Positive mental health as a moderator of the association between risk factors and suicide ideation/behavior in psychiatric inpatients

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ABSTRACT

In recent studies positive mental health has been shown as a resilience factor related to suicide ideation/behavior. It is not known if positive mental health buffers the effect of various risk factors (depression, perceived burdensomeness, hopelessness, childhood maltreatment) on suicide ideation/behavior in psychiatric inpatients—a high risk population.

A total of 100 psychiatric inpatients were included in the survey. Four hierarchical regression analyses were conducted to examine, whether positive mental health moderates the association between the four risks factors and suicide ideation/behavior.

Positive mental health was shown to moderate the association between perceived burdensomeness and suicide ideation/behavior. The association between the other three risk factors and suicide ideation/behavior was not moderated by positive mental health.

Given the cross-sectional nature of the data, conclusions on causality cannot be drawn.

The buffering effect of positive mental health suggests that positive mental health may improve the identification of individuals at risk of suicide ideation/behavior and may be an important area to target in the prevention and treatment of individuals at risk of suicide. Further research is needed.

1. Introduction

Suicide is common in psychiatric inpatients. It could be shown that each year in European psychiatric clinics 78–187 patients per 100,000 die by suicide (e.g. Ajdacic-Gross et al., 2009; Madsen et al., 2012). The risk of suicide is highest in the first week after admission and the first week after discharge (Qin and Nordentorft, 2005). Risk factors for suicides during an inpatient stay include previous suicide attempts, suicide ideation, depressed mood and hopelessness as well as feelings of worthlessness (Large et al., 2011). While substantial efforts have been made to understand which risk factors contribute to suicide ideation and suicidal behavior (Franklin et al., 2017), far less attention has been paid to factors that buffer individuals against the development of suicide ideation and behavior in the face of risk factors. Furthermore, research has mainly explored protective or resilience factors by examining their direct linear association with suicide ideation/behavior (e.g. Rutter et al., 2008; Osman et al., 1993) which, however, does not demonstrate a buffering role for the variable of interest (Johnson et al., 2010a).

In their work on the Bi-Dimensional Framework Johnson et al. (2011); Johnson, (2016), suggest that to be viewed as conferring resilience, a variable needs to demonstrate three main characteristics: (1.) It needs to comprise a separate dimension to risk and moderate the association between risk and outcome. Therefore, to ascertain resilience an assessment of both, risk and suicide ideation/behavior is necessary. (2.) It needs to be viewed as existing on a bipolar continuum, with its inverse amplifying the association between risk and outcome. (3.) It needs to be a psychological construct, such as an ability or a perceived ability of the individual to overcome difficulties, or a set of positive beliefs or personal resources, which buffer individuals against the development of negative outcomes—such as suicide ideation and behavior—when confronted with risk factors.

In the context of a comprehensive literature review, Johnson et al. (2011) identified diverse abilities and beliefs with buffering qualities concerning suicide ideation: The most consistent evidence supporting a buffering or attenuating role was found for overall

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positivity of attributional style and higher levels of agency. Of special interest to the current study, Johnson et al. (2010b) found positive self-appraisals of the ability to cope with emotions, difficult situations and the ability to gain social support to buffer the association between stressful life events and suicide ideation/behavior in a student sample. Positive self-appraisals of the ability to cope with emotions did furthermore moderate the association between hopelessness and suicide ideation in patients suffering from psychosis (Johnson et al., 2010a).

Positive self-appraisals—as assessed with the Positive Mental Health (PMH) Scale (Lukat et al., 2016), have also been shown to confer resilience against suicide ideation/behavior. The PMH-Scale is a brief measure of positive self-appraisals associated with life satisfaction ("All in all, I´m satisfied with my life.") as well as positive functioning (e.g. "I feel that I am actually well equipped to deal with life and its difficulties"). Siegmann et al. (2018) examined the degree to which potential resilience factors—namely positive mental health, self-efficacy, satisfaction with life, social support and specific resilience appraisals—buffer the effects of depression on suicide ideation. Only positive mental health was shown to moderate the association between depression and suicide ideation both in a sample of German and Chinese students: For those individuals who reported high level of positive mental health, their level of suicide ideation did not increase significantly even when they experienced a heightened level of depressive symptoms (see also Teismann et al., 2016, 2018a). In addition, Brailovskaia et al. (2018) could show that positive mental health also moderates the association between cyberbullying and suicide ideation/behavior in German students. All of these studies stress the importance of positive mental health as a resilience factor, i.e. a set of positive beliefs that buffers the effect of risk factors on suicide ideation (cf. Johnson, 2016). Nonetheless, the buffering effect of positive mental health—as assessed with the PMH-scale—on suicide ideation/behavior has only been shown in non-clinical samples by now. Therefore, the first aim of the current study was to investigate, whether positive mental health moderates the association between risk factors and suicide ideation/behavior in a clinical sample of psychiatric inpatients.

Furthermore, only two different risk factors—depression and cyberbullying—have been investigated in previous studies on the buffering qualities of positive mental health (Brailovskaia et al., 2018; Siegmann et al., 2018; Teismann et al., 2018a). Consequently, the second aim of the current study was to investigate whether positive mental health moderates the association between a broader range of risk factors and suicide ideation/behavior. Four different risk factors were chosen for the current study: depression, hopelessness, perceived burdensomeness and childhood maltreatment. Depression and hopelessness have been shown to be two of the most important predictors of inpatient suicide (Large et al., 2011). Perceived burdensomeness is a key construct of the interpersonal theory of suicide (Joiner, 2005), whose significance for suicide ideation/behavior has been demonstrated in a large number of studies (Chu et al., 2017). Finally, childhood maltreatment (including sexual and physical abuse as well as neglect) is a well-known risk factor for suicidal behavior in adolescence and adulthood (e.g. Brodsky and Stanley, 2008; Zatti et al., 2017) and was therefore chosen as another risk-factor of interest to the current study.

As a final point, previous studies on the buffering effect of positive mental health made use of single item assessments of suicide ideation (Siegmann et al., 2018; Teismann et al., 2016, 2018a) or suicide ideation/behavior (Brailovskaia et al., 2018). Although this is not uncommon in suicide research (Green et al., 2015), it may lead to misclassification (Hom et al., 2015; Millner et al., 2015). Thus, a third aim of the current study was to investigate the moderating qualities of positive mental health using a validated and recommended screening tool to assess suicide ideation/behavior (Batterham et al., 2015).

It was hypothesized that positive mental health moderates the association between depression, hopelessness, perceived burdensomeness, childhood maltreatment and suicide ideation/behavior in psychiatric inpatients. More specifically, it was expected that individuals who report high levels of positive mental health do not show significantly increased levels of suicide ideation/behavior in the face of heightened levels of depressive symptoms, hopelessness, perceived burdensomeness and traumatic experiences during childhood.

2. Methods

2.1. Participants

The sample comprised $N = 105$ patients being treated in a psychiatric inpatient unit between January and October 2016. Five patients did not answer the questionnaire on suicide ideation/behavior and were therefore excluded from further analysis. The remaining sample consisted of $n = 100$ inpatients ($n = 52$ female; age: $M = 42.99$ SD $= 11.79$). The most common diagnoses according to the International Classification of Diseases (ICD-10; WHO, 1992) were affective disorders (F3: 76%), as well as neurotic, stress-related and somatoform disorders (F4: 8%) and substance use disorders (F1: 7%). In the Suicidal Behaviors Questionnaire (SBQ-R; see below) fifty patients had a score of ≥ 8 (cutoff-score for adult inpatients; Osman et al., 2001) and thirty-one patients reported one or more lifetime suicide attempts. With regard to childhood maltreatment, 42 participants had a score ≥ 3 regarding emotional abuse, 28 participants had a score ≥ 3 regarding physical abuse, 18 participants had a score ≥ 2 regarding sexual abuse, 33 participants had a score ≥ 4 regarding emotional neglect and 21 participants had a score ≥ 4 regarding physical neglect (clinical cutoff-scores provided by Glaesmer et al., 2013). Nineteen participants were married, $n = 37$ were single, $n = 23$ were either separated or divorced, $n = 17$ were in a steady relationship and $n = 4$ were widowed. Participants were 98% Caucasian and 2% Africans.

Prior to assessments, participants were informed about the purpose of the study, the voluntary nature of their participation, data storage and security. They gave written informed consent before participating. If patients had agreed to participate, questionnaires were presented in a paper-pencil version. No information on patients' identity was inquired. The physician or therapist in charge of the patient's treatment provided information on patient's diagnoses. The study was approved by the responsible Ethics Committee.

2.2. Measures

2.2.1. Suicidal behaviors questionnaire—revised (SBQ-R; Osman et al., 2001)

The SBQ-R comprises four items assessing different aspects of suicidal behavior (lifetime suicide ideation, suicide plans, suicide attempts, 12-month suicide ideation, suicidal communication and one's estimation of how likely a future suicide attempt might be). Each item utilizes a different Likert scale with a sum score of 18 points indicating the highest severity of suicidal behavior. The German version of the SBQ-R shows sufficient psychometric properties (Cronbach´s $\alpha = 0.72$; Glaesmer et al., 2018). Internal consistency for the SBQ-R in the current sample was $\alpha = 0.85$.

2.2.2. Positive mental health scale (PMH; Lukat et al., 2016)

The PMH-Scale assesses positive self-appraisals associated with subjective and psychological aspects of well-being across nine items (e.g., "In general, I am confident"; "All in all, I am satisfied with my life"; I manage well to fulfill my needs"), rated on a scale ranging from 0 (*do not agree*) to 3 (*agree*). Unidimensional structure and good convergent and discriminant validity are demonstrated in samples comprised of students, patients and the general population. Internal consistency ($\alpha = 0.82$–0.93) was also good in all samples. Furthermore, across-time correlations between PMH scores are fairly high ($r \geq 0.57$, $p < 0.01$ across a time-lag of 17 month) in healthy and clinical samples (Lukat et al., 2016). Internal consistency for the PMH in the current

Table 1
Means, standard deviations and correlations of study variables.

	M (SD)	SBQ-R	PMH	PHQ-D	INQ-PB	CTS	BHS
SBQ-R	8.36 (4.4)	–	− 0.525[b]	0.484[b]	0.578[b]	0.289[b]	0.605[b]
PMH	19.09 (7.23)	− 0.525[b]	–	− 0.652[b]	− 0.644[b]	− 0.206[a]	− 0.673[b]
PHQ-D	14, 26 (5.7)	0.484[b]	− 0.652[b]	–	0.586[b]	0.114	0.568[b]
INQ-PB	20.4 (10.03)	0.578[b]	− 0.644[b]	0.586[b]	–	0.194	0.586[a]
CTS	10.48 (5.02)	0.289[b]	− 0.206[a]	0.114	0.194	–	0.132
BHS	4.31 (2.97)	0.605[b]	− 0.673[b]	0.568[b]	0.586[b]	0.132	–

Note: BHS = Beck Hopelessness Scale; CTS = Childhood Trauma Screener; INQ-PB = Perceived Burdensomeness Subscale of Interpersonal Needs Questionnaire; PHQ-D = Patient Health Questionnaire – Depressive Symptoms; PMH = Positive Mental Health Scale; SBQ-R = Suicide Behaviors Questionnaire-Revised.

[a] = $p < 0.05$.
[b] = $p < 0.01$.

sample was $\alpha = 0.94$.

2.2.3. Patient health questionnaire – depressive symptoms (PHQ-9; Spitzer et al., 1999)

Severity of depressive symptoms was measured by the PHQ-9. The PHQ-9 assesses the occurrence of nine depressive symptoms according to the Diagnostic and Statistical Manual of Mental Disorders (APA; 2003) within the previous two weeks. It has been shown to have good sensitivity and specificity (Muñoz-Navarro et al., 2017) as well as good internal consistency ($\alpha \geq 0.86$; Kroenke et al., 2001). The suicide item was excluded from the PHQ-sum score to avoid overlapping and thus part-whole correlations. Internal consistency for the PHQ-9 in the current sample was $\alpha = 0.86$.

2.2.4. Perceived burdensomeness subscale of interpersonal needs questionnaire (INQ-PB; Van Orden et al., 2012)

The INQ-PB assesses the amount of perceived burdensomeness with six items (e.g., "These days I feel like a burden on the people in my life"). All items are to be answered on a 7-point Likert scale ranging from "1″ (not at all true for me) to "7″ (very true for me). The German version of the INQ shows good psychometric properties ($\alpha = 0.94$; Hallensleben et al., 2016). Internal consistency for the INQ-PB in the current sample was $\alpha = 0.93$.

2.2.5. Childhood trauma screener (CTS; Grabe et al., 2012)

The CTS is a screening instrument for the retrospective assessment of adverse childhood experiences. The scale includes five items assessing the occurrence and frequency of sexual, emotional and physical abuse as well as emotional and physical neglect (e.g. "When I was growing up, someone molested me sexually", "When I was growing up, there was someone who took me to the doctor when I needed it"). All items are to be answered on a 5-point Likert scale ranging from "1″ (never) to "5″ (very often). The internal consistency has been shown to be good ($\alpha = 0.75$). Internal consistency for the CTS in the current sample was $\alpha = 0.76$.

2.2.6. Beck hopelessness scale (BHS; Beck et al., 1974)

The BHS originally includes 20 true-false items that assess pessimistic and hopeless cognitions (e.g., "I look forward to the future with hope and enthusiasm"). To reduce the amount of questions to be answered, a BHS short version (Krampen, 1994) containing ten of the original items was used in the current study. The internal consistency of the short version has been shown to be good ($\alpha = 0.84$; Krampen, 1994). Internal consistency for the BHS in the current sample was $\alpha = 0.80$.

2.3. Data analyses

All statistical analyses were conducted using the statistical analysis program IBM SPSS Statistics 21. Initially, correlation analyses were carried out to explore associations between key variables, to measure the direction and strength of the correlations of the relevant variables. Four hierarchical regression analyses were conducted to examine, whether positive mental health moderates the association between the four risks factors – depression, perceived burdensomeness, childhood maltreatment and hopelessness - and suicide ideation/behavior. In each analysis, the variables were entered in four steps: In the first step, age and gender were entered as covariates. In the second step, the risk factor was entered. In the third step, positive mental health was included. In the final step, the interaction terms of the risk factor and positive mental health was entered. In all analyses, z-standardized variables were used (Franzier et al., 2004). Assuming a medium-sized effect ($f^2 = 0.15$), an alpha error level of 5%, five predictors and a sample size of $N = 100$, the test power was 1-$\beta \geq 0.90$ and therefore sufficient according to Cohen (1988). In all models, there was no substantial multicollinearity between the variables as all values of tolerance were > 0.25, and all variance inflation factor values were < 5 (Urban and Mayerl, 2006). The residuals of all regression models are approximate normally distributed, as assessed by the Shapiro-Wilk-Test $p > 0.05$ and visual inspection of the histograms.

If the interaction term added significant predictive variance to the regression model, it indicated a moderating effect of positive mental health on the association between the risk factor and suicide ideation (Hayes, 2013). The magnitude of the interaction effect was assessed by the change in R^2. To further analyze significant interaction effects descriptively, simple slopes analyses were applied to examine the effects of the focal predictor on the dependent variable at 1 SD above and 1 SD below the mean value of the moderator.

3. Results

3.1. Descriptive statistics and correlations

Descriptive statistics for each measure and correlations are presented in Table 1.

The analysis of correlations indicated that all risk factors correlate significant positively with suicide ideation/behavior and all risk factors as well as suicide ideation/behavior correlate significant negatively with positive mental health (see Table 1). All risk factors—except childhood maltreatment—correlate significant positively with each other.

3.2. Moderation analysis

All risk factors were found to be positive predictors of suicide ideation/behavior—after controlling age and gender and they remain significant predictors when positive mental health is added in the third step (see Tables 2–5). Positive mental health was found to be a negative predictor of suicide ideation/behavior in each analysis. Positive mental health was also found to moderate the effect of perceived burdensomeness (see Table 3) on suicide ideation/behavior. However, the impact of depression, childhood maltreatment, hopelessness on suicide

Table 2

Results of the hierarchical linear regression analysis predicting suicide ideation/behavior with depression and positive mental health.

	Model 1				Model 2				Model 3				Model 4			
	B	β	t	p	B	β	t	p	B	β	t	p	B	β	t	p
Intercept	8.90	–	5.13	0.00	8.92	–	5.83	0.000	8.58	–	5.79	0.000	7.76	–	5.03	0.000
Age	−0.01	−0.03	−0.25	0.800	−0.02	−0.05	−0.54	0.594	−0.01	−0.04	−0.41	0.684	0.00	−0.01	−0.11	0.911
Gender	−0.43	−0.05	−0.47	0.641	0.224	0.03	0.27	0.785	0.47	0.06	0.59	0.556	0.48	0.06	0.61	0.545
Depression*	–	–	–	–	2.11	0.49	5.1	0.000	1.16	0.27	2.17	0.033	1.48	0.34	2.64	0.010
Positive mental health*	–	–	–	–	–	–	–	–	−1.40	−0.33	−2.67	0.009	−1.26	−0.30	−2.41	0.018
Depression* x pos. mental health*	–	–	–	–	–	–	–	–	–	–	–	–	−0.60	−0.17	−1.72	0.089
Model	Adj. R^2 = −0.019 $F(2,88)$ = 0.149 p = 0.862				Adj. R^2 = 0.207 $F(3,87)$ = 8.813 $p < 0.000$				Adj. R^2 = 0.259 $F(4,86)$ = 8.861 $p < 0.000$				Adj. R^2 = 0.275 $F(5,85)$ = 7.841 $p < 0.000$			
Change in R^2	0.003 $p = 0.862$				0.230 $p < 0.000$				0.059 $p = 0.009$				0.024 $p = 0.089$			

Notes.

* z-standardized characteristics; $N = 100$.

ideation/behavior was not moderated by positive mental health (see Tables 2, 4 and 5).

In the visual representation, it is shown that in those who reported high levels of positive mental health, increased levels of perceived burdensomeness were associated with reduced increases in suicide ideation/behavior (see Fig. 1). Therefore, the moderating effect of positive mental health on the association between perceived burdensomeness and suicide ideation/behavior is only relevant for patients with high levels of perceived burdensomeness.

4. Discussion

The aim of the current study was to investigate whether positive mental health buffers the association between various risk factors and suicide ideation/behavior. There were two main findings: (1.) Positive mental health buffers the impact of perceived burdensomeness on suicide ideation/behavior in psychiatric inpatients. (2.) Positive mental health did not buffer the impact of depression, hopelessness and childhood maltreatment on suicide ideation/behavior.

The current study indicates that positive mental health buffers the impact of perceived burdensomeness on suicide ideation/behavior: For individuals who reported high levels of positive mental health, the levels of suicide ideation/behavior did not increase substantially even when experiencing a heightened level of perceived burdensomeness. According to the *Interpersonal Theory of Suicide* (Joiner, 2005), the view that one's existence burdens family and friends must be present in order for someone to desire suicide. Perceived burdensomeness is understood as a generic, proximal and causal risk factor for suicide ideation. In accordance with this assumption, there is ample scientific evidence that perceived burdensomeness is indeed an important risk factor for suicide ideation/behavior (for reviews see Chu et al., 2017; Ma et al., 2016). On

this background, the current results highlight the importance of positive mental health as a resilience factor in the sense of Johnson et al. (2011). Furthermore, the current results stress the importance of incorporating potential resilience factors into comprehensive theoretical models of suicide risk, such as the Interpersonal-psychological Theory of Suicide (cf. Cheavens et al., 2016).

It is important to acknowledge, that positive self-appraisals regarding life satisfaction and positive functioning as well as perceived burdensomeness and suicide ideation are not mutually exclusive. As such, individuals who have higher levels of positive mental health can nevertheless experience themselves as a burden for others or develop depressive symptoms as well as suicide ideation. In this sense, a study by Teismann et al. (2018b), showed that among clinical samples moderate to high levels of PMH regularly co-occur with suicide ideation. Therefore, a person can agree to statements as "In general, I am confident" (PMH Item 4) or "I feel that I am actually well equipped to deal with life and its difficulties" (PMH Item 7) and still suffer from suicide ideation at the same time. Indeed, an internal struggle between reasons for living and reasons for dying is rather common for suicide ideators (Harris et al., 2010).

However, against expectations, positive mental health did not buffer the impact of depression, hopelessness and childhood maltreatment on suicide ideation/behavior in the current study. This finding stands in sharp contrast to previous studies that found positive mental health to buffer the impact of depression on suicide ideation in student samples (Siegmann et al., 2018; Teismann et al., 2018a). One may speculate that positive self-appraisals—as assessed with the PMH scale—are a buffer against suicide ideation only in persons suffering from low levels of depression (as to be found in student samples), whereas it loses its buffering effect in more severe depression (as to be found in clinical samples). Furthermore, childhood maltreatment as well as pervasive

Table 3

Results of the hierarchical linear regression analysis predicting suicide ideation/behavior with perceived burdensomeness and positive mental health.

	Model 1				Model 2				Model 3				Model 4			
	B	β	t	p	B	β	t	p	B	β	t	p	B	β	t	p
Intercept	8.23	–	4.73	0.000	6.58	–	4.59	0.000	6.95	–	4.92	0.000	6.24	–	4.40	0.000
Age	0.01	0.01	0.14	0.887	0.04	0.10	1.15	0.255	0.03	0.07	0.79	0.431	0.03	0.08	0.94	0.348
Gender	−0.16	−0.02	−0.17	0.865	0.59	0.07	0.78	0.440	0.79	0.9	1.07	0.289	0.70	0.08	0.96	0.339
Burdensomeness*	–	–	–	–	2.63	0.60	6.92	0.000	1.91	0.44	3.93	0.000	1.74	0.40	3.62	0.000
Positive mental health*	–	–	–	–	–	–	–	–	−1,10	−0.25	−2.29	0.025	−1.33	−0.31	−2.76	0.007
Burdensomeness* x pos. mental health*	–	–	–	–	–	–	–	–	–	–	–	–	−0.87	−0.19	−2.26	0.027
Model	Adj. R^2 = −0.021 $F(2,92)$ = 0.023 p = 0.977				Adj. R^2 = 0.323 $F(3,91)$ = 15.973 $p < 0.000$				Adj. R^2 = 0.353 $F(4,90)$ = 13.843 $p < 0.000$				Adj. R^2 = 0.381 $F(5,89)$ = 12.594 $p < 0.000$			
Change in R^2	0.001 $p = 0.977$				0.344 $p < 0.000$				0.036 $p = 0.025$				0.033 $p = 0.027$			

Notes.

* z-standardized characteristics; $N = 100$.

Table 4
Results of the hierarchical linear regression analysis predicting suicide ideation/behavior with childhood maltreatment and positive mental health.

	Model 1				Model 2				Model 3				Model 4			
	B	β	t	p	B	β	t	p	B	β	t	p	B	β	t	p
Intercept	8.40	–	4.85	0.000	8.49	–	5.09	0.000	8.25	–	5.69	0.000	−8.00	–	5.43	0.000
Age	0.00	0.00	0.04	0.972	0.00	−0.01	−0.06	0.950	−0.01	−0.02	−0.19	0.851	0.00	0.00	−0.04	0.970
Gender	−0.34	−0.04	−0.37	0.714	0.07	0.01	0.08	0.937	0.79	0.09	1.01	0.315	0.68	0.08	0.87	0.388
Childhood maltreatment*	–	–	–	–	1,41	0.30	2.94	0.004	0.93	0.20	2.18	0.032	0.82	0.17	1.88	0.064
Positive mental health*	–	–	–	–	–	–	–	–	−2.165	−0.50	−5.55	0.000	−2.26	−0.52	−5.63	0.000
Childhood maltreatment* x pos. mental health*	–	–	–	–	–	–	–	–	–	–	–	–	−0.42	−0.09	−1.00	0.320
Model	Adj. R^2 = −0.020 $F(2,94)$ = 0.068 p = 0.935				Adj. R^2 = 0.057 $F(3,93)$ = 2.926 p = 0.038				Adj. R^2 = 0.286 $F(4,92)$ = 10.591 $p < 0.000$				Adj. R^2 = 0.286 $F(5,91)$ = 8.674 $p < 0.000$			
Change in R^2	0.001 p = 0.935				0.085 p = 0.004				0.229 $p < 0.000$				0.007 p = 0.320			

Notes.
* z-standardized characteristics; $N = 100$.

hopelessness may make it particularly difficult for those affected to remember or experience characteristics of positive mental health. Positive mental health loses its protective significance in such a context, as it might be less accessible to those affected. On the other hand, positive self-appraisals of the ability to cope with emotions has been shown to moderate the association between hopelessness and suicide ideation in a study of patients suffering from psychosis (Johnson et al., 2010a). This finding suggests that specific types of positive self-appraisals may be relevant in the context of different risk factors—even in patients suffering from severe disorders. Therefore, further studies are needed to investigate the interaction of different risk factors and positive self-appraisals in clinical populations.

In terms of clinical implications, the results of the current study suggest that it may be important to account for the presence of resilience factors, such as positive mental health, in addition to risk factors, when assessing individuals for suicide risk. Resilience factors that can be targeted in assessment and treatment are particularly important to identify. The present results suggest that developing positive self-appraisals may reduce the likelihood of suicide ideation/behavior by attenuating the impact of risk. Nonetheless, it remains to be seen in future studies on clinical samples, whether positive mental health qualifies as an *important* resilience factor. However, irrespective of whether positive self-appraisals as assessed with the PMH scale or other types of positive self-appraisals (Johnson et al., 2010a) are considered, it may be beneficial to think of fostering self-appraisals in clinical interventions for suicidal patients (cf., Huffman et al., 2014).

Several limitations must be taken into account when interpreting the study. First, given the cross-sectional nature of the data, conclusions about causation are bound to involve some degree of speculation. Second, all constructs were assessed with self-report measures. It may

well be that self-reports do not adequately reflect the relevant objective behavior. Furthermore, using the same method to assess all constructs could have resulted in biased estimates of the effects. Third, the number of patients suffering from other disorders than affective disorders was not large enough to perform separate analyses in the current study. Fourth, generalization of the results towards other groups of psychiatric inpatients is not possible, since the study focused only on this mainly depressed population. Fifth, in the current study childhood maltreatment was assessed using only one screening instrument. Therefore, it was not possible to investigate associations between specific kinds of childhood maltreatment and suicide ideation/behavior (cf. Zatti et al., 2017). More comprehensive assessment methods should be used in future studies. Finally, the buffering effects described in this study are only related to one specific resilience factor, namely positive mental health. The findings to date suggest that specific types of positive self-appraisals moderate the association between different risk factors and suicide ideation/behavior (cf. Johnson et al., 2010a,b). Future studies should expand upon this by comparing the buffering capacities of different kinds of positive self-appraisals in relation to a broader range of risk factors and suicide outcomes.

To conclude, the present study demonstrated that positive mental health buffered the impact of perceived burdensomeness on suicide ideation/behavior. Accounting for positive mental health may improve the identification of individuals at risk of suicide ideation/behavior and may be an important area to target in the prevention and treatment of individuals at risk of suicide. However, since positive mental health did not buffer the effect of other risk factors (depression, hopelessness, childhood maltreatment) on suicide ideation/behavior in psychiatric inpatients it remains to be seen, whether positive mental health qualifies as an important resilience factor.

Table 5
Results of the hierarchical linear regression analysis predicting suicide ideation/behavior with hopelessness and positive mental health.

	Model 1				Model 2				Model 3				Model 4			
	B	β	t	p	B	β	t	p	B	β	t	p	B	β	t	p
Intercept	8.65	–	4.89	0.000	8.58	–	6.05	0.000	8.45	–	6.06	0.000	7.90	–	5.39	0.000
Age	0.00	−0.01	−0.09	0.929	−0.01	−0.02	−0.18	0.859	−0.01	−0.02	−0.21	0.838	0.00	0.00	0.00	1.000
Gender	−0.59	−0.07	−0.63	0.530	−0.21	−0.02	−0.28	0.778	0.09	0.01	0.12	0.902	−0.09	−0.01	0.11	0.910
Hopelessness*	–	–	–	–	2.59	0.60	7.03	0.000	1.91	0.45	3.88	0.000	1.75	0.41	3.42	0.001
Positive mental health*	–	–	–	–	–	–	–	–	−1.03	−0.24	−2.04	0.044	−1.19	−0.27	−2.28	0.025
Hopelessness* x pos. mental health*	–	–	–	–	–	–	–	–	–	–	–	–	−0.52	−0.11	−1.19	0.236
Model	Adj. R^2 = −0.018 $F(2,87)$ = 0.205 p = 0.815				Adj. R^2 = 0.346 $F(3,86)$ = 16.685 $p < 0.000$				Adj. R^2 = 0.369 $F(4,85)$ = 14.016 $p < 0.000$				Adj. R^2 = 0.372 $F(5,84)$ = 11.554 $p < 0.000$			
Change in R^2	0.005 p = 0.815				0.363 $p < 0.000$				0.030 p = 0.044				0.010 p = 0.236			

Notes.
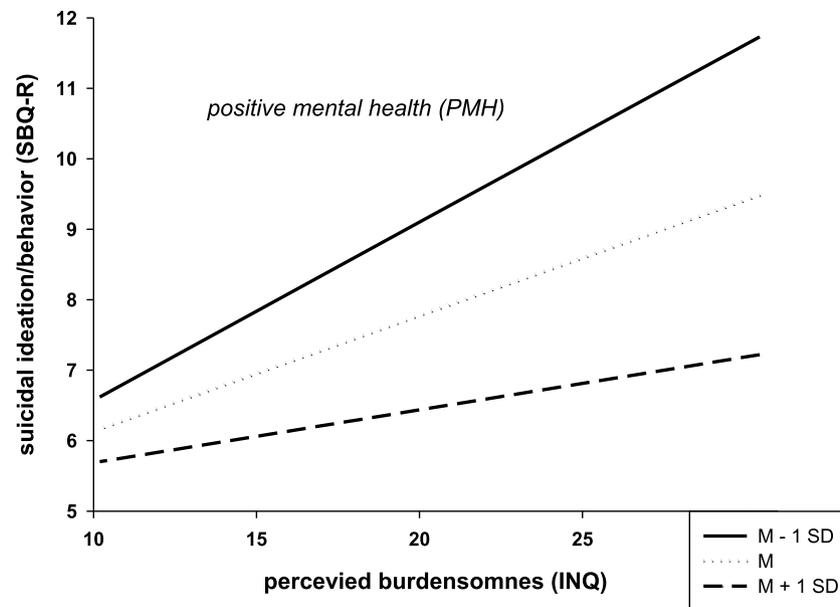* z-standardized characteristics; $N = 100$.

Fig. 1. Level of positive mental health moderates the relationship between perceived burdensomeness and suicide ideation/behavior in an inpatient sample. INQ = Interpersonal Needs Questionnaire; PMH = Positive Mental Health Scale; SBQ-R = Suicide Behaviors Questionnaire-Revised.

Authors' contributions

All authors read and approved the final manuscript. Paula Siegmann and Tobias Teismann conducted the study design and wrote a first draft of the article. Paula Siegmann conducted statistical analysis, in collaboration with Natalie Fritsch. Ulrike Willutzki designed the study in collaboration with the lead author. Marcus Wolters and Peter Nyhuis assisted in data collection. All authors contributed to the writing, reviewing and final editing process.

All authors state their compliance with the Code of Ethics of the World Medical Association (Declaration of Helsinki). They also agree to the ethical standards of the Faculty of Psychology's Ethical Commission of the Ruhr-Universität Bochum.

Conflict of interest

None.

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None.

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