such as the basic military training, without suffering negative consequences. Consciously adopting suppression as an emotion regulation strategy, for a limited time, could serve to enhance self-control and protect self-esteem.

This interpretation is in line with previous findings showing that different strategies have different consequences but the most suitable emotion regulation strategies depend on the person and the situation (Gross 2015; Kashdan and Rottenberg 2010). Therefore, it is important to be flexible in emotion regulation strategies in order to adapt them to each specific circumstance (Bonanno and Burton 2013). Remaining inflexible is probably maladaptive and flexibility is likely to be proven beneficial (Aldao 2013). The adaptive value of this flexibility and variation of emotion regulation strategies in different contexts must be investigated in future research. It seems that certain strategies are more or less adaptive, and therefore the situational conditions, such as the military basic training in the present study, should always be considered as a factor in the interpretation of results.

Another explanation for the non-significant moderator effect could be found in a study by Moore et al. (2008) who detected a mediation effect of rumination between suppression and depressive symptoms. In basic military training recruits have very little leisure and rarely have time to reflect and are thereby less prone to ruminate. This could be another reason for the nonsignificant effect of suppression on depressive mood in the current study.

Implications

The findings from the current study might prove helpful in stress-management theories and therapies. Helping distressed people learn a useful way to avoid or better manage their chronic stress is important. Therefore, one potential outcome from this research could be to suggest that reinterpreting an emotion-eliciting situation is healthy and helps decrease the negative impacts of chronic stress.

Furthermore, the current findings are important for military organizations. Basic military training is a chronic stressor (Boesch et al. 2015; Bernton, Hoover, Galloway, and Popp 1995), which increases the possibility of developing a depressed mood. Therefore, supervisors should pay close attention to depression-prone recruits. In addition, the measurement of emotion regulation strategies could be implemented into the selection procedures to predict the conscript's ability to cope with the specific circumstances of military basic training. Furthermore, it would make sense in the context of training, to convey the role of emotion regulation and learning to differ adaptive and maladaptive strategies. This could be integrated into existing trainings for soldiers or senior staff members, for example the Army Resilience Training (Niederhauser, Zueger, and Annen 2017). In addition, the current findings could be worthwhile for non-military organizations with (strong hierarchical) structures and daily activities comparable to the army.

Limitations and directions for future research

Several limitations to the present study must be mentioned. First, it must be noted that the participants in the current study were recruits. Given the context of a conscript army cohort, the random sample is characteristic only of young and healthy male adults. Generalization to other populations should be made cautiously and cohort effects cannot be excluded. It would be important to replicate the present findings in future studies across other populations. Second, prior to the military basic training a pre-selection with performance and psychological tests has taken place; therefore a selection bias may have already affected the "random sample" group. Third, the study is cross-sectional and therefore causal interpretations are not possible. Further research should be longitudinal to address issues related to causality. Finally, these results are based on self-reported questionnaires, which

is at risk of being affected by socially desirable answering. Future studies with both subjective and objective measure of stress are needed to find out more about the association of chronic stress and depressed mood.

Previous research has found different personality traits acting as a moderator between distress and depressive symptoms (for example Chang and Sanna 2003; Heinisch and Jex 1997; Hutchinson and Williams 2007). Further studies should shed light on the integrative pattern of these traits. Chronic stress and reappraisal together accounted for only 28.2% of variance indicating that other factors must be involved in developing stress-induced depressed mood. It may be that a combination of personality traits functioning together is what allows a person in high stress conditions to stay healthy and avoid developing depressive symptoms. In addition, the combination of both emotion regulation strategies and their consequences should be investigated. Furthermore, future studies should examine the moderating effect of additional emotion regulation strategies and coping styles. A particular focus on rumination is recommended because this emotion regulation strategy has the strongest relationship with psychopathology (Aldao et al. 2010; Zawadzki 2015).

Despite these limitations, the findings of this study suggest that reappraisal as an emotion regulation strategy plays a significant and important role in the process of developing a depressed mood in high stress conditions whereas suppression does not show any impact on stress-induced depressed mood. ◆

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