Article

Education and mental health: Do psychosocial resources matter?

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ABSTRACT

Prevalence rates for mental health problems are higher when an individual's socioeconomic status (SES) is low, but the underlying mechanisms are not clearly understood. We investigated associations between education as indicator for SES and depressive symptoms as well as positive mental health (PMH). Moreover, we hypothesized that low education is associated with a lack of psychosocial resources and more daily hassles, which in turn mediate the relationships between education and mental health. In a German representative sample ($N = 7937$), we cross-sectionally first examined whether a person's educational level was associated with depressive symptoms and PMH. Educational level was defined as the highest academic qualification achieved. Second, we investigated whether also sense of control, resilience, delay of gratification, cultural activity and daily hassles followed gradients along the educational level. Third, we investigated whether they mediated the relationship between education and mental health. Results showed that depressive symptoms measured by items from the DASS-42 depression subscale were more prevalent for persons with a low educational level, PMH operationalized by the Positive Mental Health Scale was equally distributed, and all psychosocial characteristics followed the gradient of educational level. In addition, the group with a high school diploma was particularly burdened. Structural equation modeling indicated that the associations between education and mental health were mediated by all psychosocial characteristics and daily hassles, apart from the delay of gratification. In the group with the lowest educational level the model fit indices for depressive symptoms and PMH were acceptable ($\chi2 = 10007.243$ (627), CFI = 0.869, RMSEA = 0.04 (90% CI [0.04, 0.04], SRMR = 0.05; and $\chi2 = 12779.968$ (741), CFI = 0.86, RMSEA = 0.05 (90% CI [0.05, 0.05], SRMR = 0.05), respectively). The effect size P_m refers to the proportion of the total effect that is mediated by one or more variables ("M"), and the effect size of all indirect effects in the model for depressive symptoms was $P_m = .80$ and for PMH it was $P_m = .68$. The results support our hypotheses that low education is associated with less psychosocial resources, which in turn serve together with daily hassles as pathways between education and depressive symptoms as well as PMH. Building on these findings, longitudinal studies are necessary to investigate causality.

1. Introduction

An increased risk of physical and mental disorders in socially disadvantaged population groups is well documented (Robert Koch Institute, 2015). With respect to depression, a meta-analysis of 51 population-based surveys found that adults with the lowest socioeconomic status (SES) have an increased risk (odds ratio = 1.81) compared to those with the highest SES (Lorant et al., 2003). Recent results from a national German survey show that the 12-month prevalence rate for mood disorders is more than twice as high for low SES people (14%) than for those with high SES (6.3%; Jacobi et al., 2014). A gradient in mental health is generally found when analyzing each of the single indicators occupation, income and education (The ESEMeD/MHEDEA

2000 Investigators, 2004), and it is evident throughout the whole lifespan (Chang-Quan, Zheng-Rong, Yong-Hong, Yi-Zhou, & Qing-Xiu, 2010).

Mental health goes beyond the absence of psychopathology, and a comprehensive evaluation of mental health status should take psychopathological symptoms, but also the positive dimension of mental health (PMH) into account (World Health Organization, 2001). Psychopathology and PMH are two interrelated but distinct dimensions, and PMH is defined as a general feeling of well-being, comprising emotional, psychological and social well-being (Keyes, 2002). Currently, a valid and superior taxonomy of well-being is missing. There are several well-being models, e.g. PERMA model (Seligman, 2012) or the distinction in hedonic (subjective) and eudaimonic (psychological)

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well-being (Keyes, Shmotkin, & Ryff, 2002). The PMH-Scale refers to the widely used concept of Keyes' model which includes emotional, psychological and social well-being. In the literature, the term "positive mental health" is often used interchangeably with "subjective well-being", "quality of life" or "life satisfaction". For the sake of consistency we will use PMH in this study. People with low SES have also lower levels of PMH (Wood & Tarrier, 2010).

Attempts to explain the causal mechanisms underlying the relationship between SES and mental health can be subsumed under two models. The selection model posits that the social gradient is caused by individuals' downward drift after the onset of disorders. In contrast, the causation model assumes that factors associated with lower SES contribute to the onset of disorders (Perry, 1996). With respect to depression, empirical evidence is not consistent across studies, but mainly supports the causation model (Hudson, 2005). Studies on social selection or causation and PMH are sparse.

Multiple mechanisms may contribute to the association between SES and mental health (Marmot et al., 1998). Risk factors related to low SES are unhealthy and stressful working conditions, material deprivation, and inadequate preconditions for recreational leisure time (Siegrist & Marmot, 2008). Individuals who experience a multitude of stressful events, environmental demands and daily hassles are at increased risk of subsequently developing some form of psychopathology, and the likelihood is enhanced under low SES (Gallo, 2009; Schmidt-Traub & Lex, 2005). Low SES has been suggested to increase stress by reducing people's sense of control over their lives (Marmot, 2004), and it is well established that sense of control decreases with decreasing social position (Farhood & Dimassi, 2012; Huurre, Rahkonen, Komulainen, & Aro, 2005). Cultural activities such as reading and visiting theater or cinema have also been shown to be associated with SES (Pampel, 2011; Purhonen, Gronow, & Rahkonen, 2011) and as a risk factor for depression, anxiety and stress when lacking (Cuypers et al., 2012).

However, to date research mainly focuses on interactions between biological and psychological factors. According to the biopsychosocial model mental health is to be explained by all three factors, with biological factors, psychological ones (e.g. resilience, sense of control), and social factors (e.g. education, occupation, income) interacting and all contributing to mental health (Schwartz, 1982; Suls & Rothman, 2004).

SES is associated with a lack of a number of psychological and psychosocial resources which are relevant for depression and PMH (Gallo, 2009; McLeod, Lawler, & Schwalbe, 2014; Suls & Rothman, 2004). Specifically, there is empirical research suggesting that sense of control, resilience, the ability to delay gratification and the amount of cultural activities are associated with the educational level and also influence mental health. The relevance of low sense of control and experiencing negative events as uncontrollable is well documented for depression (Hammen & Watkins, 2008). Regarding PMH, research has shown that self-control is a key variable (Hofmann, Luhmann, Fisher, Vohs, & Baumeister, 2013; Tangney, Baumeister, & Boone, 2004). Resilience, which is defined as the ability to cope successfully with stressful life circumstances and promote positive adaption (Wagnild & Young, 1993), reduces depressive symptoms (Brunwasser, Gillham, & Kim, 2009) and is positively related to PMH (Liu, Wang, & Li, 2012; Liu, Wang, Zhou, & Li, 2014). Moreover, less cultural activities are conducted under low education (Cuypers et al., 2012), they have been found to be associated with depression (Cuypers et al., 2012; Wilkinson, Waters, Bygren, & Tarlov, 2007), and higher life satisfaction is related with more cultural activity (Velten et al., 2014). In addition, the ability to delay gratification, which refers to a person's postponement of immediately available opportunities to satisfy impulses in favor of pursuing chosen important rewards or goals that are temporally remote but ostensibly more valuable, and which is helpful in both achievement settings and situations in everyday life, was found to be related to SES (Watts, Duncan, & Quan, 2018) and also to depression (Wertheim & Schwarz, 1983). Furthermore, individuals under low socioeconomic

circumstances suffer from more frequent exposure to daily hassles (Matthews et al., 2000; Turner & Turner, 2005) and experience more severe hassles (Grzywacz, Almeida, Neupert, & Ettner, 2004). The cumulative effects of daily stressors are important predictors for the emergence of symptoms of depression and lower PMH (Matthews et al., 2000; Turner & Turner, 2005).

Taken together, sense of control, resilience, delay discounting, cultural activities and daily hassles were found to be negatively related to depression (Brunwasser et al., 2009; Cuypers et al., 2012; Hammen & Watkins, 2008; Parrish, Cohen, & Laurenceau, 2011), positively to PMH (Helzer & Jayawickreme, 2015; Lai & Mak, 2009; Lu, Wang, Liu, & Zhang, 2014; Velten et al., 2014), and to diminish with lower SES (Cuypers et al., 2012; Farhood & Dimassi, 2012; Pechmann, Petermann, Brahler, Decker, & Schmidt, 2014). However, most of the studies did not investigate all three components, SES, psychosocial characteristics, and mental health, together. None asked whether SES affected the psychosocial characteristics, and if these in turn contributed to mental health. To the best of our knowledge, no study investigated mediations between SES, psychosocial characteristics and depressive symptoms as well as PMH. The exact psychosocial pathways through which SES influences mental health have thus not been identified yet. We aimed to investigate the same variables for both mental health dimensions in order to compare the empirical results for both dimensions.

Moreover, gender and age are further important sociodemographic factors, with a higher risk for women (9.9%) than men (4.2%; Maske et al., 2016) and a higher risk for younger people (9.1%) than for older ones for depression (5.4%; Jacobi et al., 2014). Regarding PMH and gender the findings are inconsistent. Some research showed that women reported lower levels of PMH (Nydegger, 2004), but others indicated higher PMH (Stocks, April, & Lynton, 2012). The relationship between age and PMH follows an u-shape throughout the lifespan (Blanchflower & Oswald, 2008; Cheng, Powdthavee, & Oswald, 2015; Stone, Schwartz, Broderick, & Deaton, 2010).

Based on the previous findings we hypothesize that low education is associated with a lack of these psychological and psychosocial resources and a higher number of daily hassles, which in turn mediate the relationships between education and depressive symptoms as well as PMH. First, we hypothesize to find cross-sectional differences in depressive symptoms and PMH rates according to education. Second, we hypothesize that educational gradients exist for the psychosocial characteristics and daily hassles. Third, we assume that the relationship between education and depressive symptoms as well as PMH is mediated by these characteristics. Fourth, as there is considerable evidence of differences in depressive symptoms and positive mental health rates for the sociodemographic factors gender (Maske et al., 2016; Moksnes & Espnes, 2013) and age (Blanchflower & Oswald, 2008, as well as for depressive symptoms with respect to urbanicity (Peen, Schoevers, Beekman, & Dekker, 2010), we also investigate such differences in addition to the underlying mechanisms between education and mental health.

2. Materials and methods

2.1. Procedure

Data was gathered in the context of the longitudinal BOOM (Bochum Optimism and Mental Health Studies, http://www.kli.psy.ruhr-uni-bochum.de/klipsy/projekte/boom/boom-publications.html) a research program which aims to identify protective factors related to positive and negative mental health. The sample is representative for the German adult population. Data collection in Germany was performed in 2012 and 2013 via four different sampling methods, face-to-face interviews, online survey, telephone interviews and a mixed method approach, which allowed individuals to participate either online or via a set-top box. The Ethics Committee of the Faculty of Psychology of Ruhr-Universität Bochum approved the study.

Participants were given informed consent about the purpose of the study and participation was voluntarily and anonymous.

2.2. Measures

2.2.1. Depressive symptoms

Depressive symptoms were assessed using a subset of items from the depression subscale of the Depression Anxiety Stress Scales (DASS-21; Lovibond & Lovibond, 1995b). The following items from the DASS-42 formed the depression subscale used in our analyses: 3,5,10,13,16,17 und 21. The items are rated on a scale from 0 (*never*) to 3 (*almost always*). The DASS-42 (Lovibond & Lovibond, 1995a) is a widely used instrument which shows excellent psychometric properties in clinical (Cronbach's α for depression scale = .97; Antony, Bieling, Cox, Enns, & Swinson, 1998; retest-reliability $r = 0.71$; Brown, Chorpita, Korotitsch, & Barlow, 1997) and non-clinical samples (α for depression scale = .95; Crawford & Henry, 2003). The subscales may serve as an outcome measure and a screening and monitoring instrument. We applied the recommended cut-off of 10 for depression, which indicates an enhanced risk for the existence of a depressive disorder (Lovibond & Lovibond, 1995a).

2.2.2. Positive Mental Health Scale

The 9-item Positive Mental Health Scale assesses emotional, psychological and social aspects of well-being (Lukat, Margraf, Lutz, van der Veld, & Becker, 2016). Participants respond to statements such as "I am in good physical and emotional condition" on a scale ranging from 1 (*I disagree*) to 4 (*I agree*). The scale has strong psychometric properties (retest-reliability $r = 0.74$, $p < .001$; Cronbach's α = 0.93; Lukat et al., 2016). The cut-off for positive mental health (score ≥ 25) was determined by taking the mean plus one standard deviation (Lukat et al., 2016).

2.2.3. Educational level

We analyzed the educational level as an indicator of SES, following former studies on social inequality in health (Marmot et al., 1998; Mirowsky & Ross, 2003). The highest level of education achieved by the participant was assessed using four categories: secondary school qualification (graduation from Hauptschule), secondary school certificate (graduation from Realschule), high school diploma (Abitur), and university degree (Hochschulabschluss). Data for occupation and income were not fully available and comparable across the four sampling methods for the BOOM study sample and were therefore not included in this study.

2.2.4. Sense of control

Sense of control was assessed using two items ("Do you experience important areas of your life (i.e., work, freetime, family, etc.) to be uncontrollable, meaning that you cannot, or barely can, influence them?" and "Do you experience these important areas of your life as unpredictable or inscrutable?"). The items were generated by the last author based on clinical and scientific expertise and are rated on a scale from 0 (*not at all*) to 4 (*very strong*).

2.2.5. Resilience Scale

Psychosocial stress resilience was assessed with the 11-item version of the Resilience Scale, which demonstrates very good reliability and consistency ($r = 0.95$; Cronbach's α = 0.91; RS-11; Schumacher, Leppert, Gunzelrnann, Strauß, & Brähler, 2005). Participants responded to items such as "I usually manage one way or another" (see appendix 1) on a scale ranging from 1 (*I disagree*) to 7 (*I agree*).

2.2.6. Delay of gratification

Delay of gratification was assessed using two items of the German-Swiss version of the delay discounting test (Forstmeier & Maercker, 2011). Participants have to choose between a small, immediate and a larger, delayed monetary reward (e.g., "If you had to decide whether to get a small gift of money immediately or had to wait for a bigger one for a while, what would you choose? I would rather have 41 EUR today or 61 EUR in 30 days"). The test demonstrates a rather low internal consistency over all subscales (Cronbach's α = 0.39; Forstmeier, Drobetz, & Maercker, 2011; retest-reliability: $r = 0.71$; Forstmeier & Maercker, 2011).

2.2.7. Cultural activity

Frequency of cultural activity was assessed using one item generated by the team of the last author, which was rated on a scale ranging from 0 (*none*) to 3 (*more than 4 times a week*): "With what intensity did you engage yourself in a mental or cultural activity, such as reading, going to the theatre or cinema, or making music, in the last 12 months?". The item is part of a lifestyle choices assessment which demonstrated a good multi-group model fit indicating that lifestyle choices predict mental health comparably across different samples (Velten, Bieda, Scholten, Wannemüller, & Margraf, 2018).

2.2.8. Daily hassles

The 9-item Daily Stressors Screening was used to assess routine stressful experiences in domains like financial constraints, dissatisfaction with job, housing or discrepancies with related persons on a scale ranging from 0 (*not at all*) to 4 (*very much*) (Scholten, Lavallee, Velten, Zhang, & Margraf, 2014). It demonstrates good validity (Cronbach's α = 0.82; Schönfeld, Brailovskaia, Bieda, Zhang, & Margraf, 2016) and reliability ($r = 0.75$; Brailovskaia, Teismann, & Margraf, 2018).

2.2.9. Urbanicity

Participants were asked to indicate the population size of their place of residence. Urbanicity was categorized into the following groups: Towns with less than 20.000 inhabitants; 20.000–99.999; 100.000–499.999; and more than 500.000 inhabitants.

2.3. Data analysis

Statistical analyses were conducted using SPSS version 21 and MPlus 7 (Muthén & Muthén, 2012). Missing values did not exceed 5%, except for daily hassles (7%). Further analysis indicated that older participants had significantly more missing values in daily hassles ($t = 7.9$, $p < .001$, $df = 277$, $d = -0.52$). For descriptive and univariate statistics, missing data were handled using a multiple imputation (MI) procedure. The descriptive scale properties mean and standard deviation as well as skewness and kurtosis were calculated. Cronbach's alpha indicated internal reliability. Because assessment methods had an influence on the data (see also Zhang, Kuchinke, Woud, Velten, & Margraf, 2017), its influence was controlled in all analyses. Logistic regression was applied to calculate odds ratios (OR) with 95% confidence intervals (95% *CI*) for the risk of depressive symptoms and for PMH according to educational level, gender, age and the degree of urbanicity. The highest level of education (university degree) was used as the reference category. Kruskal– and Mann-Whitney-U statistics were conducted to test for differences in psychological characteristics with respect to the educational level.

Correlations were calculated to assess the relations between the variables. If significant relations were evident, we included the variables in the multiple mediation model. We used structural equation modeling (SEM) for the multiple mediation models. Missing data in MPlus were handled using full information maximum likelihood (FIML). MI and FIML are the two most common approaches to missing data analysis and yield similar results when the same variables are taken into account. Robust maximum likelihood estimation was used such that standard errors and a chi-square test statistics were robust to non-normality.

Sobel tests were used to test for the indirect effects. We desisted from the procedure of bootstrapping to test for the indirect effects,

because this procedure cannot take into account a weighting variable which is necessary to keep the sample representative for the total population. Even when the bootstrap procedure actually outperforms the Sobel test, the latter works well in large samples. We desisted from calculating the widely used K^2 because the definition of K^2 is mathematically incorrect. To test for the size of the indirect effects found in the mediation model, we calculated effect sizes by means of P_m. P_m is a measure of proportion of the indirect effect relative to the total effect, indicating how much of the total effect is explained by the mediators. Regarding the classification of the sizes of the indirect effects, we used the typology provided by Zhao and colleagues (Zhao, Lynch, & Chen, 2010). It is not comparable across studies and is taken into account for each model separately. The calculation of P_m is only meaningful when there is a direct effect and the indirect effect *ab* and the direct effect *c* have the same sign (Preacher & Kelley, 2011).

The goodness-of-fit of each multiple mediation model was evaluated with a combination of fit indices because χ^2 is sensitive to large sample sizes and thus leads to oversized rejection rates. For absolute fit, Root Mean Squared Error of Approximation (RMSEA) and Comparative Fit Index were calculated to estimate incremental fit. RMSEA < 0.06 - 0.08 and CFI > 0.95 are cut-off criteria for a good model fit. For the standardized root mean square residual (SRMR), values smaller than 0.09 indicate a good fit (Hu & Bentler, 1999).

Separate multiple mediator models for depressive symptoms and PMH as dependent variables were calculated. Dummy variables for the ordinal variable education were created. We particularly focused on the lowest educational level as risk group, and on the group with the highest educational level. Thus, multiple mediator models were calculated for the dummy variables secondary school qualification and university degree, resulting in four structural equation models.

3. Results

3.1. Descriptive data

Sample characteristics are presented in Table 1. Overall, 9.4% of the sample scored above the cutoff for depressive symptoms, and 23.4% scored above the cutoff for PMH.

3.2. Correlations

Depressive symptoms and PMH were associated with all risk and protective variables, as expected (see supplement 1). Depressive symptoms were most strongly positively associated with resilience and daily hassles and PMH negatively with these two characteristics. Depressive symptoms and PMH were also negatively associated with each other. Method, age and gender were significantly related to the key study variables and included as covariates in the multiple mediator models.

3.3. Odds ratios

An educational gradient was found for depressive symptoms, as the risk was higher for the group with the lowest qualification referred to the reference group with a university degree (see supplement 2). For the groups with a secondary school certificate or a high school diploma risks were also higher than for the reference group. For PMH no educational gradient was found.

We found an age gradient for depressive symptoms with decreasing risk in higher age. PMH was lower for all age categories under 65 years compared to the group older than 65. A higher risk for depressive symptoms was given for women, whereas for PMH results indicated equality for gender. The risk for depressive symptoms and PMH was higher in rural than urban areas. Towns of middle sizes did not differ from cities with more than 500.000 inhabitants in risk of depressive symptoms. PMH was also lower in rural areas, and in towns with

Table 1
Demographic characteristics of the sample.

Characteristics	Participants (*N* = 7937)
Gender, female, *n* (%)	4160 (52.4%)
Age, years: mean (sd)	47.6 (17.4)
Marital status, *n* (%)	
Single	4207 (53%)
Married	2343 (29.5%)
Separated/divorced/widowed	1356 (17.5%)
Education	
Secondary school qualification	2135 (26.9%)
Secondary school certificate	2859 (36%)
High school diploma	1402 (17.7%)
University degree	1541 (19.4%)
Urbanicity	
1–19.999	3278 (41.3%)
20.000–99.999	2165 (27.3%)
100.000–499.999	1144 (14.4%)
> 500.000	1350 (17%)
Assessment method	
Face-to-face	1870 (23.6%)
Telephone	2007 (25.3%)
Online	2039 (25.7%)
Mixed Method	2021 (25.5%)
DASS Depression (Cut-off > 10)	741 (9.4%)
female	410 (5.2%)
male	327 (4.2%)
PMH (Cut-off ≥ 25)	1858 (23.4%)
female	991 (12.6%)
male	867 (11%)

Note. DASS Depression = subset of the Depression scale of the Depression Anxiety Stress.
Scale; PMH = Positive Mental Health Scale.

20.000–99.999 inhabitants, compared to large cities.
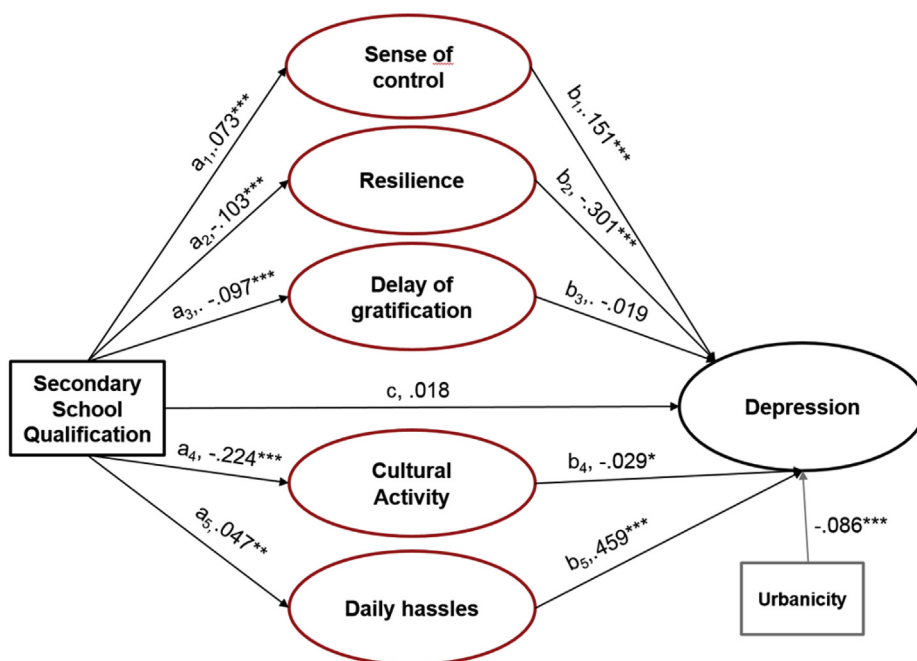
3.4. Kruskal Wallis and Mann Whitney U

Sense of control, resilience and delay of gratification partly followed a gradient and were lowest for the group with a secondary school qualification and highest for those with a university degree (see supplement 3). The group with a secondary certificate reported equal levels as the group with a high school diploma. Cultural activities followed an explicit educational gradient. Daily hassles showed a curvilinear pattern and were lowest in the groups with a secondary school qualification and university degree, whereas the group with a high school diploma experienced the highest amount of stressors.

3.5. SEM results

3.5.1. Education and depressive symptoms

In the SEM results for the lowest educational level, secondary school qualification, and depressive symptoms, the mediation model yielded an acceptable fit to the data ($\chi2 = 10007.243$ (627), CFI = 0.869, RMSEA = 0.04 (90% *CI* [0.04, 0.04], SRMR = 0.05). The direct path from secondary school qualification was not significant ($b = 0.02$, $p = .086$; see Fig. 1), indicating an indirect-only mediation. Examination of the specific indirect effects (see Table 2) indicated that sense of control ($b = 0.01$, $p < .001$), resilience ($b = 0.03$, $p < .001$), cultural activity ($b = 0.01$, $p < .01$) and daily hassles ($b = 0.02$, $p = .001$) mediated the relationship between secondary school qualification and depressive symptoms. Delay of gratification was not a significant mediator ($b = .00$, $p = .148$). The effect size of all indirect effects was $P_m = .80$.

In the SEM results for the highest educational level, university degree, and depressive symptoms, the mediation model yielded an acceptable fit to the data ($\chi2 = 10014.266$ (627), CFI = 0.87, RMSEA = 0.04 (90% *CI* [0.04, 0.04], SRMR = 0.05). The direct path from university degree to depressive symptoms was significant

Note. The effect of age, method and gender were controlled on all variables in the model. Age had a significant effect on controllability (-.01***), delay of gratification (.00***), daily hassles (-.01***), resilience (.01***), cultural activity (.01***) and depression (.00***); method had a significant effect on controllability (.08***), delay of gratification (.03***), daily hassles (.01*), resilience (.13***) and cultural activity (.24***); gender had a significant effect on delay of gratification (.03**), daily hassles (-.03***) and cultural activity (-.17***). The numbers are regression coefficients.

Fig. 1. SEM results for lowest educational level and depressive symptoms.

Table 2
SEM results for education – depressive symptoms.

Group	Point estimate	SE	Z
Secondary school qualification			
Indirect effects	.07	.01	7.04***
Total	.09	.01	6.57***
Sense of control (ab$_1$)	.01	.00	4.61***
RES-11 (ab$_2$)	.03	.00	6.97***
DOG (ab$_3$)	.00	.00	1.45
Cultural activity (ab$_4$)	.01	.00	2.56*
DSS (ab$_5$)	.02	.01	3.31**
University degree			
Indirect effects	−.05	.01	−5.42***
Total	−.07	.01	−6.49***
Sense of control	−.01	.00	−3.41**
RES-11	−.02	.00	−4.96***
DOG	−.00	.00	−1.45
Cultural activity	−.01	.00	−2.52**
DSS	−.02	.01	−3.07**

Note. RES-11 = Resilience Scale-11; DOG = Delay of gratification (0–2), DSS = Daily Stressor Screening, SEM = structural equation modeling. *$p < .05$, **$p < .01$, ***$p < .001$.

($b = −0.02$, $p = .009$), thus indicating a complementary mediation (see Table 2). Sense of control ($b = −0.01$, $p = .001$), resilience ($b = −0.02$, $p < .001$), cultural activity ($b = −0.01$, $p = .012$) and daily hassles ($b = −0.02$, $p = .002$) were significant mediators between university degree and depressive symptoms. Delay of gratification was no significant mediator ($b = −0.00$, $p = .148$). The overall effect size was $P_m = .68$.
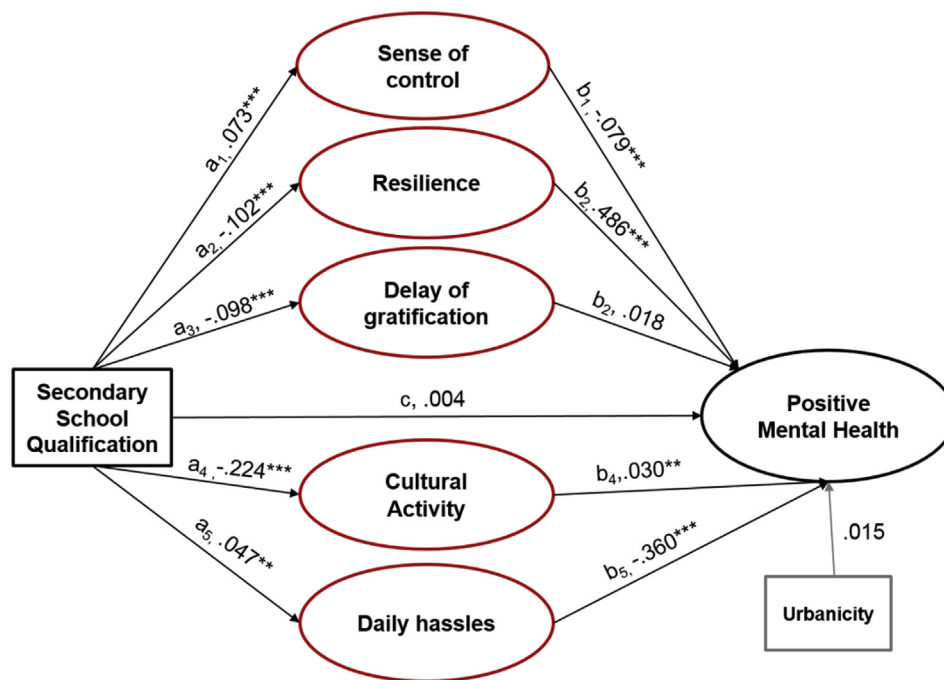
3.5.2. Education and PMH

The SEM results for secondary school qualification and PMH also yielded an acceptable fit to the data ($\chi2 = 12779.968$ (741), CFI = 0.86, RMSEA = 0.05 (90% CI [0.05, 0.05], SRMR = 0.05). The direct path from secondary school qualification to PMH was not significant ($b = 0.00$, $p < .250$; see Fig. 2), indicating an indirect-only mediation. Sense of control ($b = −0.01$, $p < .001$), resilience ($b = −0.05$, $p < .001$), cultural activity ($b = −0.01$, $p = .003$) and daily hassles ($b = −0.02$, $p = .001$) mediated the path between secondary school qualification and PMH (see Table 3). P_m was not calculated because there was no direct effect and the indirect paths and the direct path point to opposite directions.

The SEM results for university degree and PMH showed an adequate fit to the data ($\chi2 = 12803.307$, CFI = 0.857, RMSEA = 0.05 (90% CI [0.04, 0.05], SRMR = 0.05). The direct path from university degree to PMH was not significant ($b = −0.00$, $p > .250$). Sense of control ($b = 0.00$, $p = .003$), resilience ($b = 0.03$, $p < .001$), cultural activity ($b = 0.00$, $p = .005$) and daily hassles ($b = 0.01$, $p = .002$) were significant mediators (see Table 3). Again, P_m was not calculated because there was no direct effect and the indirect paths and the direct path had opposite signs.

4. Discussion

We investigated pathways by which education might influence depressive symptoms and PMH in a nationally-representative population

Note. The effect of age, method and gender were controlled on all variables in the model. Age had a significant effect on sense of control (-.01***), delay of gratification (-.00***), daily hassles (-.01***), resilience (.01***), cultural activity (.01***) and PMH (.00***); method had a significant effect on sense of control (.08***), delay of gratification (.03***), daily hassles (.01*), resilience (.13***) and cultural activity (.24***); gender had a significant effect on delay of gratification (.03**), daily hassles (-.03***) and cultural activity (-.17***). The numbers are regression coefficients.

Fig. 2. SEM results for lowest educational level and positive mental health.

Table 3
SEM results for education – positive mental health.

Group	Point estimate	SE	Z
Secondary school qualification			
Indirect effects	−.08	.01	−7.84***
Total	−.08	.01	−5.58***
Sense of control (ab1)	−.01	.00	−3.87***
RES-11 (ab2)	−.05	.01	−7.39***
DOG (ab3)	−.00	.00	−1.48
Cultural activity (ab4)	−.01	.00	−2.94**
DSS (ab5)	−.02	.01	−3.27**
University degree			
Indirect effects	.05	.01	5.78***
Total	.05	.01	4.67***
Sense of control	.00	.00	3.01**
RES-11	.03	.01	5.02***
DOG	.00	.00	1.49
Cultural activity	.01	.00	2.82**
DSS	.01	.01	3.05**

Note. RES-11 = Resilience Scale-11; DOG = Delay of gratification (0–2), DSS = Daily Stressor Screening, SEM = structural equation modeling. *p < .05, **p < .01, ***p < .001.

sample study in Germany. The expected differences in depressive symptoms and in psychosocial characteristics in the educational level were found. The risk of depressive symptoms was higher in the group with the lowest educational level (OR = 1.78; p < .001) and comparable to former meta-analytical results (OR = 1.81; p < .001) measured with different SES indicators (Lorant et al., 2003). All psychosocial resources were less distinct in people with a low educational level, indicating that individuals with low education were psychologically particularly burdened. They had fewer psychological resources to cope with adversities in terms of sense of control and resilience, and their ability to delay gratification, which is helpful in both achievement settings and situations in everyday life, was also significantly lower. Cultural activities, which might help to distract from and cope with stressors, were also conducted less often.

Moreover, all psychosocial characteristics, besides the delay of gratification, and daily hassles mediated the associations between education and depressive symptoms as well as PMH. The effect size in the model for low education and depressive symptoms of $P_m = .80$, indicating the proportion of the indirect effect relative to the total effect, demonstrated that a considerable amount of the total effect was explained by the psychosocial variables and daily hassles. The absence of direct effects between low educational level and depressive symptoms as well as PMH further underscored the strong effects of psychosocial characteristics. The attenuation of psychosocial resources of people with low education along with daily hassles might enhance their risk of suffering from depressive symptoms and lower levels of PMH.

Psychosocial characteristics, besides the delay of gratification, and daily hassles were significant mediators between education and depressive symptoms as well as PMH also for those with a high level of education. On average, individuals with high education were better equipped with psychosocial resources, but an individual lack of psychosocial resources along with daily hassles also puts individuals with

higher education at risk for depressive symptoms and lower levels of PMH. The effect size in the model for high education and depressive symptoms of $P_m = .68$ indicated that more than two third of the total effect was explained by the mediators.

No gradient was found for PMH along education, which is in contrast to our hypothesis and to a former study (Luhmann, Schimmack, & Eid, 2011). Moreover, no gender differences were found for PMH, and all age categories below 65 years showed significantly lower PMH compared to the oldest group. We did not find the curvilinear course of PMH demonstrated in former studies (Blanchflower & Oswald, 2008). In addition, PMH was lower in rural areas and small cities. We assume that additional factors beyond those investigated here influence PMH. Self-efficacy, optimism or personality factors could be possible factors which influenced the results (Schönfeld et al., 2016; Sun, Kaufman, & Smillie, 2018). However, as the current study is the first to investigate SES and PMH along with psychosocial resources as mediators, we refrain from any speculative interpretation. Future studies are necessary to identify the most relevant factors that influence PMH.

Daily hassles did not demonstrate the same pattern of social differences as the psychosocial resources. The group with a high school diploma experienced the highest amount of daily hassles, and the risk for depressive symptoms was also equally high for the group with a high school diploma as for the group with the lowest educational level. We assume that different types of stressors are common in each social class and contribute specifically to both daily hassles and the risk for depressive symptoms and lower levels of PMH (Hammen & Watkins, 2008; McLeod, 2013). A high level of daily hassles affects people regardless of social status and puts them at risk for worse mental health.

The age and gender differences in depressive symptoms, demonstrating a female preponderance and an age-related gradient with higher rates for young people, replicate the results from numerous studies (see Hammen & Watkins, 2008). However, in contrast to previous studies (e.g., Jacobi et al., 2014), we found a higher risk of depressive symptoms in rural areas. With respect to the differences in depressive symptoms and PMH according to urbanicity, age and gender that we found, the sample size was too small to investigate multiple mediations of the psychological characteristics in the corresponding subgroups. These relationships are likely to be multifaceted and future investigations on larger samples are needed to investigate complex interactions between positive and negative mental health, psychosocial resources, different facets of SES such as education, income and occupation, as well as urbanicity, age and gender.

4.1. Limitations

Different constellations of risk and protective factors can explain the role of the educational level as a tangible marker, and alternative explanations cannot be ruled out by the current study design. We did not investigate social support, marital status or perceived inequality, for example, which are associated with depression (Hammen & Watkins, 2008). Moreover, the psychosocial characteristics should be operationalized more comprehensively in future studies, especially the delay of gratification and sense of control. The latter was assessed by two self-generated items for which have not been validated. To measure delay of gratification, we applied two items about hypothetical money rewards from the delay discounting questionnaire (Forstmeier & Maercker, 2011), which includes further items about real snacks or magazines. Moreover, delay of gratification could also be operationalized on a behavioral level (Goellner, Ballhausen, Kliegel, & Forstmeier, 2018). Delay of gratification is also closely related to future orientation and future time perspective, which can be assessed with an imagination task or a scale, and it is considered to be a measure of the ability for self-regulation, for which comprehensive scales exist (see Goellner et al., 2018).

In addition, depressive symptoms were assessed with the self-administered DASS subscale, awaiting replication in a sample with clinical diagnoses. Another important aspect is that higher levels of depressive symptoms in people with low educational level might have led to more pessimistic self-assessments with respect to the psychological characteristics (Hammen & Watkins, 2008). Moreover, the variables we focused on might not be unique to depressive symptoms and PMH (McLeod et al., 2014; Phelan, Link, & Tehranifar, 2010).

4.2. Implications for future research

The findings of the current cross-sectional study help to shed light on the mechanisms underlying the social gradient in mental health. However, the cross-sectional design prevented us from examining causal relationships, and longitudinal studies are necessary to investigate causality. We assume that the development of psychosocial resources is partly influenced by conditions related to the level of education. Hence, if people with low education have fewer psychosocial resources to respond to daily hassles and to chronic stressors such as the lack of material resources and financial stress that is related to low SES, they are particularly burdened and at risk for depressive symptoms (McLeod, 2013; Ross & Mirowsky, 2013). Indeed, a recent study utilizing a longitudinal design found that locus of control was a mediator between education and depression (Culpin, Stapinski, Miles, Araya, & Joinson, 2015). Thus, our conclusions are consistent with other evidence. With respect to PMH, the results are less clear, and the general feeling of well-being seems to be influenced by variables that were not assessed in the present study.

Mental health researchers have not yet taken full advantage of the conceptual models of cumulative advantage and cumulative disadvantage that have been offered to explain social class disparities in physical health (Hatch, 2005; McLeod, 2013). Future longitudinal studies should therefore include income and occupation, and analyses of biological factors should also be integrated in order to comprehensively examine the biopsychosocial model, as biological, social and psychological factors interact in influencing mental health (Suls & Rothman, 2004). Biological (e.g., genetic) factors might underlie the present findings and multiple processes could be operating simultaneously. Social factors may trigger or buffer genetic risks. In addition, interactions between sociodemographic risk factors should be analyzed. Low educational level might be a more severe risk factor for depressive symptoms in a large city than in the countryside, for example (Jacobi et al., 2014). Finer-level analyses of differences in subgroups of the population, expanding the scope and considering multiple influences of SES and gender, age and urbanicity on individually-based risk factors and mental health, as well as their dynamic interplay with mutual influences (see also Marmot et al., 1998) can shed light on mutual influences and interactions over the life course. An understanding of how various aspects of SES are linked to biological and psychological pathways will help provide insights into what it is about SES that matters for mental health. Differences in health related and general habits ("habitus") between individuals from low and high SES have been proposed since decades (Bourdieu, 1984; Cockerham & Hinote, 2009) and empirical research on the mechanisms behind social gradients in mental health is overdue.

4.3. Conclusions

The results demonstrate that it is worthwhile to investigate the relationships between education, psychosocial characteristics and negative and positive mental health. Social inequality goes along with differences in prevalence patterns of depressive symptoms and with inequality in psychosocial resources. An unequal distribution of psychosocial resources promotes social inequality, and groups with low level of education need to be provided with better socioeconomic conditions and facilitated with the development of protective psychosocial characteristics (Levy & O'Hara, 2010). Interventions should take the social distribution of psychosocial characteristics into account or

should at least be equally distributed across groups with different social status. Our study provides information on possible intervention points to improve psychosocial resources and in turn mental health. Programs to strengthen resilience and manage daily stressors have been empirically validated (Anthony, Alter, & Jenson, 2009) and should be applied parallel to large-scale improvements of educational and working conditions.

Ethical approval

Data was gathered in the context of the longitudinal BOOM (Bochum Optimism and Mental Health Studies, http://www.kli.psy. ruhr-uni-bochum.de/klipsy/projekte/boom/boom-publications.html) a research program which aims to identify protective factors related to positive and negative mental health. Data collection in Germany was performed in 2012 and 2013. The Ethics Committee of the Faculty of Psychology of Ruhr-Universität Bochum approved the study. Participants were given informed consent about the purpose of the study and participation was voluntarily and anonymous.

Appendix A. Resilience Scale

When I make plans I follow through with them.
I usually manage one way or another.
Keeping interested in things is important to me.
I am friends with myself.
I feel that I can handle many things at a time.
I am determined.
I keep interested in things.
I can usually find something to laugh about.
I can usually look at a situation in a number of ways.
Sometimes I make myself do things whether I want to or not.
I have enough energy to do what I have to do.

Appendix B. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.ssmph.2019.100392.

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