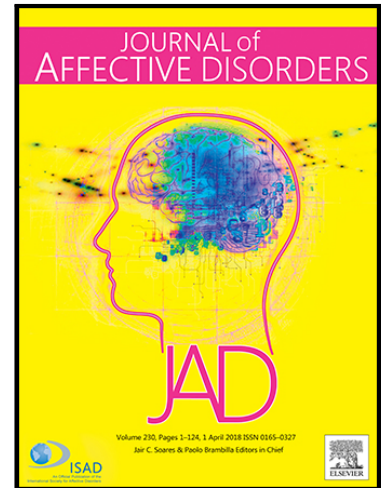# Accepted Manuscript

The role of optimism in the relationship between job stress and depressive symptoms. Longitudinal findings from the German Ageing Survey

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**Highlights**

- A nationally representative sample of older adults was used.
- Fixed effects regression analysis was used.
- Job stress is associated with an increase in depressive symptoms longitudinally.
- Optimism is associated with a decrease in depressive symptoms longitudinally.
- Optimism moderates the relation between job stress and depressive symptoms.

# The role of optimism in the relationship between job stress and depressive symptoms.

# Longitudinal findings from the German Ageing Survey.

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**Abstract**

*Background:* The aim of the present study was to investigate the effect of job stress on depressive symptoms and whether optimism moderates this relationship longitudinally. Data were used from 2002 until 2014 (wave 2 to 5) of the German Ageing Survey. The sample consists of community-dwelling individuals living in Germany aged from 40 to 95 years (7,086 observations in fixed effects regression analysis).

*Methods:* A self-report questionnaire was used to measure depressive symptoms (Center for Epidemiologic Studies Depression Scale), job stress (scale 1 to 5) and optimism (Optimism Scale of Brandtstaedter & Wentura).

*Results:* Adjusting for potential confounders, fixed effects regression analysis revealed that an increase in job stress was associated with an increase in depressive symptoms, whereas an increase in optimism was associated with a decrease in depressive symptoms. Optimism significantly moderated the relation between job stress and depressive symptoms.

*Limitations:* The possibility of a small sample selection bias cannot be dismissed.

*Conclusions:* The present study highlights the moderating role of optimism in the relation between job stress and depressive symptoms longitudinally. Thus, efforts to increase optimism in individuals might be beneficial in reducing depressive symptoms among individuals with high job stress.


Keywords: Optimism; stress; depressive symptoms; longitudinal studies

## INTRODUCTION

Stress, and in particular job stress, is a psychological issue and a widespread phenomenon caused by work characteristics as well as personal characteristics which leads to adverse health outcomes (Shields, 2006, Iacovides et al., 2003). Stress outcomes like fatigue, heart disease, depression, diabetes and burnout were discussed in previous literature (Cohen and Herbert, 1996, Iacovides et al., 2003, Melchior et al., 2007). Special emphasis is put on depressive disorders because estimations showed that over the course of one year about 8.9% of the working population aged 15 to 65 in Germany fulfill all criteria for a depressive disorder and up to 26.7% experience depressive symptoms (Wittchen and Jacobi, 2006). Health care costs in Europe for depression add up to 118 billion Euros per year (Sobocki et al., 2006). Society, economy and the affected individual have to master an excessive burden caused by depressive disorders resulting from job stress (Shields, 2006). Consequently, economy is weakened by lost productivity in the workplace (Tennant, 2001).

Numerous studies have been conducted to examine the relation between stress at workplace and depressive symptoms. Strong evidence showed that job stress is positively correlated with depressive symptoms (Shields, 2006, Iacovides et al., 2003, Dragano et al., 2008, Clays et al., 2007, Kawakami et al., 1992, Lin et al., 2010).

Moreover, employees' stress management is dominated by coping mechanisms which enhance their mental health. According to Lazarus (1993), mental toughness, personality characteristics, self-efficacy, optimism and educational background have a bearing on an individuals' coping behavior. Furthermore, it has been shown that optimism has a positive impact on individual's stress-coping ability (Schou and Ekeberg, 2005, Steginga and Occhipinti, 2006). Following, studies have revealed that an increase in optimism lead to a decrease in depressive symptoms (Achat et al., 2000, Symister and Friend, 2003).

Concerning optimism as a moderator, a *cross-sectional* study of Banerjee (2012) investigated the association of dispositional optimism on the stress-depression relationship. A survey method was used and filled in by 94 employees working in a private Indian university. Analysis was conducted with 94 participants (with a mean age of 32.9 years and 79% male participants). Higher psychological stress was associated with a higher depression level, whereas higher dispositional optimism was associated with a lower level of depression. Optimism significantly moderated the relationship between job stress and perceived depression.

However, *longitudinal* studies on this research topic are missing. The advantage and strength of longitudinal studies are displayed in determining causality, tracking intra-individual changes and diminishing unobserved heterogeneity (Brüderl and Ludwig, 2015). Summing up, most studies used cross-sectional data and carried out analyses regarding stress, depression and optimism in association with each other but did not focus on optimism as a moderating variable. To fill these gaps, the present study examined the moderating role of optimism in the relationship between job stress depressive symptoms using a longitudinal approach. Hence, the aim of this longitudinal study was twofold:

- first, we investigated the impact of job stress on depressive symptoms,
- and second, we examined whether optimism moderates this relationship using a nationally representative sample of German workers of middle age and older.

As optimism is modifiable (Blackwell et al., 2013), efforts to increase optimism in individuals might be beneficial in reducing depressive symptoms among individuals with high job stress.

Following, we hypothesized that an increase in job stress is associated with an increase in depressive symptoms. This assumption was based on findings in previous literature mentioned above. Moreover, we hypothesized that high job stress is linked to less depressive symptoms when optimism increases. Here, we assume that optimism could alleviate the job stress depressive symptoms relationship (Achat et al., 2000).

## METHODS

### *Sample*

Data were retrieved from the second (2002), the third (2008), the fourth (2011) and the fifth (2014) waves of the German Ageing Survey (DEAS). It is organized by the German Center for Gerontology (DZA, 'Deutsches Zentrum für Altersfragen') and under the patronage of the Federal Ministry for Family Affairs, Senior Citizens, Women and Youth (BMFSJ). This nationwide, representative cohort-sequential study combines cross-sectional samples with longitudinal samples while relying on participants of the community-dwelling population aged 40 and older in Germany (Klaus et al., 2017). The data offer a broad range of research topics regarding diversity and changes in the living conditions of middle-aged and older people as well as changes in individual ageing (i.e. health, well-being, work, volunteering, income, family and social support). Baseline recruitments took place in 1996 with 4,838 participants followed by wave 2 in 2002 with n = 3,670, wave 3 in 2008 with n = 6,205, wave

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5 in 2014 with n = 6,002. Wave 4 in 2011 was solely a panel survey of 4,855 participants who had been interviewed before. Additionally, panel assessment took place in waves 2, 3 and 5 with re-interviewed participants of 1,526, 1,995 and 4,322 participants, respectively. The baseline samples have been randomly chosen across Germany whereas age, gender and region (East and West Germany) served for stratification. Trained staff interviewed the participants face-to-face via computer-assisted personal interviewing (CAPI) and a standardized questionnaire was handed out.

While the response rate for first time participants was 25% in 2014, it was 61% for panel participants. The response rate of this study corresponds to other large survey studies conducted in Germany (Neller, 2005). According to Solon et al. (2015) estimates are negatively influenced in their efficiency by the use of weights which is why we did not use weights in this study. In order to ensure the representativeness of the sample in the follow-up waves, the groups which are most likely to contribute to panel attrition are oversampled: the sample is disproportionally stratified by gender and region (East and West Germany) and by age (40-54, 55-69, 70-85) (Klaus et al., 2017). Moreover, there is a decline in the participance of re-interviewed individuals: from the baseline year 1996, 31.5% took part in the survey in 2002, 20.5% in 2008, 21.5% in 2011 and 18.3% in 2014. From the baseline year 2002, 32.4% participated in 2008, 31% in 2011 and 28.1% in 2014. Finally, 46.1% of the baseline sample in 2008 took part in 2011 and 41.4% in 2014. This decline is caused by health problems, death, location movement and denial to participate but it has been shown that panel attrition is small (Klaus et al., 2017). Further details were made available elsewhere (Klaus and Engstler, 2016, Klaus et al., 2017). In the current study, data of variables were examined which were recorded from 2002 until 2014. We restricted our sample to employed individuals. Prior to the interview, written informed consent was given.

Please note that an ethical statement for the DEAS study was not necessary because criteria for the need of an ethical statement were not met (risk for the respondents, lack of information about the aims of the study, examination of patients). This is in accordance with the German Research Foundation-guidelines (Deutsche Forschungsgemeinschaft, DFG) available at: http://dfg.de/foerderung/faq/geistes_sozialwissenschaften/ (only available in German language).

*Dependent variable*

Depressive symptoms were assessed using the Center for Epidemiologic Studies Depression Scale (CES-D) which measures depressive symptomatology by means of previously validated longer scales in the general population (Radloff, 1977). The possible range of scores is 0-45, with higher scores indicating more depressive symptoms (Radloff, 1977). The use of the CES-D scale is favorable due to substantial evidence of construct validity, acceptable test-retest stability, high internal consistency and excellent concurrent validity by clinical and self-report criteria (Radloff, 1977).

### Independent variables

To measure participants' perception of job stress, participants filled out a 5-point Likert-type scale (1 = very difficult, 2 = difficult, 3 = a little difficult, 4 = hardly difficult, 5 = not at all difficult) which presents their level of stress at present. Here, higher scores meant less job stress. The single item stress question (SISQ) is widely used (Arapovic-Johansson et al., 2017). Moreover, the validity and reliability of the single-item stress question has been demonstrated (Arapovic-Johansson et al., 2017).

According to a validated scale ("Affective valence of future perspectives" scale) with five items (four levels) (Brandtstädter and Wentura, 1994), the participants' level of optimism was assessed. The questions asked are for example 'For me the future is full of hope', 'I look to the future with confidence' and 'The future holds a lot of good in store for me'. Four items have been recoded. A rating scale ranging from 1 to 4 (1 = strongly agree, 4 = strongly disagree) was used. The individual scale value with a possible range of 1 to 4 is the mean of the items. The scale represents the mean of at least 3 items with valid values. Here, higher values were matched to higher optimism. Cronbach's alpha was .85 in our study.

Regarding potential confounders as examined in the study of Cole et al. (2003), variables were determined as follows: age, the type of partnership in household (single, partner in the same household, with partner without combined household), the number of living children (ranging between 0 and 8) and the total number of physical diseases (for example, cardiac and circulatory disorders, diabetes or cancer, ranging between 0 and 11). Furthermore, the monthly equivalence income in Euro (new OECD equivalence scale) was added in FE regression analysis as it has been shown that income serves as a potential confounder (Zimmermann and Katon, 2005).

### Statistical analysis

For estimating the effect of optimism on the job stress depressive symptoms relationship fixed effects (FE) regressions were used in the current study.

When time-constant unobserved factors (e.g., genetic disposition) are correlated in a systematic way with the explanatory variables, other panel regression models such as random effects (RE) regressions lead to inconsistent estimates (Cameron and Trivedi, 2005). Contrarily, FE regressions provide consistent estimates when such a correlation is present (under the strict exogeneity assumption) (Cameron and Trivedi, 2005).

FE regressions only use within-individual variations. Accordingly, the FE estimator is called 'within-estimator'. Following, sex and education were not added in FE regression analysis because sex and education (in higher age) are constant within individuals over time. However, it is worth noting that time-constant factors (observed and unobserved) did not bias the FE estimates. Therefore, this longitudinal study used a FE model to examine the moderating effect of optimism on stress and depression. The Hausman test supported this choice (Sargan-Hansen statistic: 32.45, P-value = 0.00). Cluster-robust standard errors were computed (Stock and Watson, 2008). The significance level was determined at 0.05. All statistical analyses were performed using Stata 14.0 (College Station, Texas).

## RESULTS

### *Sample characteristics*

Table 1 displays the descriptive characteristics of the sample (n = 7,649) which was used in the FE regression analysis. The mean age was 52.7±6.2 and on average the monthly net equivalent income was 2,047.2±1,381.3EUR. Most of the respondents had a partner in the same household (82%). On average, respondents had 1.1±0.7 children and about 1.7±1.5 physical diseases. Regarding job stress, the mean was 2.7±1.2. Mean optimism score was 3.1±0.5. The mean of depressive symptoms using the CES-D scale was 6.5±5.7, ranging from 0 to 45.

| Table 1 – Characteristics of observations included in fixed effects regression analysis (wave 2 to wave 5, n = 7,086) | |
|---|---|
| Variables | N (%)/ mean (SD); range |
| Age (in years) | 52.7 (±6.2); 40-83 |
| Monthly equivalence income (in EUR) | 2,047,2 (±1,381.3); 80-33,333.3 |
| Type of partnership in household: | |
|   Single | 998 (13.1) |

| | |
|---|---|
|   Partner in the same household | 6,252 (81.9) |
|   With partner without combined income | 386 (5.1) |
| Number of living children | 1.1 (±0.7); 0-8 |
| Total number of physical diseases | 1.7 (±1.5); 0-11 |
| Job stress (1 = Very difficult, 2 = Difficult, 3 = A little difficult, 4 = Hardly difficult, 5 = Not at all difficult) | 2.7 (±1.2); 1-5 |
| Optimism (from 1 = less optimistic to 4 = very optimistic) | 3.1 (±0.5); 1-4 |
| Depressive symptoms (CES-D) (from 0 = no depressive symptoms to 45 = severe depressive symptoms) | 6.5 (±5.7); 0-45 |
| EUR, Euro; CES-D, Center for Epidemiologic Studies Depression Scale; SD, standard deviation. Note that the variables, sex and education were not included in FE regressions as explanatory variables since these variables are time-invariant (i.e. they did not vary within individuals in old age). These variables are only used to describe the sample. | |

## *Regression analysis*

Table 2 depicts the results of the regression analysis with depressive symptoms as dependent variable (regression analysis with standardized variables is available as supplementary material). Column 1 shows the effect of job stress on depressive symptoms (first model). In column 2 (second model), optimism was added to the model, while column 3 (third model) illustrates the effect of the interaction term 'job stress x optimism' on depressive symptoms. In the first model, FE regression analysis revealed that an increase in the job stress scale, which means that respondents reported less job stress, was associated with a decrease in depressive symptoms ($\beta$ = -0.71, P < 0.001).

In the second model, an increase in optimism was associated with a decrease in depressive symptoms ($\beta$ = -2.32, P < 0.001). In the third model, the interaction term 'job stress x optimism' achieved statistical significance ($\beta$ = 0.47, P < 0.05). This means that an increase in optimism can alleviate the negative impact of increasing job stress on depressive symptoms (please see figure 1). Figure 1 was conducted using the 'marginsplot' command in Stata. This command can help to visualize interactions. Please see for further details (Mitchell, 2012).
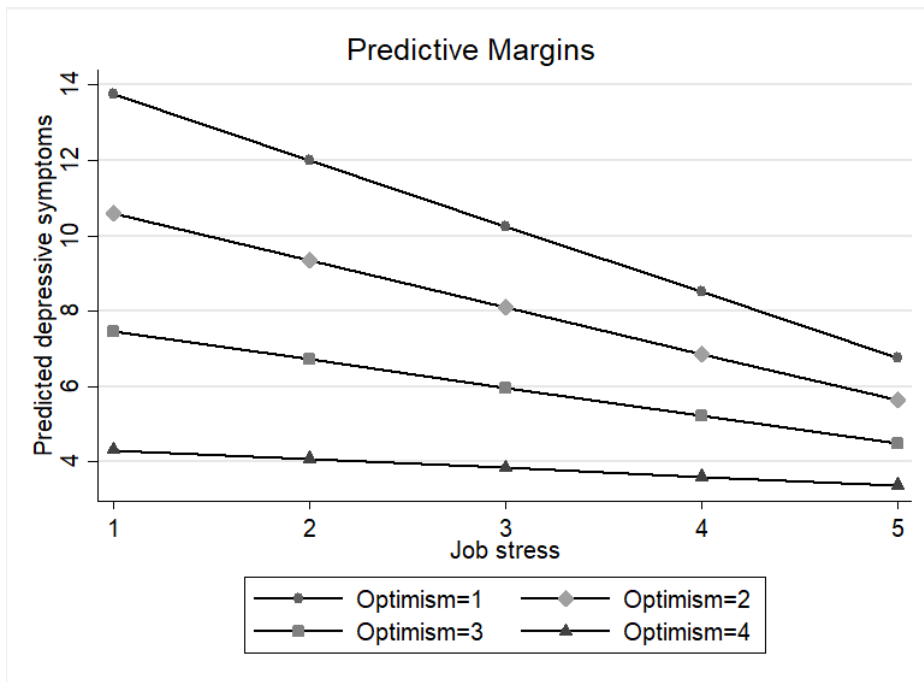
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**Fig. 1** The moderating effect of optimism on the relationship between job stress and depressive symptoms (higher optimism values correspond to higher optimism, and higher job stress scores correspond to less job stress). Please note that the y-axis reflects the estimates of the margins.

Moreover, increasing depressive symptoms were negatively related to ageing ($\beta$ = -0.06, P < 0.05; $\beta$ = -0.07, P < 0.05). An increase in the total number of physical diseases were positively associated with an increase in depressive symptoms ($\beta$ = 0.41, P < 0.001; $\beta$ = 0.35, P < 0.01). To test the robustness (in terms of significance) of the interaction term, the control variables type of partnership and existence of children were sequentially added to the regression model (results not shown, but available upon request). The interaction term remained almost the same in terms of significance and effect size. Furthermore, when limiting the age from 40 years up to the beginning of retirement (65 years), the interaction term remained almost the same.

| Table 2 – Predictors of depressive symptoms – results of fixed effects regressions (total sample) | | | |
|---|---|---|---|
| Independent variables | (1) CES-D | (2) CES-D | (3) CES-D |
| Age | -0.06* (0.03) [-0.11 - 0.00] | -0.06* (0.03) [-0.11 - 0.00] | -0.07* (0.03) [-0.12 - 0.11] |
| Monthly equivalence income | 0.00$^+$ (0.00) [0.00 - 0.00] | 0.00$^+$ (0.00) [0.00 - 0.00] | 0.00 (0.00) [0.00 - 0.00] |
| Type of partnership in household | -0.29 (0.40) | -0.36 (0.40) | -0.35 (0.40) [-3.36 - 0.94] |

| | | | |
|---|---|---|---|
| | [-3.18 - 1.07] | [-3.30 - 0.93] | |
| Number of living children | 0.18 (0.24) [-0.23 - 0.71] | 0.27 (0.23) [-0.14 - 0.79] | 0.25 (0.23) [-0.15 - 0.77] |
| Total number of physical diseases (0-11) | 0.41*** (0.11) [0.20 - 0.63] | 0.35** (0.11) [0.14 -0.56] | 0.35** (0.11) [0.14 - 0.56] |
| Job stress (1 = Very difficult, 2 = Difficult, 3 = A little difficult, 4 = Hardly difficult, 5 = Not at all difficult) | -0.71*** (0.12) [-0.95 - 0.47] | -0.65*** (0.12) [-0.89 - -0.42] | -2.12** (0.76) [-3.65- -0.72] |
| Optimism (from 1 = less optimistic to 4 = very optimistic) | | -2.32*** (0.33) [-2.98 - -1.69] | -3.56*** (0.74) [-5.06 - -2.18] |
| Interaction term: Job stress x optimism | | | 0.47* (0.23) [0.04 - 0.94] |
| Constant | 10.78*** (1.83) | 17.83*** (2.07) | 21.79*** (2.99) |
| Observations | 7,101 | 7,086 | 7,086 |
| Number of case numbers | 5,025 | 5,017 | 5,017 |
| $R^2$ | 0.03 | 0.06 | 0.07 |

CES-D, Center for Epidemiologic Studies Depression Scale

Beta-coefficients are reported; cluster-robust standard errors in parentheses; 95%-CI in square brackets. ***$P < 0.001$, **$P < 0.01$, *$P < 0.05$, [+]$P < 0.10$.

Observations with missing values were dropped (listwise deletion). It is worth noting that the Stata command for FE regression analysis ('xtreg, fe') include individuals with only one observation in calculating the number of observations because these individuals deliver information about the variance components, the constant, the between $R^2$ and so on. Nevertheless, it does not affect the beta-coefficients as well as the standard errors.

## DISCUSSION

### Main findings

The aim of this longitudinal study was to investigate the impact of job stress on depressive symptoms and whether optimism can moderate this relationship. Regressions revealed that (i) job stress had a significant impact on depressive symptoms and (ii) that optimism moderated the job stress depressive symptoms relationship significantly.

### Previous research and possible explanations

Our findings extend previous cross-sectional studies' findings showing that there is an association between job stress and depressive symptoms (Aneshensel and Stone, 1982, Melchior et al., 2007, Iacovides et al., 2003, Kawakami et al., 1992, Shields, 2006, Tennant, 2001). Mental health problems are predicted by stressful work conditions (Melchior et al., 2007, Godin et al., 2005). The following studies examined different job characteristics and their relationship to depression: Kawakami et al. (1992) found that depression was associated with job unsuitability, lack of control over workplace and poor human relations between

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Japanese blue-collar worker (n=468). In another study, perceived low control and high commitment in the workplace of German individuals aged 45-74 years was related to elevated levels of depression (n=1,811) (Dragano et al., 2008). Siegrist (2008) emphasized in a study of working men and women of middle-aged population from a variety of occupations and countries that high demand and low control combined with low rewards (in terms of esteem, money and promotion) were linked to an increase in depressive symptoms by eighty percent within a few years. Moreover, Cho et al. (2008) underlined in a study with a nationwide sample that discomfort in the working climate and inadequate social support account for the highest risk factors in triggering depression (n=8,522). Steyn et al. (2014) found that stressful job characteristics such as task significance and autonomy were associated with depression among white collar workers in South Africa (n=215).

Furthermore, there is considerable evidence that job stress is associated with burnout (Iacovides et al., 2003, Williams and Cooper, 1998, Ahola et al., 2014, Bianchi et al., 2016). The following studies disproved the hypothesis that burnout and depression are separate entities with only few characteristics in common: For example, Al-Alawi et al. (2017) showed in a cross-sectional study of 662 students in Oman that the presence of high occupational burnout elevates the risk of depression. In addition, also Bianchi et al. (2013) supported the hypothesis that burnout and depression are no separate entities (n=545) and Bianchi et al. (2015b) found that there is a qualitative and quantitative overlap of burnout with depression. Besides, several studies have proven that job stress is associated with burnout (Jamal and Baba, 2000, Ross et al., 1989, Oehler et al., 1991, Taris et al., 2001). Overall, it is still unclear how the state of burnout (i.e., the end stage of the burnout process) differs from clinical depression (Bianchi et al., 2015a) andif individuals suffer from depressive symptoms or burnout or both.

Cross-sectional studies are likely to be biased by self-selection and estimates rely on differences between individuals (between-variation) (Brüderl and Ludwig, 2015). The present study used a panel regression model (exploiting within variations) to reduce the fundamental problem of unobserved heterogeneity. Thus, results from the present study extend the findings from previous studies in so far that the association between job stress and depressive symptoms prevailed when analyzing participants over the time of twelve years. Previous longitudinal studies support this finding: Melchior et al. (2007) (n=972) and Clays et al. (2007) (n=2,821) both conducted a longitudinal study, in which they controlled for depression and any other psychological disorder prior to the start of measurement, and found a significant

relationship between high job demands and depression. Additionally, Shields (2006) emphasized that depression is significantly negatively affected by job strain after controlling for socio-economic status, social support and age using longitudinal data from the Canadian Community Health Survey (n=20,747).

Moreover, in our study, optimism was shown to be a moderator when participants experienced job stress and resulting depressive symptoms. Like the current study, a previous study by Banerjee (2012) reported that optimism moderates the job stress depressive symptoms relationship. But contrarily, Banerjee's study used a cross-sectional approach and a rather restricted setting. The present study extends this finding (1) by using a nationally representative sample of individuals in the second half of life and (2) by using a longitudinal approach.

Regarding coping mechanisms, stressful situations create high demands which can be coped with behavioral (i.e. being optimistic) and cognitive efforts according to the transactional theory (Folkman, 1984). Thereby, coping plays an important role to reduce psychological illness and foster motivation (Melchior et al., 2007). Following, various studies shed light on the high correlation of coping behaviors with depression (Ingram et al., 1988, Morrow and Nolen-Hoeksema, 1990). As regards optimism, it has been shown that optimism can increase the effort to reach goals (Nes and Segerstrom, 2006, Strutton and Lumpkin, 1993). Thus, it can inspire individuals to persevere when faced with difficult work situations.. Consequently, individuals who score high in optimism react far less to stressors than individuals who score low in optimism.

Concerning optimism, the longitudinal study of Cederbald et al. (1995) demonstrated that optimism was associated with positive mental health and lower frequencies of some mental disorders (n=148). Following, it has been shown that optimism is associated with higher psychological well-being in groups at risk of mental disorders (Scheier and Carver, 1992) and that optimism is associated with smaller increases in stress and depression (n=89) (Brissette et al., 2002) and with better mood, higher numbers of helper T cells and higher natural killer cell cytotoxity (n=140) (Segerstrom et al., 1998). . Above all it can be assumed that optimism serves as a coping strategy when facing the job stress depressive symptoms relationship.

As regards the negative association between age and depressive symptoms, our findings are in accordance with previous studies (Mirowsky and Ross, 1992, Wild et al., 2011, Wade and Cairney, 1997). It has been demonstrated that employment, economic well-being, life-cycle gains and losses in marriage mostly cause this relationship (Mirowsky and Ross, 1992).

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Besides, physical, emotional and social losses are better compensated with coping strategies and people gain better psychological immunization (Wild et al., 2011).

Demographic generalizability of the relationship between job stress and depressive symptoms are depicted by the following studies: Gershon et al. (2002) emphasized that high-stress jobs are associated with increased mental health problems in the US. Similar results were found by Wang et al. (2001) in Canada and by Tyssen et al. (2001) in Norway. Furthermore, Kawakami et al. (1992) stressed this relationship by examining Japanese blue-collar workers and Boey et al. (1997) found evidence for this relationship in Singapore.

### *Strengths and limitations*

In sum, our study has several strengths. To our knowledge, this is the first *longitudinal* study investigating the effect of optimism on the relationship between job stress and depressive symptoms. Using FE regression analysis, the problem of unobserved heterogeneity was reduced and time-constant potential confounders (unobserved and observed) are eliminated (Brüderl and Ludwig, 2015). Additionally, a large representative sample of community-dwelling individuals aged 40 and over was used. Long-term changes were examined (from 2002 until 2014). Moreover, it is worth highlighting that the measurement for depressive symptoms (CES-D scale) is a validated instrument (Radloff, 1977). Measurement for assessing optimism is as well favorable due to substantial validity of the scales (Brandtstädter and Wentura, 1994).

Concerning limitations, sample selection bias is likely to occur because some individuals with low education and low income were not considered in the survey due to self-selection. Among the oldest age group sample selectivity can be observed as well. Additionally, panel attrition (endogeneity selection bias) could bias our estimates because panel participants were younger, healthier and better educated. However, Klaus et al. (2017) demonstrated that both effects (sample selectivity as well as panel attrition) were rather small and that sociodemographic characteristics of the sample are distributed close to those of the German population. Although job stress was measured using one single item, it demonstrated satisfactory construct, content and criterion validity (Elo et al., 2003, Littman et al., 2006). However, future research with more sophisticated scales is needed. Other time-varying potential confounders (e.g., psychosocial factors) might play a role in the relation between job stress and depressive symptoms. Future research is required to clarify the role of these factors.

**CONCLUSION**

The results of the present study underline the importance of an increasing level of optimism in individuals with depressive symptoms when facing a high level of job stress to reduce depressive symptoms. Thus, as optimism is modifiable, efforts to increase general optimism might be beneficial to reduce the negative effect of job stress on depressive symptoms. For example, intervention programs on best possible self (BPS) to encourage an optimistic outlook in employed individuals might be beneficial because it has been shown that best possible self (BPS) led to significantly larger increases in optimism (Meevissen et al., 2011). Also, Peters at al. (2013) demonstrated that BPS led to increased optimism and life satisfaction (n=82). Similarly, BPS led to an increase in positive affect and positive future expectancies in a study by Peters et al. (2010). This was also demonstrated elsewhere (Sheldon and Lyubomirsky, 2007). Additionally, as we have shown that job stress is associated with depressive symptoms, it is reasonable to expect that positive changes in job characteristics may improve depressive symptoms. Noe et al. (2013) suggested a strategy called job-redesign to cope with this problem. Likewise, a strategy for improving performance was recommended by several studies (Bohlander and Snell, 2013, Hertzberg, 1968, Noe et al., 2013). However, further research (e.g., stratified by sex, sector or region) is required to get a better understanding of the impact of optimism on the relation between job stress and depressive symptoms. Additionally, future research is required to clarify whether different job characteristics affect depressive symptoms differently and whether this relation is moderated by optimism.

## Ethical standards

## Conflict of interest

## Funding

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