Article

Self-Efficacy as a Mechanism Linking Daily Stress to Mental Health in Students: A Three-Wave Cross-Lagged Study

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Abstract

Background and Objectives: While stress is generally well established to be predictive for different indicators of mental health, little is known about the longitudinal effects of daily life stressors and the role of self-evaluation factors. We tested whether perceived general self-efficacy is a mediator for the association between daily life stressors and psychopathological symptoms as well as subjective well-being.
Methods: Data derived from 2160 Chinese university students was assessed at three time points with one-year intervals. We used the Brief Daily Stressor Screening, the General Self-Efficacy Scale, the Positive Mental Health Scale, and the Depression Anxiety and Stress Scales. Total, direct, and indirect effects were estimated using 95% bootstrapped confidence intervals and structural equation modeling.
Results: Latent variable mediation analyses showed that daily stressors were associated with increased symptoms of depression, anxiety, and stress and with decreased subjective well-being. All cross-lagged mediational paths via self-efficacy were significant in predicting positive and negative mental health.
Conclusions: Considering stress of daily life as well as including the two dimensions of mental health may be important for future research and practice. This study provides novel evidence for mediating stress effects by perceived self-efficacy, which should be focused in intervention- and prevention-based approaches.

Keywords

Self-efficacy, mental health, daily stress, depression, anxiety, longitudinal mediation

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The concept of self-efficacy originates from the social cognitive theory (SCT), which combines behavioral and cognitive factors of learning. Encompassing processes of attention, memory, and motivation, the SCT suggests that learning is the result of observing behavior and attitudes (Bandura, 1986). In accordance with Bandura's SCT, self-efficacy as a personality factor and positive resistance resource belongs to such appraisal processes and is substantial in the regulation of stress (e.g., Bandura, Caprara, Barbaranelli, Gerbino, & Pastorelli, 2003). It refers to a person's ability to handle environmental difficulties and to respond adequately in demanding situations. This evaluation of qualities that focus on the management of challenges may refer to either a wide range of a person's behavior, which is more seen as a trait factor and specified as *general self-efficacy*, or certain domains of activities, that is, *specific self-efficacy* (Bandura, 2006). Self-efficacy is widely known to be essential for posttraumatic recovery (Benight & Bandura, 2004; Benight & Harper, 2002) and predictive for better psychological adjustment, lower distress, fewer symptoms of burnout, and less symptoms of depression over time (Bisschop, Kriegsman, Beekman, & Deeg, 2004; Brouwers & Tomic, 2000; Gallagher et al., 2011). Higher levels of coping self-efficacy were associated with less social anxiety, cognitive depression, and externalizing symptoms (Singh & Bussey, 2010). It is even suggested to be a determinant for the neuroendocrine stress response and peripheral physiological reactivity. Higher levels of self-efficacy are generally accompanied by a lower cortisol response after stress (Nierop, Wirtz, Bratsikas, Zimmermann, & Ehlert, 2008) and diminished autonomic arousal after mental challenges (Sanz & Villamarín, 2001; Sanz, Villamarín, Álvarez, & Limonero, 2006). Moreover, beneficial effects have been found with regard to better problem-solving efficiency, increased motivation, and better performance (Hoffman, 2010; Niemiec & Lachowicz-Tabaczek, 2015). Nevertheless, a debate is ongoing concerning the role of self-efficacy and its universal protective effects are questioned (Bandura, 2012; Bandura & Locke, 2003; Vancouver, 2012; Vancouver, Gullekson, Morse, & Warren, 2014). It has been argued that high levels of self-efficacy may lead to decreased investment of resources due to a low discrepancy between self-perception and the planed goals (Powers, 1991). This idea was supported by Vancouver and coworkers who found negative effects in the performance of cognitive tasks in a series of laboratory investigations (e.g., Vancouver, More, & Yoder, 2008). Although self-efficacy can have positive and negative effects on different levels (see Schönfeld, Preusser, & Margraf, 2017), evidence on the beneficial effects for mental health clearly predominate this field of research.

Toward a complete model of mental health

The number of publications on well-being has grown immensely in the past decade (Miret et al., 2015). Although mental health traditionally has been

character of a high general self-efficacy due to the postulated salutogenic function, on one hand, and the pathogenic impact of daily stressors, on the other hand, a model that includes both factors in order to predict complete mental health from a longitudinal perspective is lacking. In general, stress buffering is indicated when an indirect effect is conducted opposed to an overall effect. More specifically, the effect of stress on mental health is decreased by inserting psychological resources into the model. The moderation and mediation models clarify two different conceptualizations of stress buffering (see Cox & Ferguson, 1991). [AQ2] In the moderation model, the role of self-efficacy is to impact the association between stressor and the reaction to it, which is the perceived distress. Specific conditions influencing this relationship can be identified by interaction effects. In the mediation model, self-efficacy operates as the intervening factor decreasing the effects of the stressor (e.g., Cohen & Edwards, 1988; Cohen & Wills, 1985 [AQ3]). The effects can be additive or subtractive, and the stressor has an indirect effect on mental health due to the implication of psychological resources (MacKinnon, Krull, & Lockwood, 2000). [AQ4] This allows the possibility to avoid a group distinction based on the level of self-efficacy and to calculate the effect size of the indirect pathway via self-efficacy. The mediational role of self-efficacy has been already supported before (e.g., Schönfeld et al., 2016), yet, to our knowledge, this study is the first to test for the mediational paths of general self-efficacy for the effects of daily stress on the two factors of mental health in a two-year period of time.

We expect that stress would longitudinally affect mental health, which would be reduced through self-efficacy. Based on the dual-continua model of mental health (e.g., Keyes, 2005), self-efficacy would partially explain the effects of daily stress on mental health and the mediation effects of self-efficacy would differ for positive mental health and psychopathological symptoms. First, our hypotheses therefore encompass negative effects of daily stressors on mental health after two years and, second, these effects would be mediated via the perceived general self-efficacy, which acts as a buffer.

Since the parameters of a measurement model may vary over time, we used structural equation modeling (SEM) and a two-step approach. Using a confirmatory factor analysis (CFA), we first tested the level of invariance in the latent variables of daily stressors; self-efficacy; positive mental health; and symptoms of depression, anxiety, and stress across three times of measurements. This allows the assumption whether the measures of the constructs, that is, the hypothesized model, are consistent with the data in order to ensure that the instruments we used assess the same constructs at three different points in time. As recommended by Turnes and Ernst (2016) we, second, estimated total, direct, and indirect effects in longitudinal mediation models using three waves of measurement and two time intervals in order to elucidate of how the process of effects causes future outcomes. Reducing the unbiased estimations in

Psychometric properties of the BDSS were already established in a Chinese sample (Schönfeld et al., 2016). In the present study, the Cronbach's α levels were .90 at T1, .89 at T2, and .87 at T3.

The General Self-Efficacy Scale (GSE; Schwarzer & Jerusalem, 1995) was utilized to measure the participants' general sense of perceived self-efficacy. The GSE consists of 10 items rated on a four-point Likert scale (from 1 = *not at all true* to 4 = *exactly true*). We used the shortened five-item version of the GSE in the current study, which has shown good reliability (Schönfeld et al., 2016). One example of an item is "*I am confident that I could deal efficiently with unexpected events*" or "*If I am in trouble, I can usually think of a solution.*" Cronbach's α reliability coefficients of the present samples were .91 at T1, .91 at T2, and .88 at T3.

To assess the level of psychological, emotional, and social aspects of well-being, the unidimensional Positive Mental Health (PMH) Scale (Lukat, Margraf, Latz, van der Veld, & Becker, 2016) was used. The PMH Scale consists of nine items ranging on a four-point Likert scale from 0 (*do not agree*) to 3 (*agree*). One example is "*I feel that I can handle many things at a time*" or "*I enjoy my life.*" Psychometric properties of a Chinese version were established in several publications (e.g., Maercker et al., 2015). Internal consistencies of the present samples were excellent (Cronbach's $\alpha_{t1} = .92$, $\alpha_{t2} = .96$, $\alpha_{t3} = .93$). [AQ6]

The Depression Anxiety Stress Scales 21 (DASS-21; Lovibond & Lovibond, 1995) was used to assess the perceived level of negative mental health. The DASS-21 measures core symptoms of negative emotional states over the period of the previous week and is subdivided into the three subscales—depression, anxiety, and stress—with seven items per subscale. It is a globally used and validated self-report questionnaire and covers a broad range of psychological distress symptoms (Clara, Cox, & Enns, 2001; Henry & Crawford, 2005; K. Wang et al., 2016). It is a screener for symptoms rather than a diagnostic instrument for psychological diseases. Participants rated 21 statements on a four-point Likert scale (0 = *never;* 3 = *almost always*). Reliability coefficients were good to excellent in the three waves of the present study's cohort (depression: $\alpha_{t1} = .85$, $\alpha_{t2} = .95$, $\alpha_{t3} = .91$; anxiety: $\alpha_{t1} = .81$, $\alpha_{t2} = .93$, $\alpha_{t3} = .90$; and stress: $\alpha_{t1} = .82$, $\alpha_{t2} = .93$, $\alpha_{t3} = .90$).

Statistical analyses

Data were screened for missing values so that only complete cases were included in the model. Descriptive statistics were examined using means, standard deviations, and intercorrelations. All CFA models were estimated using Mplus 7.4 (Muthén & Muthén, 2012). Following recommendations for the analysis of several measurements (Sass, 2011; Sass, Schmitt, & Marsh, 2014), we preliminary tested measurement invariance of the scales across time by conducting maximum likelihood estimation procedure to deal with nonnormality of the data. As usual,

Table 1. Means, standard deviations, and bivariate correlations of the variables.

Variable	M	SD	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1. DS1	12.12	6.23																		
2. DS2	12.61	6.34	.36***																	
3. DS3	14.36	7.80	.31***	.38***																
4. SE1	15.27	3.50	−.17**	−.09*	−.08***															
5. SE2	14.29	3.26	−.16**	−.22**	−.19***	.37***														
6. SE3	14.61	2.68	−.14**	−.15**	−.19***	.34***	.42***													
7. PMH1	21.26	5.37	−.30**	−.19***	−.17***	.72***	.32***	.28***												
8. PMH2	18.63	6.49	−.05*	−.18**	−.14***	.40***	.52***	.29***	.41***											
9. PMH3	20.71	4.95	−.22**	−.27***	−.32***	.32***	.39***	.56***	.40***	.45***										
10. DEP1	1.62	2.70	.34***	.23***	.16***	−.33***	−.19**	−.17**	−.45***	−.28***	−.28***									
11. DEP2	2.21	3.42	.21**	.41***	.26***	−.13**	−.27***	−.16**	−.25***	−.29***	−.32***	.31***								
12. DEP3	2.35	3.58	.22**	.28***	.40***	−.12**	−.21***	−.21***	−.20***	−.25***	−.44***	.31***	.41***							
13. ANX1	2.04	2.74	.34***	.22***	.18***	−.33***	−.17**	−.19**	−.42***	−.25***	−.27***	.78***	.25***	.28***						
14. ANX2	2.77	3.44	.25**	.42***	.28***	−.13***	−.27***	−.17**	−.24***	−.23***	−.31***	.26***	.86***	.38***	.29***					
15. ANX3	2.79	3.65	.24**	.29***	.41***	−.12***	−.22***	−.22***	−.19***	−.23***	−.41***	.28***	.37***	.89***	.32***	.40***				
16. STR1	2.59	3.07	.35***	.23***	.19***	−.38***	−.19***	−.20***	−.47***	−.31***	−.31***	.77***	.26***	.29***	.80***	.28***	.30***			
17. STR2	3.30	3.72	.25***	.45***	.29***	−.16**	−.30***	−.19***	−.27***	−.30***	−.35***	.28***	.83***	.38***	.29***	.87***	.39***	.34***		
18. STR3	3.16	3.80	.26***	.30***	.42***	−.15***	−.24***	−.25***	−.23***	−.28***	−.46***	.30***	.36***	.87***	.32***	.38***	.89***	.34***	.42***	

Note. DS: daily stressors at time 1–3; SE: self-efficacy T1–T3; PMH: positive mental health T1–T3; DEP: depression T1–T3; ANX: anxiety T1–T3; STR: stress T1–T3.
*$p<.05$; ***$p<.001$ (two-tailed). [AQ16]

Measurement invariance across time

Before testing the longitudinal path models, measurement invariance of the constructs across time has to be established in order to ensure validity. Table 2 presents the fit indices for each of the invariance models, separately for each scale. For all scales, the configural invariance model proved to have an overall

Table 2. Goodness of fit indices for measurement invariance across time.

Model	χ^2	df	$\Delta\chi^2$	Δdf	RMSEA (90% CI)	SRMR	CFI
Daily stressors							
Configural model	1405.62	283			.043 (.041, .045)	.034	.95
Metric invariance	1518.90	299	113.28	16	.043 (.041, .046)	.037	.95
Scalar invariance	3021.81	321	1502.91	22	.062 (.060, .064)	.046	.89
Partial scalar invariance[a]	2798.94	318	222.87	3	.060 (.058, .062)	.045	.90
Self-efficacy							
Configural model	364.32	72			.043 (.039, .048)	.017	.99
Metric invariance	384.75	80	20.43	8	.042 (.038, .046)	.024	.99
Scalar invariance	546.95	88	162.20	8	.049 (.045, .053)	.027	.98
Positive mental health							
Configural model	2513.41	294			.059 (.057, .061)	.050	.95
Metric invariance	2686.77	310	173.36	16	.060 (.058, .062)	.062	.95
Scalar invariance	3542.03	324	855.26	14	.068 (.066, .070)	.082	.93
Depression							
Configural model	1313.48	165			.057 (.054, .060)	.036	.94
Metric invariance	1357.22	177	43.74	12	.056 (.053, .058)	.039	.94
Scalar invariance	1447.91	187	90.96	10	.056 (.053, .059)	.039	.94
Anxiety							
Configural model	120.14	176			.052 (.049, .055)	.029	.95
Metric invariance	1203.18	177	1083.04	1	.052 (.049, .055)	.029	.95
Scalar invariance	1312.54	189	109.36	12	.052 (.050, .055)	.031	.95
Stress							
Configural model	1258.88	165			.055 (.053, .058)	.051	.94
Metric invariance	1371.23	177	112.35	12	.056 (.053, .059)	.055	.94
Scalar invariance	2125.77	182	754.54	5	.070 (.068, .073)	.081	.90

Note. df: degrees of freedom; RMSEA: root mean square error of approximation; SRMR: standardized root mean square; CFI: comparative fit index. All p values for chi-square tests were $p < .001$.
[a]Release intercepts ds3_t3, ds4_t2, ds7_t1.

did not include zero, indicating that all total, direct, and indirect effects of daily stress on positive mental health and symptoms of depression, anxiety, and stress via self-efficacy were significant. In Figure 1, the path analyses of the cross-lagged panel from each dependent variable as indicators of mental health are displayed. For both positive and negative mental health, including the subscales depression, anxiety, and stress, the mediation model with standardized structural coefficients was significant.

Discussion

Although a chronic exposure to stress is widely known to be debilitating, little is known about the effects of minor daily life stressors and the personal evaluation of the ability to deal with it. The purposes of the present study were first to examine the effects of daily stress on both hedonic and eudaimonic well-being (see Deci & Ryan, 2008; Keyes, 2005) and on psychopathological symptoms as well as to investigate the mediation via perceived general self-efficacy. Extending cross-sectional research on self-efficacy's meditational role for the effects of daily stressors and positive and negative mental health (Schönfeld et al., 2016), we support the mediation in a multivariate model and a two-year time interval.

As it is a prerequisite for comparing repeated measurements with self-report instruments, measurement invariance across time of the scales was initially tested. Deficiency of longitudinal measurement invariance can result in biases of effects sizes and misinterpretations of conclusions. Indicated by good model fit indices, full strong invariance was confirmed for the DASS-21 subscales, the PMH Scale, and the GSE Scale. Accordingly, time-dependent changes of the unidimensional scales can be concluded due to actual personal or environmental changes instead of confounded changes in responding—apart from the BDSS, which was only partial scalar invariant. We assume that this may be because the BDSS measures a relatively broad range of life areas.

As second finding of the study, the effects between the variables were estimated by combining stress-buffering models (e.g., Cohen & Edwards, 1988) and dual-factor models of mental health (e.g., Keyes, 2005) in order to apply an ordered sequence of the paths. Stress-buffering models aim to identify factors that reduce the deleterious effects of stress (Wheaton, 1985), and in dual-factor models of mental health, both the positive and negative indicators of mental health constitute the level of complete mental health, leading to the conclusion that a single bipolar dimension is no longer sufficient (X. Wang et al., 2011). In accordance with our predictions, daily stressors were associated with lower levels of positive mental health and higher levels of depression, anxiety, and stress symptoms over both follow-up periods. This is consistent with previous research on the association between daily stressors and depression and anxiety (Izadinia, Amiri, Jahromi, & Hamidi, 2010). Daily stressors have been also related to cognitive function and neurobiological reactivity (Rahdar & Galván, 2014).

responding. However, the self-report measures used in this study are reliable and well validated. Next, it is widely known that the relationship between stress, on one hand, and psychopathology and the subjective well-being, on the other hand, is reciprocal. Thus, these findings should be replicated in an experimental design, which manipulates the level of self-efficacy in order to draw causal conclusions more specifically. Research and theory suggest that self-efficacy can be changed or increased by giving a positive feedback about one's performance (see Zinken, Cradock, & Skinner, 2008). These results indicate an essential approach for prevention as self-efficacy may be manipulated prior to the confrontation with stress. It has been shown that self-efficacy is an important target for psychological interventions in order to better protect mental health (e.g., Jimenez, Melendez, & Albers, 2012). On this basis, negative consequences of stress can be reduced by the appraisal of one's abilities to handle upcoming situations. A strength of this study is the multiwave design for conducting mediation analyses to reduce biased estimates (Maxwell, Cole, & Mitchell, 2011). Moreover, large sample sizes are recommended for the usage of SEM. Extending previous research on the relationship between stress and mental health, this study shows that the absence of positive mental health can be treated regardless of the presence of psychopathological symptoms in order to prevent the development of psychological constraints. Future research as well as programs that aim to prevent mental disorder should therefore focus not only on the impact of daily stress but also on self-efficacy as a self-appraisal mechanism that substantially contribute to the protection of mental health.

Declaration of Conflicting Interests

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