

RESEARCH PAPER

Positive Emotions and Flourishing are Resilience Factors for Stress Symptoms

Benjamin Berend¹, Dominic Vogt², and Michaela Brohm-Badry¹

Corresponding author

¹ Benjamin Berend, PhD, Department of Learning and Instruction, Universität Trier, Universitätsring 15, 54296 Trier, Germany. Tel.: +49-(0)651-201-23 77
Email: berend@uni-trier.de Fax: +49-(0)651-201 39 41

Affiliations

¹ Department of Learning and Instruction, Universität Trier, Universitätsring 15, 54296 Trier, Germany

² Formerly Universität Trier, Universitätsring 15, 54296 Trier, Germany; no current university affiliation

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There are no conflicting interests with regard to our article.

Ethical statement

Our research was undertaken in accordance with the professional ethics guidelines of the German Society for Psychology (DGPs).

Abstract

Background Flourishing has been shown to strengthen resilience and improve our health status whereas chronic stress has frequently been reported to affect health. This study aims to estimate possible stress-buffering effects of flourishing (in general and especially with regard to positive emotions) on mental stress symptoms.

Methods We collected questionnaire data of 128 university students (67,2% female) before and during an examination period. Using the R package “mediation” (Tingley et al. 2014), we estimated associations between flourishing (general and with a focus on positive emotions) and stress symptoms, as well as mediating effects of perceived stress.

Results Higher scores in flourishing significantly predicted less problems with concentration, irritability, restlessness, lack of initiative, and burnout. All of these associations were significantly mediated by the perceived level of stress. Furthermore, higher scores in the positive emotions scale were significantly linked to less problems with concentration, irritability, restlessness, lack of initiative, emotional exhaustion, and burnout. These associations were also mediated by perceived stress levels.

Discussion Our results are in line with recent positive-psychological research. Flourishing and positive emotions may lead to lower levels of perceived stress and subsequently to less stress symptoms.

Conclusions Our results emphasize the importance of flourishing and positive emotions as resilience factors.

Keywords: Positive Emotions, Flourishing, Stress, Resilience, Health

Abstrait

Contexte Il a été démontré que l'épanouissement renforce la résilience et améliore notre état de santé, alors que le stress chronique affecte souvent la santé. Cette étude vise à estimer les éventuels effets tampons du stress de l'épanouissement (en général et surtout en ce qui concerne les émotions positives) sur les symptômes de stress mental.

Méthodes Nous avons recueilli les données du questionnaire de 128 étudiants universitaires (67,2% de femmes) avant et pendant une période d'examen. En utilisant le package R «médiation» (Tingley et al. 2014), nous avons estimé les associations entre l'épanouissement (général et axé sur les émotions positives) et les symptômes de stress, ainsi que les effets médiateurs du stress perçu.

Résultats Des scores plus élevés dans l'épanouissement prédisent significativement moins de problèmes de concentration, d'irritabilité, d'agitation, de manque d'initiative et d'épuisement professionnel. Toutes ces associations ont été significativement médiées par le niveau de stress perçu. De plus, des scores plus élevés dans l'échelle des émotions positives étaient significativement liés à moins de problèmes de concentration, d'irritabilité, d'agitation, de manque d'initiative, d'épuisement émotionnel et d'épuisement professionnel. Ces associations étaient également médiées par les niveaux de stress perçus.

Discussion Nos résultats sont en ligne avec les récentes recherches en psychologie positive. Des émotions positives et florissantes peuvent conduire à des niveaux inférieurs de stress perçu et par la suite à moins de symptômes de stress.

Conclusions Nos résultats soulignent l'importance des émotions épanouies et positives comme facteurs de résilience.

Mots clés: émotions positives, épanouissement, stress, résilience, santé

1. BACKGROUND

Chronic stress has been reported to negatively affect physical and mental health (Hellhammer, Hero, Gerhards, & Hellhammer, 2012; Juster, McEwen, & Lupien, 2010; Tafet

& Nemeroff, 2015). Chronic stress has been linked to impaired immune function (Cohen et al., 2012), cardiovascular function, and autonomic regulation (Lucini, Di Fede, Parati, & Pagani, 2005).

Moreover, chronic stress has been shown

to be associated with a higher frequency of mental disorders (Tennant, 2001) such as anxiety disorders (Morschitzky, 2009), and mood disorders (Arborelius, Owens, Plotsky & Nemeroff, 1999; Taft & Nemeroff, 2015; Tennant, 2001). In addition, high levels of chronic stress have been reported to be linked to increased depressive symptomatology (Pruessner, Hellhammer, Pruessner & Lupien, 2003), such as high irritability, decreased interest, psychomotor agitation or retardation, loss of energy, and problems of concentration (see American Psychiatric Association [APA], 2013).

Recovery during sleep may reduce negative chronic stress effects on health (Geurts & Sonnentag, 2006), whereas both acute and chronic stress have been shown to be associated with an impaired overnight recovery (Hall et al., 2004; Lindholm et al., 2009; Lindholm et al., 2012; Vrijkotte, van Doornen, & Geus, 2000). Thus, it is not surprising that chronic stress has been shown to be linked to exhaustion (Waeldin, Vogt, & Hellhammer, 2015), and burnout (Etzion, 1984).

The concept of human flourishing (Seligman, 2011) includes different factors that may counteract high stress load, and subsequently potential health damaging of stress. Flourishing emerges in a psychosocial environment that is characterized by positive emotions, engagement, relationships, meaning, and accomplishment (Seligman, 2011). Hereby, particularly positive emotions have been shown to decrease perceived stress and effects of stress on health (Denovan & Macaskill, 2016; Folkman, 2008; Folkman & Moskowitz, 2000), and to improve coping processes (Folkman, 2008; Gloria, Faulk, & Steinhardt, 2013; Waugh, 2014), as well as emotion regulation in response to acute stress (Ong, 2006; Tugade & Fredrickson, 2004). In this context, Fredrickson, Mancuso, Branigan, & Tugade (2000) describe the undoing effect of positive emotions. Interestingly, the experience of positive emotions causes a faster cardiovascular and also cognitive recovery after the experience of negative emotions (Fredrickson & Levinson, 1998; Fredrickson, Mancuso, Branigan, & Tugade, 2000; Falkenstern, Schiffrin, Nelson, Ford, & Kaiser, 2009; Liu, Ishimatsu, Sotoyama, & Iwakiri, 2016). Greater positive affect is hence related to a lower mortality risk (Okely, Weiss, & Gale, 2017). Additionally, the Broaden-and-Build Theory (Fredrickson, 2004) describes that positive emotions enhance the process of building physical, intellectual and social resources. Besides positive emotions, other flourishing-factors are related to stress as well: Considering engagement, Peifer, Schulz, Schächinger, Baumann, & Antoni, (2014) have

shown that high physiological arousal under stress negatively impacts flow-experience. Commitment and control (as measure for engagement) have been shown to be linked to reduce the impact of recent life stress on health (Kobasa, 1982; Schmitz, Neumann, & Oppermann, 2000). Social support has been linked to higher subjective well-being and decreased stress vulnerability (Ditzen & Heinrichs, 2007; Inagaki & Eisenberger, 2015). Moreover, finding meaning in life has been reported to improve coping processes and decrease perceived stress load (Park, 2010). Self-efficacy (as measure for accomplishment) has been shown to be associated with a lower perceived stress load, which in turn has been linked to burnout and exhaustion (Prati, Pietrantonio, & Cicognani, 2010; Schwarzer, 2008). Furthermore, positive psychology interventions have been shown to increase perceived well-being and to decrease depression severity (Bolger et al., 2013).

The aim of our study was to estimate possible associations between flourishing (in general and especially with regard to positive emotions) before a stressful test phase and perceived stress as well as mental stress symptoms during a perceived stressful test phase in university students. Almost 50 percent of university students in Germany show an above-average level of perceived stress as well as feelings of overextension, while at the same time showing a lack in the use of effective strategies against these circumstances (Thees, Gobel, Jose, Bohrdardt, & Esch, 2012).

We have examined the three hypotheses listed below. Due to the vast number of findings showing the impact of positive emotions on stress and stress-related phenomena mentioned above, we were especially interested in this pillar of flourishing. Therefore, we investigated the potential association for (1) flourishing, and for (2) positive emotions in particular.

H1: Flourishing before the test phase predicts perceived stress load and stress symptoms during the test phase.

H2: Positive emotions before the test phase predict perceived stress load and stress symptoms during the test phase.

H3: Perceived stress load during the test phase mediates the association between flourishing and positive emotions before the test phase and stress symptoms during the test phase.

2. METHODS

We included 137 subjects of a university course in our study. We informed the students about all necessary procedures, the

aim of the study, that participation is voluntary, and that they may cancel participation without giving reasons. All interested students signed a written informed consent. We collected questionnaire data at (1) baseline before a stressful university test phase, and (2) four weeks after baseline during the test phase. Nine of the 137 individuals (88.89% female, mean age of 20.89 (SD= 0.74) years), dropped out of the study without giving any reason, leaving a sample of 128 subjects for analyses.

Questionnaire data included socio-economic data on sex and age as well as data on flourishing, positive emotions, perceived well-being, perceived stress load, and mental stress symptoms. We assessed flourishing using the German version (Esch, Jose, Gimpel, Scheidt, & Michalsen, 2013) of the flourishing scale (FS, Diener et al., 2009). For measuring the frequency of positive emotions, we used the subscale for positive emotions of the scale of positive and negative experience (SPANE-P, Diener et al., 2009). We determined perceived stress load with the 4-item version of the perceived stress scale (PSS-4; Cohen, Kamarck, & Mermelstein, 1983). Furthermore, we assessed the frequency of mental stress symptoms (problems with concentration, irritability, restlessness, lack of initiative, emotional exhaustion and burnout). We used 5-point Likert scales for items of the flourishing scale (0=disagree, 1= rather disagree, 2= neutral, 3= rather agree, 4= agree), and for mental stress symptoms, items of the SPANE-P and the PSS-4 (0=never, 1=rarely, 2=sometimes, 3= frequently, 4= very often). Internal consistency of the scales FS (Cronbachs $\alpha = .78$), SPANE-P (Cronbachs $\alpha = .89$), and PSS-4 (Cronbachs $\alpha = .92$) were acceptable to very good. We grouped the mental and physical stress symptoms according to their frequency into *occasional symptoms* (symptom frequency “sometimes” or less) and *frequent symptoms* (symptom frequency “frequently” or higher).

2.1 Statistical Analyses

For statistical analyses, we used the version 3.5.1 (R Core Team, 2018) of the statistical software “R” (R Core Team, 2008), with the version 1.1.456 of the software RStudio (RStudio Team, 2016) as environment.

First, we described sample and baseline characteristics by giving relative frequencies for nominal data on sex, and mental stress symptoms, and mean values with respective standard deviations (SD) for scale data on age, the PSS-4, the FS-D, and the SPANE-P.

Second, we analyzed if the frequency of mental stress symptoms, as well as the scores of the PSS-4, the FS-D, and the SPANE-P

changed during the test phase as compared to the measurement time point prior to the test phase. Hereby, we performed χ^2 -tests comparing the frequencies of mental stress symptoms, and paired sample t-tests for PSS-4, FS-D and SPANE-P scores.

Third, we analyzed if FS-D and SPANE-P scores predicted perceived stress and mental stress symptoms using linear and binary logistic regression models. To evaluate if positive emotions change in the frequency of mental stress symptoms over time, we included time \times flourishing or time \times positive emotion interactions respectively in the corresponding regression analysis.

Moreover, we analyzed if potential associations between flourishing or positive emotions respectively and stress symptoms were mediated by perceived stress load. Hereby, we provided the results of the different multiple linear and binary logistic regression analyses and mediation analyses using version 4.4.6 of the R package “mediation” (Tingley, Yamamoto, Hirose, Keele, & Imai, 2014). We estimated three different paths: (1) the FS-D (or SPANE-P) as predictor and the PSS-4 as outcome (path a), (2) the PSS-4 as predictor and the respective stress symptom as outcome (path b), (3) the FS-D (or SPANE-P) as predictor and the respective stress symptom as outcome (path c). Furthermore, we evaluated the total and the indirect effect (FS-D (or SPANE-P) scores as predictor, the PSS-4 scores as mediator, and the frequency of the respective stress symptom as outcome, as well as the direct effect of FS-D (or SPANE-P) scores on stress symptom frequency adjusted for PSS-4 scores.

Mediation analyses and all regression models were statistically adjusted for female or male sex. All scale data was z-transformed.

3. RESULTS

3.1 Sample characteristics

The mean age of the study participants (67.2 % female, N = 128) was 21.55 years (SD = 2.84). Without exception, the participants were third to fifth semester students of teaching. The questionnaire survey took place in the context of three identical undergraduate courses concerning learning and instruction. Baseline characteristics of the PSS-4, the FS-D and the SPANE-P score and the frequency of mental stress symptoms are presented in Table 1 and Table 2.

There were no significant differences between female and male participants with regard to the perceived stress ($t_{126} = -.172$, $p = .864$), flourishing ($t_{126} = -1.88$, $p = .062$), positive emotions ($t_{126} = -.317$, $p = .752$) and mental stress symptoms (all $p > .05$).

Table 1: Perceived stress, well-being, and flourishing at baseline

	PSS-4	FS-D	SPANE-P
N	128	128	128
Mean	6.40	3.10	2.88
SD	2.99	0.52	0.58

PSS-4 = four item version of the perceived stress scale, FS-D = Flourishing Scale, SPANE-P = subscale for positive emotions of the Scale of Positive And Negative Experience, N = sample size, SD = standard deviation

Table 2: Frequency of mental stress symptoms at baseline

	N
	128
problems with concentration	10.94 %
irritability	12.55 %
restlessness	12.50 %
lack of initiative	8.66 %
emotional exhaustion	12.89 %
burnout	10.55%

N = sample size

3.2 Increase of perceived stress levels during as compared to prior to the test phase

There was a significant increase of perceived stress ($t_{127} = -3.59$, $p < .001$), as well as significant decrease in positive emotions ($t_{127} = 4.26$, $p < .001$). Flourishing did not significantly change over time ($t_{127} = 1.72$, $p = .089$).

The mental stress symptoms (problems with concentration, emotional exhaustion and burnout) were reported significantly more often during as compared to four weeks before the test phase (all $p < .05$) irritability, restlessness, and lack of initiative did not significantly change over time (all $p > .05$, see Table 4). Descriptive data during the test phase are presented in Table 3 and Table 4.

Table 3: Perceived stress, well-being, and flourishing during the test phase

	PSS-4	FS-D	SPANE-P
N	128	128	128
Mean	7.22	3.03	2.68
SD	3.35	0.61	0.65

PSS-4 = four item version of the perceived stress scale, FS-D = Flourishing Scale, SPANE-P = subscale for positive emotions of the Scale of Positive and Negative Experience

Table 4: Frequency of mental stress symptoms during the test phase, and the test statistics for the change over time in symptom frequency as compared to baseline

	change over time		
	N	χ^2	p
	128		
problems with concentration	20.31 %	10.74	0.002 **
irritability	16.86 %	1.57	0.182
restlessness	17.19 %	2.81	0.132
lack of initiative	14.17 %	3.39	0.061
emotional exhaustion	21.48 %	7.70	0.006 **
burnout	18.75 %	7.74	0.006 **

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

3.3 Associations between flourishing and mental stress symptoms and the role of perceived stress as potential mediator

Flourishing significantly predicted perceived stress as well as problems with concentration, restlessness, irritability, a lack of initiative, emotional exhaustion and burnout. Furthermore, perceived stress was significantly associated with problems with concentration, irritability, restlessness, a lack of initiative and burnout.

There was no significant time \times flourishing interaction for the stress symptoms (problems with concentration: $B=0.02$, $SE=0.19$, $z=0.12$, $p=.905$; irritability: $B=0.14$, $SE=0.18$, $z=0.75$, $p=.451$; restlessness: $B=0.27$, $SE=0.19$, $z=1.40$, $p=.161$; lack of initiative: $B=-0.15$, $SE=0.19$, $z=-0.78$, $p=.439$; emotional exhaustion: $B=0.11$, $SE=0.18$,

	Estimate	SE	t / z	p
Path a: FS-D - PSS4	-0.66	0.05	-12.29	<.001
Path b: PSS4 - Symptom				
problems with concentration	0.78	0.13	6.20	<.001
irritability	0.38	0.11	3.39	0.001
restlessness	0.50	0.12	4.38	<.001
lack of initiative	0.59	0.13	4.61	<.001
emotional exhaustion	0.55	0.11	4.82	<.001
burnout	0.56	0.12	4.83	<.001
Path c: FS-D - Symptom				
problems with concentration	-0.42	0.10	-4.36	<.001
irritability	-0.32	0.09	-3.49	<.001
restlessness	-0.34	0.09	-3.65	<.001
lack of initiative	-0.58	0.11	-5.48	<.001
emotional exhaustion	-0.17	0.09	-1.85	0.065
burnout	-0.26	0.09	-2.76	0.006
total, direct, and indirect effect				
	Estimate	LBCI	UBCI	p-value
problems with concentration				
total effect	-0.12	-0.17	-0.07	<.001
direct effect ^a	0.01	-0.06	0.08	0.880
indirect effect	-0.13	-0.17	-0.09	<.001
irritability				
total effect	-0.10	-0.15	-0.04	<.001
direct effect ^a	-0.03	-0.09	0.04	0.474
indirect effect	-0.07	-0.12	-0.03	0.002
restlessness				
total effect	-0.10	-0.15	-0.05	<.001
direct effect ^a	-0.01	-0.08	0.06	0.780
indirect effect	-0.09	-0.13	-0.05	<.001
lack of initiative				
total effect	-0.12	-0.16	-0.09	<.001
direct effect ^a	-0.05	-0.10	0.00	0.044
indirect effect	-0.07	-0.11	-0.04	<.001
emotional exhaustion				
total effect	-0.06	-0.12	0.01	0.090
direct effect ^a	0.05	-0.03	0.13	0.190
indirect effect	-0.11	-0.16	-0.06	<.001
burnout				
total effect	-0.08	-0.13	-0.02	0.010
direct effect ^a	0.02	-0.04	0.10	0.490
indirect effect	-0.10	-0.15	-0.06	<.001

Table 5: Results of mediation analyses with flourishing as predictor, perceived stress as mediator and stress symptoms as outcome

Note: Analyses were adjusted for sex, and time.

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

^a direct effects adjusted for the mediator PSS4

SE = standard error, LBCI = lower bound CI, UBCI = upper bound CI, CI = 95% confidence interval, FS-D = Flourishing Scale, PSS-4 = four item version of the perceived stress scale

$z=0.64$, $p=.525$; burnout: $B=0.18$, $SE=0.19$, $z=0.96$, $p=.336$).

The associations between flourishing and all of the assessed stress symptoms were significantly mediated by perceived stress (all $p < .05$, see Table 5).

3.5 Associations between positive emotions and mental stress symptoms and the role of perceived stress as potential mediator

Positive emotions significantly predicted perceived stress as well as problems with concentration, restlessness, irritability, a lack of initiative, emotional exhaustion, and burnout. Furthermore, perceived stress was significantly associated with problems with concentration, irritability, restlessness, a lack of initiative, emotional exhaustion, and burnout.

There was no significant time \times positive emotions interaction for the stress symptoms (problems with concentration: $B=-0.02$, $SE=0.18$, $z=-0.08$, $p=.934$; irritability: $B=-0.03$, $SE=0.18$, $z=-0.16$, $p=.870$; restlessness: $B=0.07$, $SE=0.19$, $z=0.36$, $p=.720$; lack of initiative: $B=-0.15$, $SE=0.19$, $z=-0.78$, $p=.439$; emotional exhaustion: $B=-0.04$, $SE=0.17$, $z=-0.22$, $p=.823$; burnout: $B=-0.03$, $SE=0.18$, $z=-0.15$, $p=.884$).

The associations between positive emotions and all of the assessed stress symptoms were significantly mediated by perceived stress (all $p < .05$, see Table 6).

6. DISCUSSION

The aim of our study was to evaluate flourishing in general and positive emotions in particular as potential resilience factors for perceived stress and stress symptomatology during a stressful test phase. Our results suggest that not only perceived stress load but also stress symptomatology may increase during stressful test phases and that flourishing as well as positive emotions may constitute resilience factors for both forms of stress. These results are in line with recent positive-psychological research by demonstrating that positive emotions and human flourishing serve as resilience factors concerning stressful life events (Gloria & Steinhardt, 2014; Cohn, Fredrickson, Brown, Mikels, & Conway, 2009; Tugade & Fredrickson, 2004).

Interestingly, we observed an effect between higher levels of positive emotions and emotional exhaustion but not between

	Estimate	SE	t / z	p
Path a: SPANE-P - PSS4	-0.62	0.05	-12.34	<.001
Path b: PSS4 - Symptom				
problems with concentration	0.82	0.13	6.49	<.001
irritability	0.27	0.11	2.46	0.014
restlessness	0.37	0.11	3.25	0.001
lack of initiative	0.76	0.13	5.90	<.001
emotional exhaustion	0.46	0.11	4.13	<.001
burnout	0.49	0.11	4.31	<.001
Path c: SPANE-P - Symptom				
problems with concentration	-0.34	0.09	-3.89	<.001
irritability	-0.39	0.09	-4.33	<.001
restlessness	-0.52	0.09	-5.54	<.001
lack of initiative	-0.38	0.09	-4.09	<.001
emotional exhaustion	-0.27	0.09	-3.13	0.002
burnout	-0.34	0.09	-3.81	<.001
total, direct, and indirect effect				
	Estimate	95% CI Lower	95% CI Upper	p-value
problems with concentration				
total effect	-0.10	-0.15	-0.06	<.001
direct effect ^a	0.03	-0.03	0.08	0.360
indirect effect	-0.13	-0.17	-0.09	<.001
irritability				
total effect	-0.11	-0.16	-0.07	<.001
direct effect ^a	-0.06	-0.13	0.00	0.064
indirect effect	-0.05	-0.09	-0.01	0.030
restlessness				
total effect	-0.14	-0.18	-0.10	<.001
direct effect ^a	-0.08	-0.14	-0.02	0.006
indirect effect	-0.06	-0.09	-0.02	0.004
lack of initiative				
total effect	-0.09	-0.13	-0.05	<.001
direct effect ^a	0.01	-0.04	0.06	0.850
indirect effect	-0.10	-0.14	-0.07	<.001
emotional exhaustion				
total effect	-0.09	-0.14	-0.04	0.002
direct effect ^a	0.00	-0.07	0.07	0.988
indirect effect	-0.09	-0.12	-0.05	<.001
burnout				
total effect	-0.10	-0.15	-0.05	0.000
direct effect ^a	-0.02	-0.08	0.05	0.590
indirect effect	-0.08	-0.12	-0.04	<.001

Table 6: Results of mediation analyses with positive emotions as predictor, perceived stress as mediator and stress symptoms as outcome

Note: Analyses were adjusted for sex.

* p < 0.05, ** p < 0.01, *** p < 0.001

^a direct effects adjusted for the mediator PSS4

SE = standard error, LBCI = lower bound CI, UBCI = upper bound CI, CI = 95% confidence interval, FS-D = Flourishing Scale, PSS-4 = four item version of the perceived stress scale

flourishing scores and emotional exhaustion. The insignificant association between flourishing and emotional exhaustion may be due to the duration of the stress exposure. Our subjects reported their perceived stress level during the last four weeks, not their levels of chronic stress. Whereas acute stress has been shown to impair recovery during sleep (Hall et al., 2004), chronic stress has been reported to lead to changes in our biological stress system (Juster et al., 2010). For example, vagal tone (which is associated with recovery) has been shown to be decreased in presence of chronic work stress during work and leisure time both on work days and at weekend (Vrijkotte et al., 2000). So, perceived stress may lead to exhaustion (Waeldin et al., 2015), and physiological impairments such as depletion of norepinephrine stores (Waeldin, Vogt, Linden & Hellhammer, 2016) – especially if stress becomes chronic (Juster et al., 2010). Furthermore, it seems particularly important to consider our findings in the context of increased flourishing and positive emotions through positive psychological interventions (Bolier et al., 2013, Emmons & McCullough, 2003, Froh, Sefick, & Emmons, 2008, Sheldon & Lyubomirski, 2006).

As it is possible to increase positive emotions and flourishing, more use could be made of corresponding methods to reduce both perceived stress and stress symptoms in educational contexts. Regarding this, counting blessings, loving kindness meditation or pursuing meaningful goals (Froh, Sefick, & Emmons, 2008, Seppala et al., 2014, Sheldon & Elliot, 1999) are examples for well well-researched and effective positive-psychological interventions. While our findings suggest the stress-reducing effects of such interventions, positive emotions apart from this have been shown to build physical, intellectual and social resources (Fredrickson, 2004). Therefore, positive-psychological interventions in academic settings appear sensible from both a health and an educational point of view.

7. CONCLUSION

Our results suggest that flourishing and positive emotions are directly and indirectly associated with reduced stress and psychological stress symptomatology.

In our view, this finding is highly relevant in the context of 21st century societies. We would like to illustrate this very briefly using the three dimensions of society, organisations and the individual: For contemporary societies, stress is a burdening factor from both a health and economic point of view. Therefore, it is associated with high costs. In Germany, for example, stress-related sick leave and stress-related diseases have been on the rise for over 15 years (Baumann, et al. 2019, Techniker Krankenkasse, 2016), while in the USA the costs to companies due to stress-related absenteeism, employee turnover and lower productivity are estimated at \$300 billion per year (Brun, 2008). In the future, both educational organisations and workplaces could play a central role in the learning of stress-related and resilience-related skills. In the German-speaking countries, there are already several positive-psychological programs for schools who want to take this concern into account (e.g. Brohm, 2012; Brohm & Endres, 2015; Brohm, Kürwitz & Berend, 2014). But learning to experience positive emotions and learning to flourish are also promising tasks for work contexts, since health and resilience of employees are not only intrinsic goods, but also ensure the effectiveness of the organisation itself. In light of our results, we hypothesize that individuals could benefit from trainings focusing on positive emotions and flourishing, both in terms of health and personal development. This is in line with reports of increased resilience in people experiencing positive emotions, with positive self-image, with high self-efficacy, and finding meaning in their lives (American Psychiatric Association, 2008, Bengel & Lyssenko, 2012, Southwick & Carney, 2018). Well-explored methods such as Loving Kindness Meditation specifically promote the experience of positive emotions and thus support stress resistance (Seppala, Hutcherson, Nguyen, Doty, & Gross, 2014; Fredrickson, Cohn, Coffey, Pek, & Finkel, 2008). Furthermore, according to the Broaden-and-Build theory, positive emotions favour the development of other important resources such as knowledge, social bonds or the motivation for personal growth (Fredrickson, 2013).

7.1 Strengths and Limitations

A strength of our study is, that we included longitudinal data, and analyzed long-term associations between flourishing (and positive emotions) and stress perception as well as stress-related mental symptoms.

We conducted an observational study with self-report questionnaire data. Thus, our study design does not allow interpreting our findings on a causal level. Also, we can only state that the degrees of flourishing and positive emotions prior to the stressful phase are indeed predictors of a lower stress experience during the exams. At the same time, however, the change rate of the stress experience before and during the test phase is not predicted. Stressful events and negative emotions have been reported to decrease or even stop the experience of positive emotions (Folkman & Moskowitz, 2000). One possible explanation therefore might be, that positive emotions, flourishing and stress symptoms did not occur independently in our sample due to a stressful exam phase. In addition, we did not differentiate in our study between dispositional optimism and variable positive emotions. For future research, it might be interesting to take trait- and state-like forms of positive emotions and optimism into account. ■

Biographies

Benjamin Berend is with the Department of Learning and Instruction, University of Trier, Germany

 <https://orcid.org/0000-0002-0752-0135>

Dominic Vogt was formerly with the University of Trier, Germany

 <https://orcid.org/0000-0003-3831-573X>

Michaela Brohm-Badry is Head of Department, Department of Learning and Instruction, University of Trier, Germany

 <https://orcid.org/0000-0002-7304-1490>

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