Employment Status and Psychosocial Quality of Work: Associations With Depressive Symptoms in a Population-Based Cohort Study

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Dedicated to

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Glossary of Terms

ADS	Allgemeine Depressionsskala
AIC	Akaike Information Criterion
ANOVA	analysis of variance
APA	American Psychiatric Association
BDI-II	Beck Depression Inventory
CASMIN	Comparative Analysis of Social Mobility in Industrial Nations
CES-D	Center for Epidemiological Studies Depression Scale
CI	confidence interval
CIDI	Composite International Diagnostic Interview
DSM	Diagnostic and Statistical Manual of Mental Disorders
e.g.	exempli gratia (for example)
GHS	German Health Interview and Examination Survey
HPA	hypothalamic pituitary adrenal
ICC	intra-class correlation coefficient
ICD	International Statistical Classification of Diseases and Related Health Problems
i.e.	id est (in other words)
LIFE	Leipzig Research Center for Civilization Diseases
LSNS	Lubben Social Network Scale
NEO-16 AM	NEO-16 Adjective Measure
OLS	ordinary least squares
O*NET	Occupational Information Network
OR	odds ratio
SCID	Structured Clinical Interview for DSM-IV
SD	standard deviation
SES	socioeconomic status
WHO	World Health Organization

1. Introduction

Depression is among the most common mental disorders, affecting approximately 322 million people worldwide to date (World Health Organization 2017). Depressive disorders can cause great suffering for those affected and their relatives (Schmid et al. 2003), impact daily functioning (Evans et al. 2014) and cause large amounts of health care costs in terms of treatment costs and lost productivity (Greenberg et al. 2015), making it a public health priority. The risk factors contributing to the emergence of depression are still not fully understood, but there is consensus that an interaction of biological, psychological and social factors contribute to an individual's risk for depression (Kendler et al. 2002, 2006). Many studies in the field of public mental health research in the last decades have focused on the identification of vulnerable groups for depression and the investigation of specific life events that can be detrimental to mental health. Since work and employment constitute an essential part of modern life, a large body of literature focusses on the possible protective or detrimental effects of work-related factors on risk for depression.

It is generally accepted that employment fulfills several functions which are considered important for mental health: Employment constitutes the main source of income for private households (Lampert et al. 2005), but it can also provide opportunities for personal growth, autonomy, daily structure, experienced community and social status (Modini et al. 2016). However, work is also a sphere where several types of stressors can be experienced. This can entail experiences of injustice, physically or psychologically demanding or even hazardous working environments. Another dimension related to mental health is the individual employment status, i.e. an individual's position within the labor market. Employment conditions that have been studied extensively with regard to mental health include e.g. unemployment or insecure employment.

Workforce participation is generally recognized as an essential prerequisite of social inclusion (Krause and Ritz 2006; Olesen et al. 2013). On the other hand, political actors highlight the importance of employment and working conditions for the generation and maintenance of good health (Deutscher Bundestag 2013). The average duration of working lives has been increasing continuously and currently amounts to 36 years in the European Union, with a further increase to be expected (Eurostat 2020). This implies that most people spend more than one third of their lives in employment, highlighting the need for up-to-date investigations of the relationship between employment, working environments and mental health. Investigating employment and work environments with regard to mental health is of particular interest since potential stressors related to employment might more easily be prevented or modified than the strain arising from other life events which are frequently unavoidable (Bonde 2008).

Meanwhile, changes abound in many Western welfare states. While standard, full-time employment is declining, atypical and contract work is increasing, and growing proportions of people experience periods of unemployment at least at some point during their employment career (Lampert et

al. 2005; Eichhorst et al. 2013). Therefore, information on the mental health situation of unemployed is of high interest. Investigating the topic of mental health and employment is also highly relevant due to demographic changes in most Western economies. In the face of ageing populations, governments have been trying to increase workforces and to prolong individual working biographies (van der Noordt et al. 2014; Andersen et al. 2020). However, impaired mental health raises the probability of premature exit from the work force, e.g. through illness-based early retirement. Furthermore, it has been shown that the experience of psychosocial stressors increases early retirement intentions on the side of the employees (Dingemans and Henkens 2019; Andersen et al. 2020; Virtanen et al. 2014). Although several reviews and meta-analyses have been published on the association between retirement and mental health during the last years, analyses of early retirement as a premature exit from the workforce are still scarce (Topa et al. 2017).

The challenges outlined above highlight the need for up-to-date knowledge on employment and working environments and their association with mental health: Only if the factors that are protective for or detrimental to mental health are known in detail, effective strategies can be developed and implemented to maintain mental health and protect work ability. The following section describes the theoretical background for the empirical studies that constitute this dissertation, including an overview on definition and characteristics of depression, etiology, epidemiological information on the prevalence of depressive disorders and the theoretical background on the association between employment, working conditions and depression.

1.1 Depressive Disorders: Definition and Characteristics

Depressive disorders are characterized by the presence of depressed mood, feelings of emptiness or loss of interest and pleasure in almost all activities, often accompanied by somatic and cognitive changes such as sleep disturbances, fatigue or difficulties concentrating (Cassano and Fava 2002). Although these emotional states can occur as a normal reaction towards negative experiences like loss, failure or exhaustion, a clinically relevant condition is indicated if these symptoms persist at a certain intensity over a sustained period. The diagnosis requires persisting symptoms within at least two consecutive weeks, experienced almost every day, most of the day. Although it can appear as a single episode of different degree (mild, moderate or severe), depression most often occurs as a recurring disorder (American Psychiatric Association 2013). Evidence from representative German studies estimated between 60 and 75% of all cases to be recurring depressive disorders (Wittchen et al. 2010).

1.2 Diagnosis and Screening

Depressive disorders are included both in the International Classification of Diseases, version 10 (ICD-10), maintained by the World Health Organization (WHO) and the Diagnostic and Statistical Manual of Mental Disorders, version 5 (DSM-5), published by the American Psychiatric Association

(APA). They belong to the group of affective disorders, which also comprises manic and bipolar disorders. The two diagnostic systems show a high level of agreement, with slight differences in the symptom groups considered and thresholds for the diagnosis. An overview of the respective diagnostic criteria for depressive episodes is provided in **Table 1**. Cases of recurrent depressive disorders belong to the diagnosis group F33 in the ICD-10.

Table 1: Diagnostic criteria for depressive disorders	
ICD-10	**DSM-V**
Core symptoms • depressed mood • loss of interest or pleasure • decreased energy or increased fatigability	**Core symptoms** • diminished or irritable mood • decreased interest or pleasure
Concomitant symptoms • loss of confidence and self-esteem • unreasonable feelings of self-reproach or excessive and inappropriate guilt • recurrent thoughts of death or suicide, or any suicidal behavior • complaints or evidence of diminished ability to think or concentrate, such as indecisiveness or vacillation • change in psychomotor activity, with agitation or retardation (either subjective or objective) • sleep disturbance of any type • change in appetite (decrease or increase) with corresponding weight change	**Concomitant symptoms** • feelings of guilt or worthlessness • fatigue or loss of energy • concentration problems • suicidality or thoughts about death • weight loss or weights gain (5% change in weight) or decrease/increase in appetite • psychomotor retardation or activation (change in activity) • hypersomnia or insomnia (change in sleep)
Diagnosis • symptoms persist for at least two weeks • *Mild depressive episode (F32.0)*: ≥ 4 symptoms, including ≥ 2 core symptoms • *Moderate depressive episode (F32.1)*: ≥ 6 symptoms, including ≥ 2 core symptoms • *Severe depressive episode (F32.2)*: ≥ 8 symptoms, including all three core symptoms	**Diagnosis** • symptoms persist for at least two weeks and represent a change from previous functioning • symptoms cause clinically significant distress or impairment in social, occupational or other levels of functioning • episode not attributable to physiological effects of a substance or another medical condition • *Major depressive disorder (296.2x):* ≥ 1 core symptom(s) and ≥ 4 concomitant symptoms
Diagnostic criteria for depressive episodes as described by the International Classification of Mental and Behavioral Disorders, version 10 (ICD-10) and Diagnostic and Statistical Manual of Mental Disorders, version 5 (DSM-5), adapted from (World Health Organization 1993b) and (American Psychiatric Association 2013)	

Structured clinical interviews represent the gold standard for the diagnosis of major depressive disorder. Validated standard instruments include the Structured Clinical Interview for the DSM-V (SCID; First 2014) or the Composite International Diagnostic Interview (CIDI) for the assessment of mental disorders according to DSM-IV and ICD-10 (World Health Organization 1993a).

Clinically diagnosed depression according to the diagnostic criteria outlined above is to be distinguished from depressive symptoms. Depressive symptoms in epidemiological studies are typically assessed by proxy-measures like e.g. award of disability pensions or medical rehabilitation (Mykletun et al. 2006; Leinonen et al. 2014; Fischer et al. 2014) but most commonly by screening tools. Several validated instruments which can be summarized as "depression scales" are available to measure depressive symptoms in the general population, the most common including the Beck Depression Inventory (BDI-II; Beck et al. 1996) and the Center for Epidemiological Studies Depression Scale (CESD; Radloff 1977), which was applied in the empirical studies comprising this dissertation. Both the original CES-D and its German translation (Allgemeine Depressionsskala / ADS; Hautzinger et al. 2012) have been validated in the general population (Cosco et al. 2017; Matschinger et al. 2000) as well as in clinical samples (Zhang et al. 2015; Patten et al. 2015; Schmitt et al. 2013). The CES-D is a selfreport scale consisting of 20 items enquiring the presence of depressive symptoms in the past week, with emphasis on the affective component of the disorder (Radloff 1977). Questions assess symptoms such as depressed mood, hopelessness or insecurity, using a 4-point-Likert-scale (0 = never/almost none of the time; 3 = most or all of the time). A sum-score is calculated with possible values ranging from 0 to 60 points, whereas higher values indicate higher levels of current depressive symptomatology. Population-based studies from Germany suggest a cut-off value of ≥ 23 as an indicator for clinical depression (Hautzinger et al. 2012).

Although epidemiological depression scales are not suitable to detect manifest clinical depression, the respective instruments can serve as valuable indicators of increased depressive symptomatology and subclinical depression. This is most often done by using cut-off scores derived from validated clinical instruments. Even if they do not fulfill the requirements for a clinical diagnosis, subthreshold depressive symptoms are of high relevance for public health since they can be very burdensome for the individual affected, impair a person's quality of life, individual performance and productivity (Busch et al. 2013; Hapke et al. 2019). Beyond that, a history of depressive symptom threshold increases a person's risk for major depression (Fogel et al. 2006).

1.3 Etiology of Depressive Disorders

The causes of depressive disorders are multifactorial: Biological (e.g. genetic predispositions), psychological and social factors contribute to an individual's risk for depression (Wittchen et al. 2010). Currently, the highest grade of evidence exists for diathesis-stress-models: This approach postulates that depression is caused by the interaction of a preexisting vulnerability/predisposition (i.e. diathesis) with

an individual's stress response to chronic or acute stressors, e.g. job loss or psychosocial stressors experienced in the workplace. If these external stressors exceed a person's coping resources, they can trigger the emergence of depression (Colodro-Conde et al. 2018). Diathesis-stress-models can therefore provide an explanation for why some individuals develop depression while others do not, even when exposed to the same amount of stress (see **Figure 1**). An individual's predisposition for depression can include genetic, biological or psychological factors.

From a sociological perspective, socioeconomic determinants like a low socioeconomic status (SES) can also be understood as factors increasing an individual's risk for depression: Lower SES typically entails lower levels of coping mechanisms, self-esteem, locus of control, social and material resources to deal with potential stressors. This is supported by meta-analyses reporting higher levels of persistent depression in lower SES groups (Lorant et al. 2003).
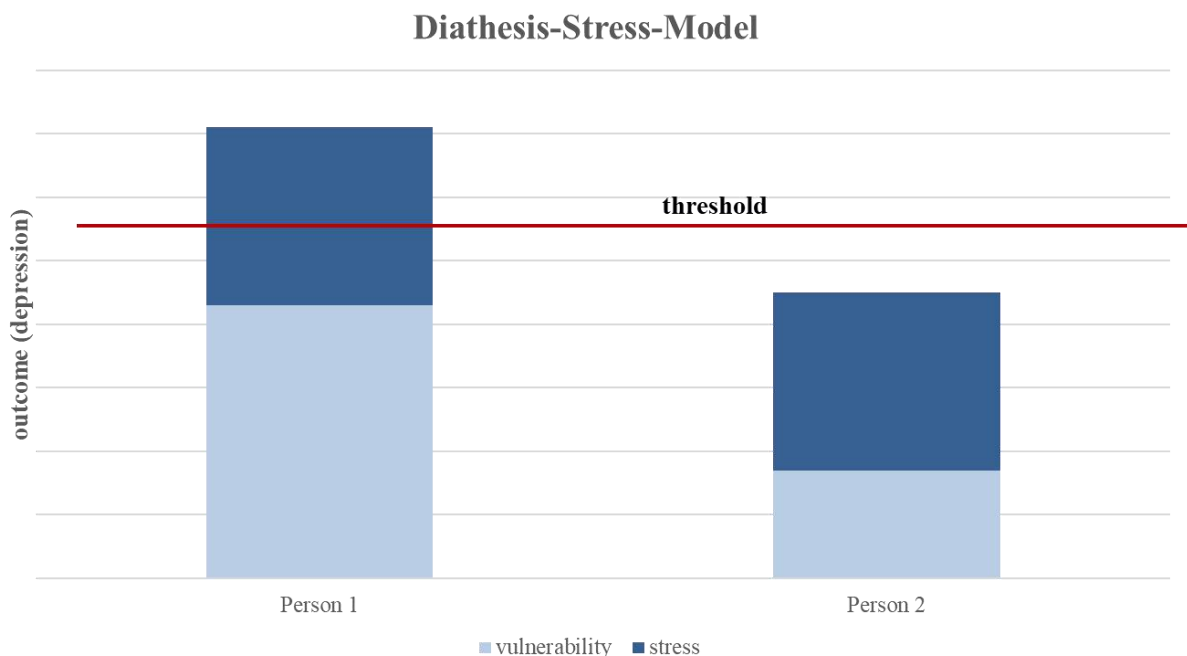

Figure 1: Diathesis-Stress-Model; source: own representation

Regarding genetic factors, a familial disposition is well-documented in depressive disorders, i.e. children of parents with a history of depression are at higher risk of developing an affective disorder themselves, while the specific pathways and mechanisms of inheritance are still unsolved (Brakemeier et al. 2008). Genetic disposition was found to interact with an individual's psychosocial development, encountered stressors and critical life events (Kendler et al. 1999; Kendler and Gardner 2016). Studies on specific genetic associations with depression primarily focused on the polymorphism of serotonin transporter gene 5-HTTLPR as a moderator of the effect of environmental stress (Caspi et al. 2003).

However, recent investigations and meta-analyses provided inconsistent results regarding a causal relationship between 5-HTTLPR expression and depression (Risch et al. 2009; Ripke et al. 2013).

Certain neurophysiological processes are associated with the onset of depression. There is evidence that a dysregulation in the transfer process of certain neurotransmitters and hormones (e.g. serotonin, noradrenalin, dopamine, cortisol) can increase risk of onset or remission (Gold 2015). Moreover, hormonal changes can increase risk for depression through an overreaction of the hypothalamic pituitary adrenal (HPA) axis which regulates important brain functions like the acquisition of memories or emotional perceptions of circumstances and events (Pariante and Lightman 2008).

1.4 Epidemiology

Recent estimates from the Global Burden of Disease Study as well as the WHO indicate that depressive disorders are among the leading causes of disability (Institute for Health Metrics and Evaluation 2018; World Health Organization 2017). Globally, the total estimated number of people affected by depression has increased by 18.4% over the last decade, reflecting overall growth of the world population and a proportionate increase of age groups where depression is most prevalent. The global prevalence currently amounts to around 322 million people or 4.4% of the world population (World Health Organization 2017). Studies based on representative data from Germany (Federal Health Survey 1998) estimated a 12-month-prevalence of 10.9% and a lifetime-prevalence of 19% for all depressive disorders among adults aged between 18 and 65 years (Wittchen et al. 2010). The 12-monthprevalence of diagnosed major depression in Germany has been estimated at 6.8% (Jacobi et al. 2015), which is highly comparable to estimates from the United States of America (6.6%; Kessler et al. 2003) and observational studies comprising 17 European countries (6.9%; Wittchen et al. 2011).

Prevalence and incidence of depression and depressive symptoms is distributed unequally within societies. Therefor, the role of important sociodemographic characteristics, i.e. gender, age and socioeconomic status, will be outlined concisely in the following paragraph, followed by information on the individual and societal costs of depressive disorders.

1.4.1 Sociodemographic and Socioeconomic Differences

Higher prevalence, incidence and morbidity of depression in women are well-documented across numerous countries and cultures: Women's risk for depression is expected to be twice as high as men's (Müters et al. 2013). Compared to men, women have a younger age at onset, longer durations of depressive episodes and a higher risk of remission (Hautzinger et al. 2012). Possible explanations for the observed differences include neurophysiological approaches (e.g. a higher reactivity of the HPAaxis to stress in women; Weiss et al. 1999), differences in coping styles or help-seeking behavior (Möller-Leimkühler 2000, 2009) and reporting of symptoms (Sieverding and Kendel 2012). Other explanations suggest a gender bias on the side of medical professionals, whereas women are more likely to receive a

psychiatric diagnosis than men, even when reporting with the same symptoms (Bertakis 2009). Moreover, discussions have emerged over the role of diagnostics, suggesting that commonly used inventories to detect depressive symptoms are biased towards symptoms more commonly expressed by women (e.g. depressed mood, feelings of worthlessness), therefore complicating a correct diagnosis of depression in men (Zülke et al. 2018).

Investigating gender differences is particularly important regarding the association of workplace factors or employment with depression. Previous studies using samples from earlier cohorts commonly stated a stronger association of work-associated factors and mental health in men, based on assumptions of a higher centrality of work for men's self-identity and a traditional male breadwinner-model. Women were often assumed to be less affected by work-related stressors due to the availability of other socially accepted roles and tasks like housekeeping or motherhood (Paul and Moser 2009). However, bearing in mind the stronger labor force attachment of women in younger cohorts and the observable change in traditional gender roles and division of labor, these assumptions should be called into question.

A social gradient for depressive disorders is well-documented, i.e. the lower an individual's social status, the higher the risk for depression (Fryers et al. 2005). Meta-analyses reported both higher incidence and prevalence of depressive disorders in lower SES-groups, with SES comprising education, occupational position and income (Lorant et al. 2003). Each of these three dimensions relates to mental health in a specific way: While education entails non-material resources like e.g. knowledge, attitudes and coping styles, the occupational dimension relates to mental health through stressors or rewards experienced in the workplace or social prestige associated with a job or occupational position. Income, on the other hand, reflects availability of material resources, and lack of income can cause stress through experienced financial strain or uncertainty (Hoebel et al. 2017). Therefor, the social gradient in incidence and prevalence of depression can partly be explained by an unequal distribution of social stressors that increase risk for depression.

Evidence on the association between depression and age remains inconsistent. Many studies report that the initial manifestation of depressive disorders on average appears between the age of 25 and 30 years. However, cohort studies point towards an earlier onset in younger birth cohorts (Wittchen 2006). Age-specific sub-analyses of representative data from Germany found the lifetime-prevalence of diagnosed depressive disorder to increase steadily until the age-group of 50 to 59 years, followed by a decline in the older age groups (Wittchen et al. 2010). In older populations, depression often occur as a comorbidity of somatic diseases and functional limitations (Härter et al. 2007).

1.4.2 Individual, Social and Economic Consequences of Depressive Disorders

Depression comes with a high rate of comorbidity and is associated with severe somatic conditions like e.g. renal insufficiency (Rothenhäusler and Kapfhammer 2003), stroke (Kouwenhoven et al. 2011) or diabetes (Holt et al. 2014). Recent meta-analyses reported that depressive episodes increased risk for

dementia (Prince 2014), and high rates of comorbidity have been reported for other mental diseases, especially anxiety disorders, eating disorders and personality disorders (Jacobi et al. 2005). Evidence also supports a high rate of comorbidity with dependency-related conditions, e.g. alcohol addiction (Gilman and Abraham 2001; Soyka and Lieb 2004). However, an analysis of the complex pathways underlying the common occurrence of these conditions with depression is beyond the scope of this dissertation.

Several studies have shown that depression is linked to excess mortality, with meta-analyses reporting relative risks of 1.6 compared to non-depressed observations (Cuijpers et al. 2014). Psychiatric disorders are considered responsible for approximately 65 to 90% of suicides, with depression being the single most important cause. According to the WHO, approximately 80% of all people who committed suicide were suffering from depressive symptoms (Krug et al. 2002). For those affected by major depressive disorder, the lifetime-suicide risk has been estimated between 12 and 15% (Harris and Barraclough 1997), although more recent analyses have suggested slightly lower risk levels (Wolfersdorf 2008).

Depression is not only burdensome for the individuals affected but comes with tremendous costs on a societal level. This includes direct costs (e.g. treatment costs) as well as indirect costs due to lost productivity, impaired work performance, absenteeism and early retirement (Karpansalo et al. 2005). In Germany alone, sickness costs for depressive disorders amounted to 8.7 billion Euro in 2015 (Statistisches Bundesamt 2019). However, many of those affected do not seek help or do not receive adequate treatment, as indicated by data from the German Health Interview and Examination Survey (GHS): Only half of those reporting a depressive disorder in the past twelve months sought treatment or were recommended by a doctor to do so (Jacobi et al. 2004). Therefore, the actual costs due to impairment and lost productivity might likely be underestimated.

Evidence from several Western countries states that depression is a particularly important reason for early retirement (Leinonen et al. 2014; Mykletun et al. 2006; Laaksonen et al. 2012). Depression is linked to retirement due to mental ill health, but also due to somatic diagnoses and non-illness-based retirement (Leinonen et al. 2014; Karpansalo et al. 2005). While the last decades were marked by an overall decrease in incapacity periods and disability pensions in Germany, ill-health retirement due to impaired mental health – especially due to depression – is on the rise. According to data from the German pension insurance, disability pension claims due to psychiatric disorders increased from 20.1% in 1996 to 41.7% of all claims in 2018, representing by now the single most important reason for disability retirement (Statistik der deutschen Rentenversicherung 2020). It has been argued, however, that this observed trend is not due to an increased prevalence of psychiatric and depressive disorders, but rather to higher rates of diagnosis and treatment for these illnesses, i.e. depressive disorders are recognized and diagnosed correctly more often (Jacobi and Linden 2018).

1.5 The Relationship Between Employment, Working Conditions and Depression

Employment is linked to better mental health than unemployment. This is commonly assumed to be due to material and psychosocial resources provided by paid employment. Second, due to the centrality of employment in modern societies, unemployment is often associated with stigma and discrimination. Experiences of stigmatization, on the other hand, can act as chronic stressors which increase distress or shame and lead to lower levels of self-esteem (Rantakeisu et al. 1999; Starrin et al. 2009; Staiger et al. 2018). For those suffering from depression or other mental illnesses, employment has been linked to lower symptom severity and an improvement of symptoms over time (Heinz et al. 2018), and gainful employment constitutes a major goal of rehabilitation for those suffering from mental illness (Riedel-Heller and Gühne 2015). Therefor, occupational health research traditionally presumes that employment is beneficial for mental health. This assumption is complemented by more recent studies investigating mental health outcomes in different employment groups. Results revealed that mental health benefits of employment depend on economic and psychosocial qualities of the respective job, suggesting the framework of an employment continuum ranging from inadequate to optimal jobs (Butterworth et al. 2011; Grzywacz and Dooley 2003). These findings suggest that it is worthwhile to consider the economic, social and psychological characteristics of work when investigating the beneficial or detrimental effects of work or joblessness on mental health.

A focus on the social environments of work emerged once physical demands and toxicological hazards were gradually brought under control and the relative share of the service sector increased over manual work in the course of the 1970s and 80s (Stansfeld and Candy 2006). When considering the relationship between psychosocial aspects of employment and (mental) health, two approaches gained particular recognition. The first of these models is the *demand-control-model* proposed by Karasek (Karasek Jr 1979): Briefly, the model states that a combination of high demands and low control in the workplace can threaten an individual's health because of limited autonomy and continuous stress (job strain). The *control*-dimension comprises the amount of control over assigned tasks and the ability to use individual skills (skill discretion). In a later amendment to the model, the dimension of social support from colleagues or supervisors was added, resulting in the *demand-control-support-model* (Johnson and Hall 1988; Johnson et al. 1989). It is assumed that a lack of experienced support can increase the detrimental mental health effects of job strain. Several meta-analyses and systematic reviews reported higher prevalence of depression or depressive symptoms in workers reporting higher levels of job strain (Netterstrøm et al. 2008; Madsen et al. 2017; Bonde 2008; Theorell et al. 2015).

By addressing norms of reciprocity derived from social exchange theory, the *effort-rewardimbalance-model* proposed by Siegrist (Siegrist 1996) investigates workplace social stressors from a different angle. It is suggested that an imbalance between (high) efforts spent at work and (low) rewards received acts as a stressor which poses a threat to an employee's health. Rewards include the categories of salary or wage, prospects of promotion, job security and, lastly, recognition or esteem

(Siegrist et al. 2004). Effort-reward imbalance has been found to increase risk for depression (Buddeberg-Fischer et al. 2008; Kivimäki et al. 2007) and early retirement intentions (Hintsa et al. 2015).

While both these models are of great merit and have been tested extensively in cross-sectional and prospective studies, it has been pointed out that other psychosocial factors of work and employment that are potentially linked to mental health are still understudied so far (Netterstrøm et al. 2008; Theorell et al. 2015; Bakker and Demerouti 2007; Marchand and Durand 2011). Moreover, especially the demand-control-model was formulated during a time of economic prosperity and a predominance of industrial labor, performed in hierarchically structured organizations and enterprises. This might limit its applicability in more modern work-environments where service-oriented jobs have become way more prominent and increase the need for additional measures of workplace stressors (Siegrist and Wege 2020). One dimension of work-environments that has gained less attention in occupational mental health research refers to social conflicts experienced at work. The WHO emphasizes the importance of social relations in the workplace, stating that conflicts or poor relations with coworkers or superiors can increase risk for mental illness (Burton and World Health Organization 2010).

Another weakness that has been pointed out when studying psychosocial stressors in the workplace is common method bias, i.e. studies relying solely on self-reports of experienced work-related stressors might be biased by over-reporting of stressful conditions by those with impaired mental health (Waldenström et al. 2008; Alterman et al. 2008; Bonde 2008). An alternative or additional way to investigate associations between workplace psychosocial stressors and mental health is the use of external assessments of workplace factors, e.g. by expert ratings or comprehensive databases of occupational titles and job characteristics. Respective studies usually reported smaller associations than those relying on self-report measures of both workplace factors and mental health outcome (Stansfeld et al. 1995; Morrison et al. 2003).

Investigating psychosocial aspects of working environments is also crucial due to demographic changes. Since the share of older workers is increasing and political efforts are undertaken to prolong individual careers, maintaining employees' mental health is crucial to ensure ability to work. It has been shown that adverse psychosocial working conditions increase plans to retire early (Thorsen et al. 2016; Siegrist et al. 2007) and actual rates of disability retirement (Wahrendorf et al. 2013).

The investigation of psychosocial stressors in the workplace, however, is commonly restricted to people in gainful employment at the time of investigation, excluding people who are temporarily not employed or who have left the labor force. Other work-related states that have been investigated regarding their association with depression are insecure employment (Kim and von dem Knesebeck 2015), unemployment (Paul and Moser 2009) or retirement (van der Heide et al. 2013). Whereas a negative association of insecure employment and unemployment with depression is sufficiently documented, evidence on the association of retirement – especially early retirement – and depression remains mixed (Waddell and Burton 2006). Reviews have pointed out the need for more in-depth

investigations on retirement and mental health, considering, among others, previous working conditions and different types of retirement (van der Heide et al. 2013).

1.5.1 Causation Versus Selection

Research on the association between workplace stressors or employment situations and mental health is often based on the tacit implication of a causal relationship, i.e.: phases of unemployment or adverse environments and stressors encountered in the workplace *cause* depressive symptoms. This line of thought has received significantly more scientific attention than the theory of *health selection*, i.e.: (mental) ill-health impairs productivity and employability, therefor selecting individuals with depression into unemployment or unfavorable jobs and lowering their chances of reemployment (Kröger et al. 2015). On the other hand, health selection from employment or unemployment into early retirement is well-documented for depressive disorders (Karpansalo et al. 2005; Lamberg et al. 2010).

Life-course approaches repeatedly demonstrated that health in early life determines trajectories of careers, selecting those in poorer health into jobs with poorer psychosocial working conditions or into unemployment over time. Longitudinal studies found depressive symptoms to predict worse working conditions (Strazdins et al. 2011). Since both pathways can occur and mutually reinforce each other, the relationship can be conceptualized as a "vicious cycle" (see **Figure 2**). Certain studies investigating both mechanisms advocated a greater influence of causation, i.e. the causal effect of workplace conditions and employment status on mental health (Ter Doest and Jonge 2006; Paul and Moser 2009), while other investigations found stronger effects of (mental health) selection, compared to causation (Olesen et al. 2013). The causation-hypothesis is strengthened by the observed improvement in mental health following re-employment (Paul and Moser 2009; Olesen et al. 2013; Waddell and Burton 2006) or improvements in working conditions (Strazdins et al. 2011; Siegrist and Wege 2020).

Selection
depression complicates job search, impairs work capacity, leads to early retirement

Causation
psychosocial stressors in the workplace / unemployment cause depression
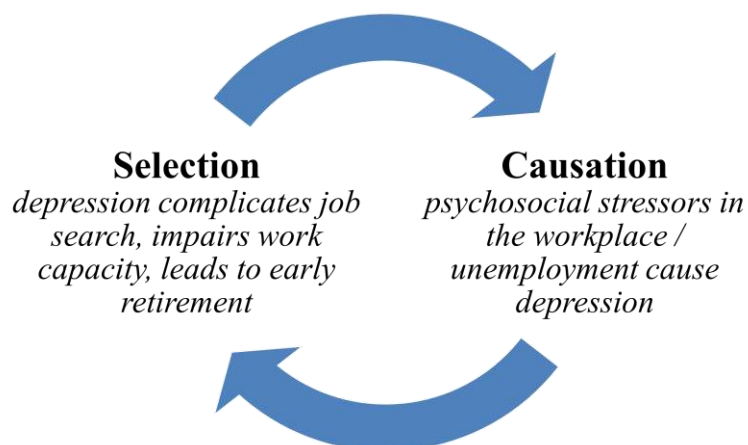
Figure 2: Relationship of work-related stressors and depression. Source: Own representation, based on Hollederer 2006

A discussion of the relative contribution of causation and selection mechanisms is beyond the scope of this dissertation. However, taking into account the possibility of health selection is worthwhile, since many higher-order social and cognitive skills required in modern working worlds (e.g. flexibility, frequent interactions with people, creating and maintaining relationships, proactivity, resilience) might be highly demanding for people suffering from depression (Jacobi and Linden 2018, 2018; Linden 2014; Lamberg et al. 2010). Furthermore, stressful life events such as job loss or retirement have been found to be associated with higher severity of symptoms, longer duration of impairment and higher likelihood of relapse in those already suffering from depression (Monroe et al. 2009).

1.6 Aims of this dissertation

This dissertation aims to contribute to the knowledge on working environments and depressive symptomatology, taking into account two perspectives: Firstly, the individual *employment status*, i.e. gainful employment, unemployment or early retirement with regard to depressive symptoms; secondly, by investigating *psychosocial stressors in employment*. The empirical studies comprising this dissertation each investigate one specific aspect of depressive symptomatology with regard to the working environment, drawing on data from a large population-based study.

The **first study** focuses on the association between unemployment and depressive symptomatology. While a negative association between unemployment and depression is sufficiently well-known, many existing studies do not differentiate between different types of unemployment or between men and women. This paper therefore seeks to contribute to the knowledge on unemployment and depression by investigating possible differences between recipients of different kinds of unemployment benefits and differences between genders, controlling for important sociodemographic information, material and social resources. We hypothesized that unemployment is linked to increased depressive symptoms, partly explained by differences in material and social resources.

In a next step, the psychosocial working environment was investigated in relation to depressive symptomatology, focusing on a psychosocial stressor of work that has so far been understudied. The **second study** therefor addressed the link between social conflicts in the workplace and depressive symptoms, in regard of important covariates, e.g. sociodemographic information and personality traits. To account for common method bias, a problem frequently encountered when investigating psychosocial aspects of work environments, we drew upon objective measures of workplace stressors and appropriate statistical tools for our investigations. It was hypothesized that social conflicts in the workplace are associated with increased depressive symptoms.

In the **third study**, the focus was shifted to early retirement and depressive symptoms. So far, evidence on the association of retirement and, especially, early retirement and mental health remains mixed, which might partly be explained by different underlying reasons for retirement. Since comprehensive studies investigating different types of retirees within the same sample are currently rare,

an investigation of a heterogeneous sample of retirees can make a valuable contribution towards a refined understanding of the link between retirement and depression. We investigated whether different reasons for early retirement (e.g. statutory, voluntary, involuntary or due to ill-health) relate differently to depressive symptomatology.

Advanced knowledge on employment status and workplace psychosocial factors with regard to depressive symptoms is of vital importance from a public health perspective. In-depth investigations of different social groups, e.g. unemployed, employed and retired persons, taking into account possible gender differences, material and social resources, can help identify potential risk groups. This knowledge is also of crucial importance for employers and policy makers, facilitating the design of tailored intervention and prevention strategies to maintain mental health and work ability.

2. Empirical Studies

2.1 Unemployment and Depressive Symptoms

Zuelke, A., Luck, T., Schroeter, M.L., Witte, A.V. Hinz, A., Engel, C., Enzenbach, C., Zachariae, S., Löffler, M., Thiery, J., Villringer, A., Riedel-Heller, S.G. (2018). The association between unemployment and depression – Results from the population-based LIFE-adult-study. *Journal of Affective Disorders*, *235*, 399-406.

Background: Unemployment is a risk factor for impaired mental health. Based on a large populationbased sample, in this study we therefore sought to provide detailed information on the association between unemployment and depression including information on (i) differences between men and women, (ii) differences between different types of unemployment, and (iii) on the impact of material and social resources on the association.

Methods: We studied 4,842 participants (18–65 years) of the population-based LIFE-Adult-Study. Depression was assessed using the Center for Epidemiological Studies Depression Scale. Employment status was divided into three groups: being employed, being unemployed receiving entitlement-based benefits, being unemployed receiving means-tested benefits. Multivariate logistic regression models were applied to assess the association between employment status and depression.

Results: Statistically significantly increased depression risk was solely found for unemployed persons receiving means-tested benefits. Adjusting for differences in sociodemographic factors, net personal income and risk of social isolation, comparable associations ofbeing unemployed and receivingmeanstested benefits with elevated depression risk were found for men (Odds Ratio/OR=2.17, 95%-CI=1.03–
4.55) and women (OR=1.98, 95%-CI:1.22–3.20).

Limitations: No conclusions regarding causality can be drawn due to the cross-sectional study design. It was not possible to assess length of unemployment spells.

Conclusion: Unemployed persons receiving means-tested benefits in Germany constitute a risk group for depression that needs specific attention in the health care and social security system. The negative impact of unemployment on depression risk cannot be explained solely by differences in material and social resources. Contrasting earlier results, women are equally affected as men.
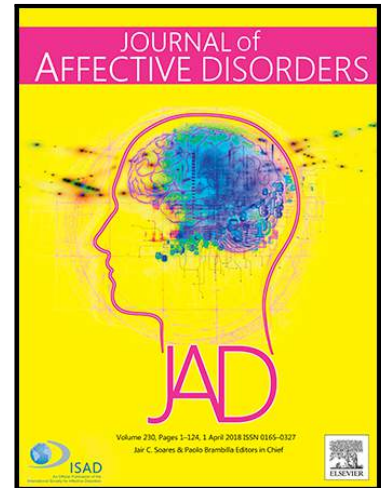
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Highlights

- Risk of depression was assessed in different subgroups of unemployed persons.
- Risk is particularly high in unemployed people receiving means-tested benefits.
- Increased risk cannot be explained only by lack of material and social resources.
- New finding: women are equally affected as men.

The association between unemployment and depression – Results from the population-based LIFE-Adult-Study

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Abstract [249/250 words]

Background: Unemployment is a risk factor for impaired mental health. Based on a large population-based sample, in this study we therefore sought to provide detailed information on the association between unemployment and depression including information on (i) differences between men and women, (ii) differences between different types of unemployment, and (iii) on the impact of material and social resources on the association. *Methods:* We studied 4,842 participants (18-65 years) of the population-based LIFE-Adult-Study. Depression was assessed using the Center for Epidemiological Studies Depression Scale. Employment status was divided into three groups: being employed, being unemployed receiving entitlement-based benefits, being unemployed receiving means-tested benefits. Multivariate logistic regression models were applied to assess the association between employment status and depression. *Results*: Statistically significantly increased depression risk was solely found for unemployed persons receiving means-tested benefits. Adjusting for differences in sociodemographic factors, net personal income and risk of social isolation, comparable associations of being unemployed and receiving means-tested benefits with elevated depression risk were found for men (Odds Ratio/OR=2.17, 95%-CI=1.03-4.55) and women (OR=1.98, 95%-CI:1.22-3.20). *Limitations:* No conclusions regarding causality can be drawn due to the cross-sectional study design. It was not possible to assess length of unemployment spells. *Conclusion*: Unemployed persons receiving means-tested benefits in Germany constitute a risk group for depression that needs specific attention in the health care and social security system. The negative impact of unemployment on depression risk cannot be explained solely by differences in material and social resources. Contrasting earlier results, women are equally affected as men.

Key words: unemployment, depression, CES-D, mental health, population-based, gender

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1. Introduction

Unemployment and job loss have long been reported to be associated with impaired mental health (McKee-Ryan et al., 2005; Stankunas et al., 2006; Paul and Moser, 2009; Wanberg, 2012; Fergusson et al., 2014). Being unemployed has been shown to be linked to reduced psychosocial wellbeing and life satisfaction. and increases the risk of affective disorders (Paul and Moser, 2009). In light of the global economic crisis, the associations between employment status and mental health have gained renewed attention. Furthermore, most welfare states in developed countries have undergone extensive reforms over the last years, including the increased use of welfare-to-work-policies, reduced population coverage of unemployment benefits, stricter entitlement criteria and more obligations for fulfilling unemployment benefits (Bambra, 2010). This also holds true in Germany where benefits for short and long-term unemployed were reduced several times during the last two decades (Kroll and Lampert, 2011a).

Currently, unemployed persons in Germany fall into two distinct categories, depending on their work history: People who have worked for at least 12 months of paid employment during the two previous years are normally entitled to unemployment insurance benefits (thereafter: *entitlement-based benefits*) for up to 12 months. Additionally, unemployed people over 50 years old can receive benefits for up to 24 months. For people without a sufficient employment history or whose entitlement to unemployment insurance has expired, there is the possibility of receiving *means-tested benefits*. These benefits are designed to provide a minimum subsistence income level and come with an obligation to accept every reasonable job offered by a job center with the possibility of sanctions in cases of non-compliance (Kroll and Lampert, 2011a). Further, means-tested benefits are only granted after other means (e.g. personal savings or social insurance) have been exhausted. Entitlement-based benefits are usually higher, since their amount depends upon one's previous salary (60-67% of the last wage). Overall, the share of unemployed people receiving means-tested benefits in Germany has been growing continuously during the last decade and currently amounts to 69% of all registered unemployed (Bundesagentur für Arbeit, 2017b).

Changes abound in the German labor market: standard, full-time employment is in decline and precarious contract and temporary employment is on the rise. In the coming years, more fragmented employment can be expected. This implies that even in times of relatively low overall unemployment (the unemployment rate in Germany in 2016 was 5.4%, (Bundesagentur für Arbeit, 2017c)), a growing portion of society will be faced with shorter or longer unemployment spells at some point in their lives (Lampert et al., 2005). Several studies confirm that unemployment in Germany is the main reason for poverty, making it a severely stressful experience. Currently, more than half of all unemployed people in Germany are living below the poverty threshold, with an income of less than 60% of the overall population median income (Giesselmann and Goebel, 2013). Investigations using longitudinal data point out that health inequalities with regard to employment status have increased significantly in the past decades in Germany (Kroll and Lampert, 2011a). However, there is a strong need for current epidemiological information on the association between unemployment and mental health in Germany. Further, information is needed with regard to the distinction between different kinds of unemployment benefits as described above which entailed drastic changes in legal circumstances and material resources for many of those being unemployed.

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Many studies have investigated the socioeconomic determinants of health with regard to outcomes like self-rated health or general measures of mental health. However, there is less information on whether unemployment is associated with symptoms of major depressive disorder (Dooley et al., 1994; Breslin and Mustard, 2003; Hämäläinen et al., 2005; Jefferis et al., 2011). Very few German studies have investigated the association between employment status and depression in population-based samples. Depression is among the most common mental diseases worldwide and is the single largest contributor to disability (Vos et al., 2015; Luck et al., 2017; World Health Organization, 2017). Further, depression is associated with considerable socioeconomic costs such as those arising from impaired work-performance, early retirement and treatment costs. Recent studies based on health insurance data state that cases of early retirement and disability due to depression have been steadily increasing in Germany during the last decade (Thom et al., 2017). Moreover, depression among the unemployed was found to be associated with lower rates of reemployment (Skärlund et al., 2012; Wanberg, 2012; Wege et al., 2017). In this context, the *overall-aim* of the present study is to investigate the association between unemployment and depression in a large population-based sample.

Several studies suggest that those who are unemployed for a longer time experience an even higher burden of disease and impaired mental health, as compared to short-term unemployed persons (Herbig et al., 2013). These findings indicate a dose-response-relationship, whereby the financial and psychosocial problems increase with prolonged unemployment (Wege et al., 2017). Furthermore, persistent unemployment can reduce chances for reemployment, when qualifications become outdated and spells of unemployment raise suspicions for potential employers (Young, 2012). The German labor-market is characterized by a relatively high degree of long-term unemployment, i.e. unemployment spells of 12 months and more (2017: 35.4% of all unemployed (Bundesagentur für Arbeit, 2017a)), with 91% of long-term unemployed receiving means-tested benefits (Bundesagentur für Arbeit, 2017b). Certain studies have pointed out the moderating influence of welfare-states on the association between unemployment and ill health, suggesting that higher replacement rates of unemployment benefits may buffer against the negative health impact of unemployment (Rodriguez, 2001; Nordenmark et al., 2006; Bambra and Eikemo, 2009; Voßemer et al., 2017). With regards to Germany, this would suggest that recipients of means-tested benefits would be more negatively impacted compared to recipients of entitlement-based benefits, which are dependent on prior earnings and work history. Moreover, the impact of stigmatization might play a moderating role. Entitlement-based benefits express an "earned" right since they require an employment history, whereas receiving means-tested benefits is often considered to be due to laziness, dependency and an unwillingness to work (Bambra, 2010; Young, 2012). It has been shown that the increased use of welfare-to-work-policies with requirements of participation in employment and skills trainings might have detrimental health effects due to stigmatization and the labelling of the poor as "deserving" or "undeserving" (Bambra, 2010). In Germany, these kinds of measures mostly apply to recipients of means-tested unemployment benefits. To date, however, few studies on the socio-economic determinants of mental health have taken into account differences between different kinds of welfare benefits. Therefore, a *specific aim (1)* of the present study is to explore possible differences in risk of depression between recipients of these different kinds of unemployment benefits.

Past studies on unemployment and mental health predominantly found stronger associations in men, most often explained by men's stronger orientation towards paid work and the

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availability of other socially accepted roles like motherhood and housekeeping for women, which are thought to make unemployment a less painful experience (Paul and Moser, 2009). However, since the labor force participation of women has been growing continuously during the last decades and paid work has become an increasingly important part of women's self-identity, it should be investigated whether this assumption of a "male breadwinner model" still holds true (Kulik, 2000). Our study, therefore, also explores possible gender differences in the association between unemployment and depression by conducting all analyses separately for men and women *(specific aim 2)*.

Drawing on established theories on unemployment and impaired mental health, it is assumed that the relationship between unemployment and depression is, at least partly, moderated by *material* and *social resources* (Nordenmark and Strandh, 1999; Bambra, 2010; Kroll and Lampert, 2011a; Kroll and Lampert, 2011b). Hence, adverse mental health outcomes in the unemployed can be explained by financial strain and economic sorrows (i.e. loss of material resources), as well as the loss of work-related contacts and social status, i.e. the loss of social resources/social isolation (Bambra, 2010; Gebel and Voßemer, 2014; Wege et al., 2017). Our last *specific aim (3),* therefore, is to investigate whether possible differences in depression risks between employment groups can be attributed to differences in material and social resources.

2. Methods

2.1 Participants

We analyzed data from the population-based LIFE Adult-study. The Leipzig Research Center for Civilization Diseases conducted the baseline data collection between 2011 and 2014 and recruited 10,000 randomly selected participants between 18 and 79 years old from Leipzig, Germany. The LIFE study seeks to investigate the prevalence of diseases such as dementia and depression and to understand the role of genetic and lifestyle-factors in the emergence of civilization diseases. As part of the core investigation, structured interviews, questionnaires and physical examinations were administered to all participants. For a detailed description of the study design and goals, see Loeffler et al. (Loeffler et al., 2015).

Written informed consent was obtained from all participants prior to enrolment in the study. The study was approved by the responsible ethics board of the Medical Faculty of the University of Leipzig.

Out of the initial LIFE Adult-study sample, we excluded respondents aged 66 years and older (n = 3,050) and all respondents who were students, full-time homemakers or out of the labor force for other reasons (n = 1,007). This resulted in a sample of 5,943 respondents who were either employed (full-time or part-time) or unemployed. We additionally excluded unemployed persons who were not receiving any benefits (n = 49). None of these persons, though, were more likely to have depression (Center for Epidemiological Studies Depression Scale (CES-D) score ≥ 23), compared to employed subjects. We finally excluded respondents with missing information on depressive symptomatology as measured by the CES-D (n = 570) or any of the other explanatory variables (n = 482), resulting in a final analysis sample of n = 4,842 persons. No differences regarding employment status or receipt of entitlement-based or means-tested benefits were found between included and excluded subjects, neither were excluded subjects more likely to have depression than included subjects. Excluded subjects

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were more likely to be male, living in a partnership and to have higher levels of education. However, these differences were only marginal.

2.2 Measures

2.2.1 Depression

Depressive features were assessed using the Center for Epidemiological Studies Depression Scale (Radloff, 1977). The scale consists of 20 items assessing typical symptoms of depression such as insecurity, depressed mood or hopelessness during the last week, using a 4-point-Likert-scale (0 = rarely/almost none of the time; 3 = most or all of the time). The score ranges from 0 to 60 with higher values indicating higher likelihood of depression. A cut-off value of ≥ 23 was used to determine a dimensional diagnosis of depression (Hautzinger et al., 2012).

2.2.2 Unemployment

Employment status was obtained through the question, "Are you currently employed (employment comprises all paid activities, regardless of duration)?". Participants were grouped into three employment groups: employed (full-time or part-time), unemployed receiving entitlement-based benefits, and unemployed receiving means-tested benefits.

2.2.3 Other measures

Several factors have been shown to be associated with both unemployment and depression in reviews and meta-analyses (McKee-Ryan et al., 2005; Paul and Moser, 2009). We included age (categorical: 18-35, 36-50, 51-65), education and respondents' marital status (married or cohabiting vs. single, divorced or widowed) as sociodemographic characteristics. Education (low, middle, high) was classified on the basis of the CASMIN (Comparative Analysis of Social Mobility in Industrial Nations) scale which considers information on general and vocational education (Brauns et al., 2003). To capture the potential association with (reduced) material resources, we used information on net personal income. To capture the potential association with (reduced) social resources, we used information from the short form of the Lubben Social Network Scale (LSNS-6). The LSNS-6 is a measure widely used for the assessment of social engagement and perceived social support. It contains questions like: "How many relatives/friends do you see or hear from at least once a month?; How many relatives/friends do you feel close to such that you could call on them for help?". The scores range from 0 to 30, with higher scores indicating higher levels of social engagement. A score below 12 points is considered to be an indicator of social isolation (Lubben et al., 2006).

2.3 Statistical analysis

All analyses were conducted using Stata (SE) 13.1. We used Chi²-tests and one-way ANOVA to analyze differences between the employment groups. Subsequently, we used logistic regression models to analyze the association between depression and employment status. In a first step, we calculated an unadjusted model (Model 1). The second model was adjusted for sociodemographic factors (age, education, marital status; Model 2). Finally, Models 3 and 4 adjusted for the potential effects of material resources (net personal income, continuous) and social resources (social isolation; LSNS-6 < 12). Risks are presented as

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Odds Ratios (OR) with 95% confidence intervals (CI), with a p-value below 0.05 considered significant. After calculating an overall-model with gender as a covariate, we conducted separate analyses for men and women.

3. Results

Table 1 provides a description of the overall-sample. No gender differences were found regarding employment groups. Unemployed receiving entitlement-based benefits (n = 133) were, on average, older than unemployed receiving means-tested benefits (n = 311) and employed subjects (n = 4.398). With respect to education, 35.9% of employed subjects belonged to the highest education category, of those receiving entitlement-based benefits, 32.2% belonged to the highest education category, and of those receiving entitlement-based benefits only 15.8 belonged to the highest education category. Those unemployed (both receiving entitlement-based and means-tested benefits) were significantly more likely to have lower levels of education and were less likely to live in a partnership. Unemployed men and women in both subgroups reported lower levels of personal income. Regarding social resources, 40.5% of those receiving means-tested benefits were socially isolated as defined by a LSNS-score < 12, while 18.8% of those receiving entitlement-based benefits and 13.1% of employed subjects could be classified as socially isolated. With regards to depression, mean CES-D-scores were highest in unemployed receiving means-tested benefits and lowest in the employed subsample. Frequency of depression as defined by a CES-D score ≥ 23 was highest in unemployed receiving means-tested benefits (21.2%), 11.3% in recipients of entitlement-based benefits and lowest in employed subjects (5.7%).

Separate sample characteristics for men and women by employment status are presented in **Table 2.** Among the 4,842 respondents of the analyzed sample, 2,256 (46.6%) were male and 2,586 (53.4%) female. The mean age was 49.9 years (SD: 8.3) for men and 49.9 (SD: 8.0) for women.

Men: Unemployed men (including those who receive entitlement-based and means-tested benefits) were, on average, significantly older and had lower levels of education than those who were employed. The subsample of unemployed men receiving means-tested benefits also contained significantly less educated persons, compared to men receiving entitlement-based benefits and employed men. Moreover, men receiving means-tested unemployment benefits were significantly less likely to live in a partnership and were significantly more socially isolated than those men in the two other employment groups. With respect to material resources, the net income of unemployed men receiving means-tested benefits was only half of that of recipients of entitlement-based benefits and only one fourth of the disposable income of employed men. Regarding depression, unemployed men receiving means-tested benefits also showed the highest CES-D mean scores. Frequency of depression was highest in unemployed men receiving means-tested benefits (14.7%), and lowest in employed men (2.8%; unemployed men receiving entitlement-based benefits: 7.1%).

Women: Mean age was significantly higher in both groups of unemployed women compared to employed women. Lower levels of education were found significantly more often in unemployed women receiving means-tested benefits. The group of unemployed women receiving means-tested benefits also contained the lowest percentage of women with high

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levels of education and the lowest percentage of women living in a partnership. On average, the disposable income of unemployed women receiving entitlement-based benefits was half that of employed women, while recipients of means-tested benefits reported about 38% of the net income of employed women. Women receiving entitlement-based or means-tested benefits were significantly more often socially isolated and scored significantly higher on the CES-D than employed women, with unemployed women receiving means-tested benefits reporting particularly high scores. Unemployed women in the means-tested benefits subsample had the highest frequency of depression (28.4%). Among recipients of entitlement-based benefits, 14.3% met the criteria for depression, as did 8.3% of employed women.

Table 3 presents the results of an overall multivariate logistic regression model with gender included as a covariate. Both unemployed groups, those receiving entitlement-based benefits and means-tested benefits, had significantly higher risks of depression (unadjusted Model 1, OR: 2.03; 95% CI: 1.16-3.55 for entitlement-based benefits; OR= 4.91, 95% CI: 3.61-6.67 for means-tested benefits). Women were at higher risk of depression than men (OR: 2.89; 95% CI: 2.23; 3.73). Higher levels of education, as well as living in a partnership were associated with reduced risks, while there were no differences detected between age-groups (Model 2). When adjusting for net personal income, differences in depression risk between unemployed persons receiving entitlement-based benefits and employed persons were no longer significant. Meanwhile, a higher risk remained for recipients of means-tested benefits (Model 3). In the fully adjusted model, controlling for social isolation (Model 4), an independent association between receiving means-tested unemployment benefits and depression remained (OR: 2.02; 95% CI: 1.35; 3.01).

The results of the separate logistic regression models for risk of depression dependent on employment group for men and women are presented in **tables 4a** and **b**. For both men and women, receiving means-tested benefits was associated with higher risks of depression, with a stronger association for men (unadjusted Model 1, OR: 6.00; 95% CI: 3.61-9.96; women: OR: 4.40, 95% CI: 2.99-6.48). The estimates were attenuated but remained significant when adjusting for sociodemographic factors (Model 2), material resources (Model 3), and social isolation (Model 4). In the fully adjusted Model 4, the OR for having depression was 2.17 (95% CI: 1.03-4.55) in unemployed men receiving means-tested benefits compared to employed men, and 1.98 (95% CI: 1.22-3.20) in unemployed women receiving means-tested benefits compared to the employed subgroup, respectively.

Besides receiving means-tested unemployment benefits, depression was also associated with other factors: living in a partnership was linked to a lower risk and social isolation to a higher risk for both men and women. Higher education was associated with a reduced depression risk in women, but not in men. Higher net personal income was linked to significantly reduced depression risk also only in women (fully adjusted model). In both genders, no significant differences in depression risk were found between age groups.

4. Discussion

The *overall-aim* of the present study was to investigate the association between unemployment and depression in a large population-based sample. We found that unemployment can be associated with a higher risk of depression, which corroborates existing national and international evidence on the relationship between employment status

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and mental health (McKee-Ryan et al., 2005; Paul and Moser, 2009; Jefferis et al., 2011; Lampert et al., 2017).

Besides confirming existing evidence on the relationship between unemployment and poorer mental health, our study on depression provides more detailed insight into this complex association. Most importantly, we were able to provide information on the importance of welfare-state policies by differentiating between different groups of unemployed people. Our findings emphasize that jobless persons should not be considered a homogenous group when it comes to depression risk. Higher risks of depression were found in unemployed men and women receiving means-tested benefits, but not in those receiving entitlement-based benefits *(specific aim 1)*. This group is mainly comprised of long-term unemployed people (as stated above, long-term unemployment benefits in Germany are usually means-tested benefits), as well as those who do not fulfill the requirements for entitlement-based benefits (e.g. because of inconsistent, temporary or substandard employment histories). The findings are in line with other studies which have found poorer health outcomes in recipients of means-tested compared to entitlement-based unemployment benefits (Rodriguez, 2001; Nordenmark et al., 2006). There is evidence that in Germany health inequalities with regard to employment status have increased substantially over the last decades when the separate distinctions of different groups of unemployed were introduced (Kroll and Lampert, 2011a). As the available safety net for unemployed people has weakened and receiving benefits has become more stigmatized than some decades ago, it has been feared that the poor mental health situation of unemployed men and women could deteriorate further (Bambra, 2010). With regards to Germany, this suggests that the subgroup of unemployed people receiving means-tested benefits might constitute a risk group for impaired mental health. As such, the health care and social security systems should recognize this risk.

Material and social resources (social isolation) have been found to contribute to the association between unemployment and depression in our study *(specific aim 3)*, corroborating previous findings from Germany (Kroll and Lampert, 2011b; Kroll et al., 2016). Regarding material resources, higher personal income was associated with reduced depression risk, but only in women. While the rather minor association may seem somewhat surprising, it is in line with other studies reporting only a moderate influence of income on health in Germany (Frijters et al., 2005; Kroll and Lampert, 2011a). A meta-analysis found that subjective measures like perceived financial strain show stronger associations with mental health in the unemployed than objective financial resources (McKee-Ryan et al., 2005). Further research investigating respective measures in unemployed men and women could, therefore, yield valuable results. Unlike the lack of material resources (income), lack of social resources (i.e. social isolation) was associated with significantly elevated depression risk in both unemployed men and women receiving means-tested benefits in our study. Contrary to previous studies reporting greater importance of social factors for women's mental health (Bjarnason and Sigurdardottir, 2003; Dalgard et al., 2006; Möller-Leimkühler, 2009), our study found that controlling for social isolation had a similar effect on both genders. In general, it is important to note that the association between receiving means-tested benefits and increased risk of depression could not be explained just by the lack of material and social resources. More research is needed to better understand the complex association of contributing factors. One such important factor contributing to the higher depression risk of recipients of means-tested benefits might be stigmatization: the responsibility for unemployment is still highly individualized in public opinion and benefit recipients are often depicted as lazy and unwilling to work (Bambra, 2010). Moreover, the

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loss of work-related features like meaningful goals and social status might be another pathway through which the experience of unemployment is associated with higher risks of depression. Finally, the possibility of health selection needs to be considered, i.e. people suffering from depression might be at a higher risk of losing their job or remaining unemployed (Paul and Moser, 2009).

Women in our study generally showed a higher risk of depression than men, corroborating previous findings on gender differences in prevalence of depression (World Health Organization, 2002). Contrary to earlier research that predominantly suggested stronger links between unemployment and impaired mental health in men, however, we found approximately equal associations between unemployment and depression in men and women *(specific aim 2)*. A possible explanation might be the higher employment rate of women in our study when compared with previous research, indicating e.g. an increased importance of paid work for women's self-identity (McKee-Ryan et al., 2005; Bambra, 2010). More broadly, these results might point towards a shift in traditional gender roles which are implied in many earlier theories on unemployment and health. It should be noted that the LIFE-Adult-Study was conducted in Leipzig, a city located in the former East Germany. Since paid work was much more common for women in former East Germany than for women in West Germany, a stronger orientation towards paid work might be expected among the women included in our study. This might have led to a stronger association between unemployment and depression in our female sample. Further studies with more comprehensive samples from both parts of Germany may be necessary to confirm our results. Nevertheless, we were able to show that unemployed women receiving means-tested benefits are at increased risk of depression, an association that is only partly explained by lower levels of material and social resources. Future studies should take into account the increasingly feminized labor market conditions and women's experience of unemployment.

4.1 Limitations

Certain methodological limitations need consideration regarding our study findings. First, since our findings rely on cross-sectional data, it is not possible to draw conclusions about the causal relationship of unemployment and risk of depression. Longitudinal studies suggest that both causation and selection play a crucial role in determining the health of unemployed men and women (Paul and Moser, 2009, Olesen et al., 2013). Second, we were unable to consider the length of current unemployment spells in our analyses, which was found to influence the association of unemployment and mental health in various studies (Paul and Moser, 2009; Herbig et al., 2013). Unfortunately, a substantial portion of the original sample was lost due to item-nonresponse. Since, however, no differences were found regarding depressive symptomatology or employment status between responders and non-responders, we are confident that this did not affect our results in a substantial way. Given that the excluded sample contained slightly more people in the highest education-category, it is possible that the reported association of higher levels of education with lower depression risk was slightly underestimated in our analyses. Finally, our sample contained only a small sample of persons receiving entitlement-based benefits, thus, generalization of the results concerning this group should be made with particular caution. Further investigations using larger samples are required to confirm our findings. Moreover, we cannot rule out that other mental and physical health conditions might influence risk of both depression and unemployment. This should be subject to future studies. Finally, depression was assessed

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using self-reported depressive symptoms. Although the CES-D depression scale is a validated and commonly used screening instrument, it is not known whether an association would also be found between unemployment and a clinical diagnosis of major depression.

4.2 Conclusions

Our study provides further evidence that unemployment is associated with higher risk of depression. Importantly, an increased risk was solely found in unemployed persons receiving means-tested benefits, a group that is mainly comprised of long-term unemployed people, as well as those who do not fulfill the requirements for entitlement-based benefits (e.g. because of unsteady, temporary or substandard employment histories). Means-tested recipients constitute a risk group for depression. This group requires specific attention within the health care and social security systems. The association between receiving means-tested benefits and increased risk of depression cannot be explained solely by the lack of material and social resources. Our findings, therefore, also indicate that the health inequalities between recipients of different unemployment benefit schemes go beyond obvious differences (e.g. in income replacement rate). More research is needed to better understand the complex association between joblessness and depression, for example by exploring additional important contributing factors (e.g. stigmatization). Tailored prevention and intervention programs may then be developed taking these additional factors into account.

Another important finding from our study is that being out of work is a serious threat not only to men's but also to women's mental health. This contrasts earlier studies which predominantly assumed a stronger association of unemployment and impaired mental health in men. Future research should, therefore, be more sensitive towards the changed labor market conditions of the 21st century and women's experiences of unemployment.

Authors' contributions

Andrea E. Zuelke conducted the statistical analyses, interpreted the data and drafted the manuscript. Tobias Luck supported in interpreting the data and drafting the manuscript. Matthias L. Schroeter, A. Veronica Witte, Andreas Hinz, Christoph, Cornelia Enzenbach and Silke Zachariae revised the manuscript for intellectual content, read and approved the final version of the manuscript. Markus Loeffler, Joachim Thiery and Arno Villringer conceptualized and designed the study, revised the manuscript for intellectual content, read and approved the final version of the manuscript. Steffi G. Riedel-Heller conceptualized and designed the study, supervised the drafting of the manuscript, supported in interpreting the data, revised the manuscript for intellectual content, read and approved the final version of the manuscript.

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Competing interests

The authors declare that they have no competing interests.

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Table 1: Sample characteristics by employment group

	n = 4,842				
Variable	Employed (n = 4,398)	Unemployed, entitlement-based benefits (n = 133)	Unemployed, means-tested benefits (n = 311)	Chi² / F	Sign.
Female (%)	53.7	57.9	47.6	5.44	P = 0.067
Age in years, mean (SD)	49.6 (8.1)	54.3 (9.4)	52.5 (8.4)	74.64	P < 0.001
Education[1] low (%)	2.9	7.5	10.3	94.44	P < 0.001
* middle(%)*	61.3	60.2	74.0		
* high (%)*	35.9	32.3	15.8		
Living in a partnership[2](%)	76.9	68.4	37.6	236.90	P < 0.001
Net personal income in Euro, mean (SD)	1,967.8 (2,341.8)	1,013.1 (511.2)	620.7 (379.3)	62.41	P < 0.001
LSNS-score[3], mean (SD)	17.3 (5.1)	16.4 (5.2)	13.2 (5.5)	92.85	P < 0.001
Socially isolated (%)[4]	13.1	18.8	40.5	173.65	P < 0.001
CES-D-score[5], mean (SD)	10.1 (6.7)	13.2 (8.2)	15.6 (9.0)	103.58	P < 0.001
Depressed[6] (%)	5.7	11.3	21.2	112.99	P < 0.001

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[1] Education assessed according to CASMIN (Comparative Analysis of Social Mobility in Industrial Nations)-classification categories low, middle, and high

[2] married or cohabiting vs. single, widowed or divorced

[3] LSNS = Lubben Social Network Scale

[4] LSNS-score < 12

[5] CES-D = Center for Epidemiological Studies Depression Scale

[6] CES-D-score ≥ 23

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Table 2: Sample characteristics by employment group and gender

Men (n = 2,256)					
Variable	**Employed (n = 2,037)**	**Unemployed, entitlement-based benefits (n = 56)**	**Unemployed, means-tested benefits (n = 163)**	**Chi² / F**	**Sign.**
Age in years, mean (SD)	49.6 (8.2)	56.6 (9.4)	52.1 (8.3)	25.61	P < 0.001
Education[7] low (%)	3.5	14.3	14.1	77.04	P < 0.001
middle(%)	60.3	50.0	72.4		
high (%)	36.2	35.7	13.5		
Living in a partnership[8](%)	79.9	76.8	36.8	157.1	P < 0.001
Net personal income in Euro, mean (SD)	2,351.2 (3,266.9)	1,217.7 (616.2)	620.8 (462.1)	26.22	P < 0.001
LSNS-score[9], mean (SD)	17.1 (5.2)	16.6 (5.0)	12.9 (5.6)	49.46	P < 0.001
Socially isolated (%)[10]	15.1	16.1	43.6	85.76	P < 0.001
CES-D-score[11], mean (SD)	9.2 (5.5)	12.0 (7.2)	14.5 (7.9)	69.02	P < 0.001
Depressed[12] (%)	2.8	7.1	14.7	61.00	P < 0.001
Women (n = 2,586)					
Variable	**Employed (n = 2,361)**	**Unemployed, entitlement-based benefits (n = 77)**	**Unemployed, means-tested benefits (n = 148)**	**Chi² / F**	**Sign.**
Age in years, mean (SD)	49.6 (7.9)	52.7 (8.5)	53.0 (8.5)	17.92	P < 0.001
Education low (%)	2.3	2.6	6.1	24.65	P < 0.001
middle (%)	62.1	67.5	75.7		
high (%)	35.6	29.9	18.2		
Living in a partnership (%)	74.4	62.3	38.5	92.42	P < 0.001
Net personal income in Euro, mean (SD)	1,637.0 (879.5)	864.3 (354.7)	620.5 (261.1)	127.29	P < 0.001
LSNS-score, mean (SD)	17.4 (5.0)	16.4 (5.3)	13.5 (5.5)	42.40	P < 0.001
Socially isolated (%)	11.3	20.8	37.2	86.61	P < 0.001
CES-D-score, mean (SD)	10.8 (7.5)	14.1 (8.8)	16.9 (9.9)	47.72	P < 0.001
Depressed (%)	8.3	14.3	28.4	67.04	P < 0.001

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[7] Education assessed according to CASMIN (Comparative Analysis of Social Mobility in Industrial Nations)-classification categories low, middle, and high

[8] married or cohabiting vs. single, widowed or divorced

[9] LSNS = Lubben Social Network Scale

[10] LSNS-score < 12

[11] CES-D = Center for Epidemiological Studies Depression Scale

[12] CES-D-score ≥ 23

Table 3: Multivariate logistic regression: Risk of depression[1] by employment group (n = 4,842)

Variable	Model 1		Model 2		Model 3		Model 4	
	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI
Ref.: Employed	1.00		1.00		1.00		1.00	
Entitlement-based benefits	**2.03****	1.16; 3.55	**1.85****	1.05; 3.28	1.50	0.84; 2.69	1.44	0.79; 2.60
Means-tested benefits	**4.91****	3.61; 6.67	**3.41****	2.45; 4.73	**2.37****	1.61; 3.50	**2.02****	1.35; 3.01
Ref.: Male	1.00		1.00		1.00		1.00	
Female	**2.89****	2.23; 3.73	**2.91****	2.24; 3.78	**2.68****	2.05; 3.50	**2.93****	2.24; 3.84
Ref.: Age 18-35 years			1.00		1.00		1.00	
Age 36-50 years			1.13	0.64; 1.99	1.25	0.70; 2.22	1.12	0.62; 1.99
Age 51-65 years			0.94	0.53; 1.66	1.01	0.57; 1.79	0.84	0.47; 1.51
Ref.: Education[2] low			1.00		1.00		1.00	
Education middle			**0.45****	0.28; 0.72	**0.48****	0.30; 0.78	**0.53****	0.33; 0.87
Education high			**0.35****	0.21; 0.59	**0.43****	0.26; 0.73	**0.52****	0.30; 0.88
Ref.: Single, widowed, divorced			1.00		1.00		1.00	
Living in a partnership			**0.43****	0.34; 0.54	**0.42****	0.33; 0.53	**0.46****	0.36; 0.59
Log. net individual income (Euro)[3]					**0.67****	0.53; 0.85	**0.70****	0.55; 0.90
Ref.: socially integrated							1.00	
Socially isolated[4]							**2.70****	2.07; 3.53
R^2	0.0632		0.0892		0.0935		0.1138	

** $p < 0.05$; Ref. = reference group; OR = Odds Ratio, CI = Confidence Interval

[1] Center for Epidemiological Studies Depression Scale (CES-D)-score ≥ 23
[2] Education assessed according to CASMIN (Comparative Analysis of Social Mobility in Industrial Nations)-categories low, middle, and high
[3] Net personal income was log-transformed due to non-normal distribution of income
[4] Socially isolated = Lubben Social Network-Scale(LSNS)-score < 12

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Table 4a: Multivariate logistic regression: Risk of depression[1] by employment group in men (n = 2,256)

	Model 1		Model 2		Model 3		Model 4	
Variable	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI
Ref.: Employed	1.00		1.00		1.00		1.00	
Entitlement-based benefits	2.67	0.93; 7.64	2.57	0.87; 7.59	2.05	0.68; 6.19	2.19	0.72; 6.72
Means-tested benefits	**6.00****	3.61; 9.96	**4.01****	2.27; 7.06	**2.46****	1.18; 5.13	**2.17****	1.03; 4.55
Ref.: Age 18-35 years			1.00		1.00		1.00	
Age 36-50 years			0.80	0.32; 1.99	0.88	0.35; 2.20	0.84	0.33; 2.13
Age 51-65 years			0.68	0.27; 1.70	0.72	0.29; 1.79	0.60	0.24; 1.53
Ref.: Education[2] low			1.00		1.00		1.00	
Education middle			0.65	0.29; 1.47	0.69	0.31; 1.55	0.74	0.33; 1.69
Education high			0.68	0.28; 1.64	0.86	0.35; 2.10	0.99	0.40; 2.46
Ref.: Single, widowed, divorced			1.00		1.00		1.00	
Living in a partnership			**0.39****	0.24; 0.63	**0.40****	0.25; 0.64	**0.46****	0.29; 0.75
Log. net individual income (Euro)[3]					**0.61****	0.38; 0.99	0.66	0.40; 1.07
Ref.: socially integrated							1.00	
Socially isolated[4]							**2.77****	1.71; 4.50
R^2	0.0539		0,0776		0.0831		0.1052	

** $p < 0.05$; Ref. = reference group; OR = Odds Ratio, CI = Confidence Interval

[1] Center for Epidemiological Studies Depression Scale (CES-D)-score ≥ 23
[2] Education assessed according to CASMIN (Comparative Analysis of Social Mobility in Industrial Nations)-categories low, middle, and high
[3] Net personal income was log-transformed due to non-normal distribution of income
[4] Socially isolated = Lubben Social Network-Scale(LSNS)-score < 12

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Table 4b: Multivariate logistic regression: Risk of depression[1] by employment group in women (n = 2,586)

Variable	Model 1		Model 2		Model 3		Model 4	
	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI
Ref.: Employed	1.00		1.00		1.00		1.00	
Entitlement-based benefits	1.85	0.96; 3.56	1.68	0.86; 3.29	1.37	0.69; 2.72	1.26	0.63; 2.54
Means-tested benefits	**4.40****	2.99; 6.48	**3.22****	2.14; 4.84	**2.36****	1.48; 3.76	**1.98****	1.22; 3.20
Ref.: Age 18-35 years			1.00		1.00		1.00	
Age 36-50 years			1.43	0.68; 2.99	1.59	0.76; 3.35	1.39	0.66; 2.95
Age 51-65 years			1.16	0.55; 2.43	1.26	0.60; 2.65	1.05	0.49; 2.22
Ref.: Education[2] low			1.00		1.00		1.00	
Education middle			**0.34****	0.18; 0.62	**0.37****	0.20; 0.68	**0.42****	0.22; 0.78
Education high			**0.25****	0.13; 0.47	**0.30****	0.15; 0.57	**0.36****	0.18; 0.71
Ref.: Single, widowed, divorced			1.00		1.00		1.00	
Living in a partnership			**0.44****	0.33; 0.58	**0.42****	0.32; 0.56	**0.46****	0.34; 0.60
Log. net individual income (Euro)[3]					**0.69****	0.52; 0.91	**0.72****	0.54; 0.95
Ref.: Socially integrated							1.00	
Socially isolated[4]							**2.66****	1.93; 3.67
R²	0.0297		0.0603		0.0643		0.0844	

** $p < 0.05$; Ref. = reference group; OR = Odds Ratio, CI = Confidence Interval

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[1] Center for Epidemiological Studies Depression Scale (CES-D)-score ≥ 23
[2] Education assessed according to CASMIN (Comparative Analysis of Social Mobility in Industrial Nations)-categories low, middle, and high
[3] Net personal income was log-transformed due to non-normal distribution of income
[4] Socially isolated = Lubben Social Network-Scale(LSNS)-score < 12

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2.2 Social Conflicts in the Workplace and Depressive Symptoms

Zuelke, A., Röhr, S., Schroeter, M.L., Witte, A.V., Hinz, A., Engel, C., Enzenbach, C., Thiery, J., Löffler, M., Villringer, A., Riedel-Heller, S.G. (2020). Are social conflicts at work associated with depressive symptomatology? Results from the population-based LIFE-Adult-Study. *Journal of occupational medicine and toxicology*, *15*(1), 1

Abstract

Background: Psychosocial stressors in the workplace can be detrimental to mental health. Conflicts at work, e.g. aggression, hostility or threats from coworkers, supervisors or customers, can be considered a psychosocial stressor, possibly increasing risk for depressive symptoms. Existing studies, however, differ in the assessment of social conflicts, i.e. as individual- or job-level characteristics. Here, we investigated the association between conflicts at work assessed as objective job characteristics, and depressive symptomatology, using data from a large population-based sample. Additionally, we investigated gender differences and the impact of personality traits and social resources.

Methods: We used data from the population-based LIFE-Adult-Study from Leipzig, Germany. Information on conflicts at work, assessed as job characteristics, were drawn from the Occupational Information Network, depressive symptoms were assessed via the Center for Epidemiological Studies Depression Scale. Multilevel linear regression models with individuals and occupations as levels of analysis were applied to investigate the association between conflicts at work and depressive symptoms.

Results: Our sample included 2164 employed adults (age: 18–65years, mean: 49.3, SD: 7.9) in 65 occupations. No association between conflicts s at work and depressive symptomatology was found (men: b=−0.14; p=0.74, women: b=0.17, p=0.72). Risk for depression was mostly explained by individual-level factors like e.g. neuroticism or level of social resources. The model showed slightly higher explanatory power in the female subsample.

Conclusion: Conflicts at work, assessed as objective job characteristics, were not associated with depressive symptoms. Possible links between interpersonal conflict and impaired mental health might rather be explained by subjective perceptions of social stressors and individual coping styles.

RESEARCH

Are social conflicts at work associated with depressive symptomatology? Results from the population-based LIFE-Adult-Study

Andrea E. Zuelke[1*] , Susanne Roehr[1], Matthias L. Schroeter[2,3], A. Veronica Witte[2], Andreas Hinz[4], Christoph Engel[5], Cornelia Enzenbach[5], Joachim Thiery[6], Markus Loeffler[5], Arno Villringer[2,3] and Steffi G. Riedel-Heller[1]

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Keywords: CES-D, Depressive symptoms, Mental health, Psychosocial work environment, Social conflict, Multilevel model, O*NET

Background

The working environment and job characteristics have a crucial influence on well-being and mental health, which in turn impact work performance and productivity [1–3]. Given the average duration of working life in the European Union currently amounts to 36.2 years, meaning that people spend more than one third of their lives in employment, it can be assumed that many sources of perceived stress are encountered in the workplace [4, 5]. Therefore, understanding how the social environment at work can enhance or impair mental health is crucial. Occupational health research in the last decades has particularly focused on the dimensions of work demands and control, drawing on Karasek and Theorell's demand-control-model [2, 6–8]. Later amendments have added another dimension – social support –, leading to the demand-control-support-model [9, 10]. It is assumed that impaired mental health and well-being can be found especially in people holding jobs characterized by high strain

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(high demands but low control) and low social support. Recent meta-analyses found higher risks for clinical depression [2, 7, 11] and depressive symptoms [6] in people experiencing job strain, reporting mostly small to medium effect sizes.

While the demand-control-(support) model provides a highly valuable measure for important aspects of work organization, it has been argued that other psychosocial aspects of the working environment are still understudied [6, 12–15]. This also applies to social conflicts at work and their possible association with mental health [16, 17]. The World Health Organization emphasizes the meaning of interpersonal relations at work for (mental) health, stressing that poor relations and conflicts with co-workers or supervisors can increase risk for mental illness [18]. Interestingly, the original article introducing the demand-control-model explicitly named social conflicts at work as a stressor, stating that job demands include "psychological stressors involved in accomplishing the workload, stressors relating to unexpected tasks, and stressors of job-related personal conflict" [8]. Against this background, social conflicts can be considered a stressful work demand, increasing risk of depression.

Social conflicts in the workplace can broadly be defined as a range of interpersonal maltreatment behaviors. It can include e.g. rude behavior, verbal aggression, bullying or physical assault [16, 19] and can result in negative consequences such as increased rates of turnover, less productivity and employee satisfaction [20, 21]. The literature supports a link between higher rates of interpersonal conflict at work and depression, whereas interpersonal conflict acts as a major stressor. Most investigations of social conflicts at work focus on occupations in the service sector, e.g. cashiers, call-center agents or bus drivers, since these jobs entail a high level of interpersonal contacts with colleagues and customers [22]. Somewhat paradoxically, the literature also reports a high prevalence of social conflict in professions with a strong focus on caring like nursing [23, 24] or teaching [25, 26]. Several studies in different work settings reported social conflict at work the single most important source of perceived stress [17, 27, 28].

A common criticism concerning studies on occupational mental health refers to the fact that most empirical studies rely on self-reported measures both of independent and outcome variables [6, 29–34]. Therefore, individuals in identical jobs can rate the amount of job stress or, specifically, work-related conflict quite differently. This might especially be true for people experiencing depressive symptoms, which may influence their affective assessment of their job and working environment [32]. Furthermore, only few validated instruments measuring subjective job-related stressors are available. To account for this risk of bias, a growing body of

research investigates associations between psychosocial factors of working environments and mental health by drawing on objective assessments of occupational information, e.g. [30, 35–37]. Rather than broad categories like "perceived stress", these assessments could possibly provide a clearer indication of the actual environmental conditions that are linked to depression and, therefore, knowledge on what aspects of the working environment need changing, allowing for effective prevention strategies [38, 39]. Lastly, previous studies on occupational mental health have often focused on jobs in the service sector, using rather small and very specific samples. More comprehensive investigations using population-based samples are currently rare, especially in Germany.

Another point of discussion refers to the level and unit of analysis: It can be argued that occupational stressors refer to qualities of jobs rather than of individual people [29, 40–42]. Despite this, most empirical investigations so far have relied solely on individual-level data. That said, workers holding the same job, i.e. individuals nested within jobs, cannot reasonably be regarded as independent units of analysis, which in turn violates important assumptions of standard ordinary least squares (OLS) regression techniques [29]. Ignoring the potential effect of clustering bears the risk of overestimating the importance of regression coefficients [40]. Therefore, it has been argued that the hierarchical structure of workers in jobs shall be recognized by choosing appropriate techniques of analysis like e.g. multilevel modeling [41, 42].

Several factors have been identified to moderate the link between psychosocial work characteristics and depressive symptoms. Neuroticism and extraversion have been found to be linked to depressive symptoms: There is a strong correlation between neuroticism and increased risk of depression, while high levels of extraversion act as a protective factor against depressive symptomatology [43–46]. It has been shown empirically that the negative effect of neuroticism is especially pronounced under stressful conditions, i.e. adversity and conflictual situations are especially harmful for people showing high degrees of neuroticism [47]. Social support from friends or family has been found a protective factor against depression in several studies (for an overview, see [48]). Protective effects against depression have also been found for higher levels of education [49, 50].

The role of gender in the relationship between work-related psychosocial stressors and mental health is still inconclusive. While some researchers report stronger effects of occupational stressors on men's health [51], others found the relationship to be stronger in women [52, 53] or reported no gender differences [6]. Possible gender differences in the association of work-related stressors with depressive symptoms might occur for

different reasons: First, women and men can differ in the degree of exposure to occupational stressors, namely: interpersonal conflict. While most studies reported men and women to be equally affected by conflicts in the workplace, others found higher rates of exposure among women (for an overview, see [54]). More detailed investigations revealed that men mostly reported conflicts with male supervisors, whereas women experience conflicts both with men and women alike and with both supervisors and colleagues in equal proportions [54]. Women, however, are more likely to perceive conflictual situations as sexual harassment [55], which might possibly overlap with social conflicts. Second, men and women might differ in their coping strategies, i.e. ways of handling interpersonal conflict, or in their resources available for handling stressors at work. It has been shown that, due to gendered socialization processes, men tend to cope with stress more instrumentally, while women are more likely to openly express emotions [17, 56]. Studies on (occupational) stress have found men to use more problem-oriented strategies whereas women are, on average, more emotion-focused [17].

Against this background, this study seeks to investigate the association between conflict at work and depressive symptoms, using a large population-based sample comprising a variety of different occupations. We hypothesize that a) higher levels of conflict at work are associated with increased depressive symptoms, b) the association will be smaller than in studies using self-report measures of interpersonal conflict. This is due to the objective assessment of interpersonal conflict as a feature of occupations in our study which does not capture different individual perceptions of stressors between workers holding the same job. We further investigate the influence of c) personality traits, i.e. neuroticism and extraversion, as well as social resources and education on the association. Neuroticism is assumed to be linked to increased levels of depression, whereas extraversion, higher levels of social resources and education should be associated with decreased depressive symptoms. Lastly, we seek to investigate possible gender differences.

Subjects and methods
Participants
We used data from the LIFE-Adult-Study, a population-based cohort study conducted by the Leipzig Research Center for Civilization Diseases. 10,000 randomly selected inhabitants of Leipzig, Germany (aged between 18 and 79 years) completed the baseline-examination between 2011 and 2014. The LIFE-Study aims to investigate the prevalence, genetic predispositions and modifiable lifestyle factors of major civilization diseases such as cardiovascular diseases, dementia or depression. Physical examinations, structured interviews and questionnaires were administered to all participants as part of the baseline assessment. Pregnancy and insufficient command of the German language were exclusion criteria. For a detailed description of the study aims and concept, see [57]. The study included an age- and sex-stratified random sample of 10,000 community-dwelling German-speaking residents of the city of Leipzig who were randomly drawn from lists provided by the local registry office. These residents were sent an invitation letter, containing information on the aims and design of the study, and a response form. If residents did not respond, a reminder invitation was sent. Non-responders were searched in public phone directories and contacted by phone. For residents who refused to participate, residents of the same age and sex were randomly drawn from the registry office's lists and invited to participate.

Out of the initial study sample, we excluded cases aged 66 years and older ($n = 3249$ cases) in order to exclude individuals who had already retired. Additionally, individuals who were not working ($n = 1446$ cases), working less than 15 h per week ($n = 159$) or had no information on current employment status ($n = 10$) were dropped from the analyses. We further excluded cases with missing values on CES-D score ($n = 348$), LSNS ($n = 217$), NEO-16 AM-info on neuroticism/extraversion ($n = 318$), education ($n = 1$) and occupations that could not be clearly matched with an O*NET-occupation identifier ($n = 42$). To avoid bias caused by small groups, observations were dropped if the respective occupation had less than 10 incumbents in the dataset ($n = 1096$ observations). Finally, we excluded cases with missing values on the conflict-variables ($n = 46$ cases) and the lowest quintiles for the variables "frequency of conflict situations" ($n = 427$), "dealing with unpleasant or angry people" ($n = 167$), "dealing with physically aggressive people" ($n = 310$). The final sample contained 2164 individuals.

Measures
Depressive symptoms
Depressive symptoms were assessed using the Center for Epidemiologic Studies Depression Scale (CES-D [58]). This self-report scale comprises 20 items, assessing depressive symptoms such as depressed mood, hopelessness or insecurity during the last week, using a 4-point-Likert-scale (0 = never/almost none of the time; 3 = most or all of the time). The score ranges from 0 to 60 points, with higher values indicating higher levels of current depressive symptomatology. Drawing on reference values from comparable population-based samples, a cut-off value of ≥23 points indicates risk of depression [59].

Individual-level covariates
We included gender and age as individual-level covariates in our analyses. To control for social resources, we

used information from the short-form of the Lubben Social Network-Scale (LSNS-6), a measure assessing perceived social resources and support. Questions include e.g. "How many friends/relatives do you see or hear from at least once a month?" or "How many friends/relatives do you feel close to such as that you could call on them for help?". Possible scores range from 0 to 30 points, higher scores indicating higher levels of social resources. A score below 12 points is considered an indicator of social isolation [60]. We further controlled for neuroticism and extraversion as assessed by the NEO-16 Adjective Measure [61]. Neuroticism and extraversion were assessed with four and three items, respectively. Participants rated themselves on a 7-point scale ranging from 1 (disagree strongly) to 7 (agree strongly), with the common introduction "I see myself as: (e.g. item 5: anxious)". We classified education (low, middle, high) based on the CASMIN-scale (Comparative Analysis of Social Mobility in Industrialized Nations), which takes into account general and vocational education [62].

Occupational-level covariates

We used occupational information from the Occupational Information Network (O*NET) database (version 23.2). The O*NET-database was developed by the US Department of Labor/Employment and Training Administration (USDOL/ETA) and provides detailed information on a total of over 900 different occupations within the US-American labor-market [63]. Data are provided by job incumbents, supervisors and occupational experts. Comparable databases for the German labor market are currently not available. O*NET data have been used to measure associations of work-related factors with depressive symptoms [35], cardiovascular disease [30], clinical depression [36], self-rated health and hypertension [64], among others. For every type of occupation, a comprehensive set of descriptors is available, including information on required skills, knowledge, values and activities common in the respective occupation. Among the section on worker activities, items assessing the importance and level/frequency of several types of social interactions in the workplace are available. Interpersonal conflict is assessed with three items: *frequency of conflict situation; dealing with unpleasant or angry people; dealing with physically aggressive people.* The three items were combined into one additive "conflict-score" as an overall-measure of interpersonal conflict in the workplace by summing up the values of the three respective items. Cronbach's alpha was 0.87, indicating a high level of internal consistency.

Since some occupations experience literally no conflictual contacts, observations were grouped into quintiles based on their respective scores in the three conflict-items. The lowest quintile was then removed from the analysis sample. To avoid the risk of bias due to statistical outliers, we excluded occupations with less than 10 incumbents from the sample.

Statistical analyses

To describe the sample with regard to individual- and occupational-level characteristics, Chi^2- and two-sample t-tests were used as appropriate. We conducted an overall-analysis of the complete sample as well as separate analyses for men and women. Subsequently, we investigated associations between interpersonal conflict in the workplace and depressive symptomatology by calculating a linear multilevel regression model. Multilevel models are suited for analyzing hierarchically structured data, e.g. individuals (level 1-units) clustered in occupations (level 2-units). P-values < 0.05 were considered significant, and all models were calculated using maximum likelihood estimation. Analyses were conducted using Stata (SE) 13.1. We first fit an empty model (null model), containing only the random effects of individuals and occupations, to determine the proportion of differences in depressive symptoms due to different occupations. In a next step, all individual-level factors are added to the analysis, resulting in a random intercept-model. The final model additionally contains individual and occupational-level covariates. As an indicator for model-fit, the Akaike information criterion (AIC) is reported for each model, with smaller values indicating better model-fit.

Results

Table 1 provides a description of independent and dependent variables. The final sample consisted of 856/39.6% men and 1308/60.4% women with a mean age of 49.4 (SD: 8.1) and 49.3 years (SD: 7.7) for men and women, respectively, (nested in 65 distinct occupations. Each occupation included, on average, 33 workers (minimum: 10, maximum: 252). Mean CES-D-scores were 8.6 (SD: 5.4) for men and 10.8 (SD: 7.6) for women, respectively (overall score: 10.0, SD: 6.9). Women in our sample had higher values in neuroticism (mean = 3.4 vs. 3.0 in men, $P < 0.001$) and extraversion (3.8 vs. 3.6 in men; $P < 0.001$). Women reported slightly higher levels of social support (mean score: 17.5 vs. 17.3 in men, respectively, $p = 0.38$), however, differences were not significant. Only 1.85% of respondents reported a low level of education. More women than men had a middle level of education (67.8 vs. 52.2%), while men more often belonged to the highest education-category (40.4 vs. 30.7% in women; $P < 0.001$). No age differences were found in our sample.

Women had slightly more contact with physically aggressive or angry people and higher overall-values for interpersonal conflict. No gender differences were found with regard to frequency of conflictual contact.

Table 1 Sample description (overall/by gender)

Variable	Total ($n = 2164$)		Men ($n = 856$)		Women ($n = 1308$)		P-value*
	mean/%	SD	mean/%	SD	mean/%	SD	
Age	49.3	7.9	49.4	8.1	49.3	7.7	0.924
Education low (%)	1.9		2.3		1.5		P < 0.001
Education middle (%)	63.6		57.2		67.8		
Education high (%)	34.5		40.4		30.7		
Social resources	17.5	5.0	17.3	5.1	17.5	4.9	0.385
Neuroticism	3.2	1.1	3.0	1.1	3.4	1.2	P < 0.001
Extraversion	3.7	1.3	3.6	1.2	3.8	1.3	0.004
Interpersonal conflict	2.8	0.4	2.8	0.4	2.9	0.5	P < 0.001
Frequency. of conflictual contact	3.3	0.5	3.3	0.4	3.3	0.5	0.197
Dealing with physically aggressive people	1.8	0.5	1.7	0.5	1.8	0.5	P < 0.001
Dealing with angry people	3.4	0.5	3.3	0.5	3.5	0.5	P < 0.001
Depressive symptoms (CES-D-score)	10.0	6.9	8.6	5.4	10.8	7.6	P < 0.001

n = 2164; age reported in years; education assessed according to CASMIN (Comparative Analysis of Social Mobility in Industrial Nations)-classification categories low, middle, and high; neuroticism and extraversion assessed by the NEO-16-AM; social resources assessed by the Lubben Social Network Scale; CES-D = Center for Epidemiological Studies Depression Scale; * p-values based on Chi^2- and two-sample t-tests, as appropriate

To illustrate different amounts of interpersonal conflict in specific occupations, examples of jobs with highest/lowest values in the respective types of contact are given in Table 2.

Interpersonal conflicts were especially common in occupations entailing care work, e.g. nurses/hospital staff, but also jobs in the education or service sector. Lowest values were found in various types of office/administrative jobs and engineering professions.

The results of an overall-multilevel linear regression model with gender as a covariate are presented in Table 3. The likelihood-ratio-test confirmed the superiority of the multilevel model over OLS-regression ($P < 0.001$). Only a small proportion of variance (2.8%) in depressive symptomatology could be explained by differences between occupations, as indicated by the intraclass correlation coefficient (ICC, null model). This implies that variation in depressive symptomatology is for the most part due to differences between individuals, with a small level of variation explained by differences between occupations.

Women had higher levels of depressive symptoms than men (b = 1.2; 95% CI: 0.66–1.74; Model 1). Depressive symptoms were reduced in people reporting higher levels of social resources (b = – 0.23; 95% CI: – 0.28; – 0.18). Neuroticism was associated with increased depressive symptomatology, while higher levels of extraversion were linked to reduced depressive symptoms. No age differences were found. Education was linked to reduced risk of depressive symptoms, however, only for the highest level of educational attainment. Variation between jobs, indicated by the standard deviation of the random intercept, decreased from 1.14 to 0.51, indicating little variation of depressive symptoms between jobs.

In Model 2, we investigated associations between occupational-level covariates and depressive symptoms. The amount of conflictual contact was not linked to depressive symptoms (b = 0.19; 95% -0.31; 0.68). The intercept was 7.45 (95% CI: 4.86; 10.04). Associations with individual-level variables remained unchanged. Given the slightly smaller AIC-value, Model 1 should be considered the better-fitting model, i.e. the inclusion of interpersonal conflict does not improve the explanatory power of the model.

Tables 4 and Table 5 report the results of separate regression models for men and women. In the male subsample, 0.8% of variation in depressive symptoms could

Table 2 Examples of occupations with high/low values of interpersonal conflict

Job variable	Highest values	Lowest values
Dealing with angry people	Policemen, educators, teachers, cashiers, nurses	IT-engineers, research fellows, manufacturing, architects, office/administrative staff, cosmeticians/hairdressers
Dealing with physically aggressive people	Policemen, tram/public transport drivers, (geriatric) nurses, teachers	Engineers, IT-sector, carpenters, architects
Frequency of conflict situation	(Geriatric) nurses, educators, teachers, lawyers, sales representatives	Lab assistants, kitchen aids, carpenters, office/administrative staff, commercial employees

Examples of jobs with lowest/highest values of interpersonal conflict on the job (2nd / 5th quintile, respectively, due to exclusion of lowest quintile)

Table 3 Results of multilevel linear regression to assess depressive symptomatology (CES-D), total sample (n = 2164)

Variable	Null model		Model 1		Model 2	
	coeff.	95% CI	coeff.	95% CI	coeff.	95% CI
Individual level						
Intercept/constant	9.84	9.51; 10.14	7.53	4.70; 10.35	7.14	4.86; 10.04
Female gender			**1.20**	0.66; 1.74	**1.19**	0.56; 1.46
Age			0.00	−0.04; 0.03	0.00	−0.03; 0.02
Education: middle			−1.84	−3.68; 0.01	−1.84	−3.21; 0.01
Education: high (ref: low)			**−2.61**	−4.49; −0.72	**−2.60**	−4.04;-1.12
Social resources			**−0.23**	−0.28; −0.18	**−0.23**	−0.28; −0.19
Neuroticism			**2.55**	2.33; 2.77	**2.55**	2.29; 2.67
Extraversion			**−0.37**	−0.56; −0.17	**−0.37**	−0.53; −0.20
Occupational level						
Interpersonal conflict					0.14	−0.60; 0.83
Random effects						
Intercept SD	1.14	0.57; 1.28	0.51	0.24; 1.03	0.50	0.18; 0.86
ICC	0.028		0.008		0.007	
Log Likelihood	− 7233.77		− 6888.12		−6888.041	
LR-Test	$\text{Chi}^2 = 23.30; P < 0.001$		$\text{Chi}^2 = 4.42; P = 0.018$		$\text{Chi}^2 = 4.23; P = 0.020$	
AIC	14,473.54		13,796.23		13,798.08	

CI confidence interval; *SD* standard deviation; education assessed according to CASMIN (Comparative Analysis of Social Mobility in Industrial Nations)-classification categories low, middle, and high; neuroticism and extraversion assessed by the NEO-16-AM; social resources assessed by the Lubben Social Network Scale; *CES-D* Center for Epidemiological Studies Depression Scale; significant associations presented in bold type

Table 4 Results of multilevel linear regression to assess depressive symptomatology (CES-D) in men (n = 856)

Variable	Null model		Model 1		Model 2	
	coeff	95% CI	coeff	95% CI	coeff	95% CI
Individual level						
Intercept/constant	8.65	8.26; 9.05	7.91	4.52; 11.31	8.30	4.20; 12.20
Age			0.03	−0.01; 0.07	0.03	−0.01; 0.07
Education: middle			−1.57	−3.71; 0.56	−1.60	−3.71; 0.56
Education: high (ref: low)			−2.08	−4.25; 0.08	−2.09	−4.26; 0.07
Social resources			**−0.20**	−0.26; −0.13	**−0.20**	−0.27; −0.13
Neuroticism			**1.86**	1.56; 2.17	**1.86**	1.55; 2.16
Extraversion			−0.26	−0.55; 0.02	−0.26	−0.54; 0.02
Occupational level						
Interpersonal conflict					−0.14	−0.98; 0.69
Random effects						
Intercept SD	0.50	0.11; 2.23	1.67×10^{-6}	4.67×10^{-9}; 0.00	3.63×10^{-7}	0.00; 0.00
ICC	0.008		1.24×10^{-13}		5.81×10^{-15}	
Log Likelihood	− 2657.96		− 2549.59		−2549.53	
LR-Test	$\text{Chi}^2 = 0.55; P = 0.229$		$\text{Chi}^2 = 0.00; P = 1.00$		$\text{Chi}^2 = 0.00; P = 1.00$	
AIC	5321.93		5117.17		5119.06	

CI confidence interval; *SD* standard deviation; education assessed according to CASMIN (Comparative Analysis of Social Mobility in Industrial Nations)-classification categories low, middle, and high; neuroticism and extraversion assessed by the NEO-16-AM; social resources assessed by the Lubben Social Network Scale; *CES-D* Center for Epidemiological Studies Depression Scale; significant associations presented in bold type

Table 5 Results of multilevel linear regression to assess depressive symptomatology (CES-D) in women (n = 1308)

Variable	Null model		Model 1		Model 2	
	coeff.	95% CI	coeff.	95% CI	coeff.	95% CI
Individual level						
Intercept/constant	10.75	10.18; 11.33	10.59	6.46; 14.72	10.06	4.96; 15.16
Age			−0.03	−0.07; 0.02	−0.03	−0.07; 0.02
Education: middle			−2.23	−5.07; 0.62	−2.21	−5.06; 0.63
Education: high (ref: low)			**−3.34**	−6.25; −0.43	**−3.33**	−6.24;-0.42
Social resources			**−0.27**	−0.34; − 0.19	**−0.27**	− 0.34; − 0.19
Neuroticism			**2.93**	2.63; 3.24	**2.94**	2.63; 3.24
Extraversion			**−0.32**	−0.59; − 0.06	**−0.32**	− 0.59; − 0.06
Occupational level						
Interpersonal conflict					0.17	−0.80; 1.14
Random effects						
Intercept SD	1.05	0.53; 2.08	0.65	0.28; 1.49	0.63	0.27; 1.50
ICC	0.019		0.010		0.001	
Log Likelihood	− 4500.89		− 4280.40		−4280.34	
LR-Test	Chi^2 = 6.87; *P* = 0.004		Chi^2 = 3.40; *P* = 0.032		Chi^2 = 3.05; *P* = 0.040	
AIC	9007.77		8578.80		8580.68	

CI confidence interval; *SD* standard deviation; education assessed according to CASMIN (Comparative Analysis of Social Mobility in Industrial Nations)-classification categories low, middle, and high; neuroticism and extraversion assessed by the NEO-16-AM; social resources assessed by the Lubben Social Network Scale; *CES-D* Center for Epidemiological Studies Depression Scale; significant associations presented in bold type

be explained by differences between occupations (null model). Multilevel regression was not superior to OLS regression, as indicated by the likelihood ratio test (*p* < 1.00). When entering individual-level factors (Model 1), social resources (b = − 0.2, 95% CI: − 0.26; − 0.13) and neuroticism (b = 1.86; 95% CI: 1.56; 2.16) were associated with depressive symptoms. Interpersonal conflict at work did not explain differences in depressive symptomatology (Model 2; = − 0.14; 95% CI: − 0.98; 0.69).

Differences between occupations explained 1.9% of differences in depressive symptomatology in women (Table 5, null model). High levels of education and social resources were linked to lower levels of depressive symptoms (Model 1; b = − 3.34; 95% CI: − 6.25; − 0.34 and − 0.27; 95% CI: − 0.34; − 0.19, respectively). Neuroticism was associated with more, extraversion with less depressive symptoms. When entering occupational-level covariates, the regression coefficients did not change, interpersonal conflict was not associated with depressive symptoms in women (b = 0.17; 95% CI: − 0.80; 1.14). However, the likelihood ratio test indicated the superiority of a multilevel approach over OLS regression for the female subsample. In both subsamples, adding information on interpersonal conflict did not improve the quality of the model, as indicated by the AIC favoring Model 1 both for men and women.

Discussion

Social conflict at work, as an objective job characteristic, was not associated with depressive symptomatology

across 65 occupations in a large population-based sample. Differences in level of depressive symptoms were mainly explained by individual-level factors. The results do not confirm our hypothesis that social conflict at work is associated with higher levels of depressive symptoms. Some possible explanations for these findings are discussed below.

A possible interpretation is that job titles alone are too imprecise as indicators to be used in studies on occupational mental health: Jobs within the same occupation can vary largely between organizations, employers etc. regarding social relationships or the amount of conflict experienced [29, 65]. Regarding the small amount of variance due to occupational titles, more precise definitions of jobs or restriction to specific occupations might prove useful [38]. Conflicts at work were especially common among nurses, teachers or other professions in the service sector in our sample, corroborating existing evidence [23–26].

Since our analyses relied on cross-sectional data, we cannot rule out a possible selection bias/healthy-worker-effect, i.e. people with impaired mental health are probably less likely to work in occupations characterized by high levels of conflict.

Another possible explanation for why we did not find an association between work-related conflict and depressive symptoms points towards the assessment of interpersonal conflict in our study: While the majority of studies on occupational mental health uses subjective

measures to assess work-related relationships or stressors, we relied on an objective measure, using a database including detailed evaluations of various aspects of work. The objective assessment of interpersonal conflict, however, might have contributed to the non-significant association. It is possible that an association would have been detected if subjective measures of job features had been used. Subjective assessments include individual perceptions of stressors such as interpersonal conflict at work, which might mediate the influence of occupational stressors [16, 41]. In other words: Objective job characteristics may be similar for all incumbents of an occupation, subjective perceptions and coping styles are not [66]. Expert ratings or average values of job characteristics for specific groups of workers might serve as more objective measures of workplace factors, but they might also capture less information about actual differences between individual working conditions [33]. This line of interpretation is supported by similar findings from the Whitehall II-study: Self-report measures of job strain were linked to depressive symptoms, whereas objective indices of job strain (i.e. expert ratings) were not [37]. A comprehensive review by van der Doef and Maes assessed studies testing the demand-control-(support) model and possible associations with mental health [67]. While overall there was much support for an association between job strain and impaired mental health when self-report measures were used, none of the studies in which job characteristics were assessed independently of the outcome measure supported a link with depressive symptoms. In a German study based on pension insurance data, conflicts in the workplace were found to be associated with higher likelihood of a depression diagnosis both in men and women [36]. However, this sample included only workers with a rehabilitation diagnosis, therefore excluding healthy cases and those with subclinical depressive symptoms. Comparisons between these findings and our study should be made with caution.

Individual-level covariates in our study mostly showed the expected association with depressive symptoms. Higher levels of neuroticism were associated with higher levels of depressive symptoms, higher levels of extraversion were linked to less depressive symptoms but only in women. Women reported more depressive symptoms than men, corroborating existing gender differences in the prevalence of depressive symptoms [68]. Men and women with higher levels of social resources reported less depressive symptoms. Social resources might be protective for mental health in general or ameliorate the impact of stressful events, e.g. from conflictual experiences in the workplace. This finding is in line with previous studies reporting a buffering effect of social resources on the impact of work-related stress [69, 70].

Higher levels of education were linked to less depressive symptoms, but only in women. Education can be understood as a form of personal capital or resource, enabling people to succeed e.g. in working contexts and to pursue personal goals [50]. Moreover, education can impact mental health indirectly since it generally enables access to higher-level jobs and higher income. This, however, was true only for the highest level of education and only for the female subsample, implying that education is protective against depressive symptomatology only beyond a certain threshold. Overall, our model was more appropriate for the female than for the male subsample, as indicated by likelihood ratio-tests and ICC. This might be due to less variation between occupations in the male subsample, leading to less explanatory power of the model.

Strengths and limitations

One strength of our study is the use of objective measures of job qualities as included in the O*NET, providing a valuable measure of occupational characteristics. Since the information on work characteristics in the O*NET are assessed by incumbents and job experts, respectively, it provides a valuable measure of interpersonal relationships in different occupations that is meaningful to interpret. Many studies in occupational health psychology share the common problem that specific instruments or questionnaires on job stressors are more adequate for certain occupations than for others [38], a risk that can – at least partially – be avoided when using information from the O*NET database. Comparable studies are rare in Germany and similar databases for the German workforce are not available so far. We used a large, population-based sample including a wide range of occupations, making the sample less selective than those in many previous studies. It has been pointed out that of the vast variety of occupations, only few have been studied in detail regarding their associations with mental health and depression [71].

We chose a multilevel framework for our research question based on theoretical grounds, since the qualities we wanted to investigate were assessed as features of jobs rather than of people. As a more technical indicator, the likelihood ratio test confirmed the nested structure of the data, indicating the superiority of a multilevel approach over OLS regression. A growing body of literature in the field of occupational mental health confirms this approach, reporting, on average, smaller associations than those found in OLS regressions and little variation between occupations [14, 29, 37, 40].

We restricted our analysis sample to people who experience at least a certain amount of interpersonal conflict at work by excluding the lowest quintile of values for the respective job characteristics. This might make

our results more robust against statistical outliers and give a more accurate impression of the association between interpersonal conflict and depressive symptoms.

Certain limitations need to be addressed when interpreting our findings. First, since our study relies on cross-sectional data, no conclusions about causality can be drawn. Unfortunately, some potentially valuable information was not included in the LIFE-Adult baseline assessment, for example on the duration the subjects had been employed in the respective occupations. It might be possible that e.g. long periods of working in an occupation with high levels of interpersonal conflict may indeed raise the risk for depression. Then again, job experiences and histories of employment might provide useful resources and coping strategies which could possibly protect against work-related stressors. These questions, however, cannot be answered within the current study. Moreover, our data did not contain information on job involvement or employees' motivation as a potential moderating factor. However, comparable studies found little [72] or no support [73, 74] for job involvement having any influence on depressive symptoms or other mental health outcomes, therefore, the impact of this factor seems negligible.

Unfortunately, a substantial part of the original sample was lost due to missing values in the explanatory variables. However, a non-responder analysis revealed no differences in depressive symptomatology between responders and non-responders; therefore, this should not have influenced the results in a substantial way.

Lastly, a possible limitation arises from applying occupational information from a US-American database to a study sample from Germany. Since the O*NET data refer to the US-American labor market, slight differences regarding e.g. responsibilities, work context and social contacts made at work might occur between the same occupations in the US and Germany, respectively. However, since the O*NET data have previously been used in other health-related studies conducted in Germany [36, 75, 76], these possible differences should be negligible.

Conclusions

This study contributes to the literature on occupational factors and depressive symptoms using multilevel analyses. As in many comparable studies investigating the link between certain job aspects and mental health using individual- and job-level information, the association is not significant and job-level factors account for only little variance in depressive symptomatology. Our findings suggest that the association of interpersonal conflict at work and depressive symptoms does not differ between occupations. It can be assumed that approaches focusing only on the individual level of analysis via e.g. self-report

measures tend to report more and stronger associations with depressive symptoms. A reason for this might be that it is less the objective job feature than rather people's individual *perception* of their job, i.e. cognitive and affective assessments of job characteristics, that are associated with depressive symptoms. If this was the case, strategies for prevention should especially focus on employees' perceptions of their jobs, promotion of psychosocial resources and individual assessments of oneself and the workplace. Against this background, further discussions on the possible factors of jobs that are associated with depressive symptoms should put a stronger focus on methodological questions and possible ways of conceptualizing research questions. This could help to disentangle the pathways through which individual and job-related factors impact workers' mental health.

The role of psychosocial aspects of employment and possible links to depression is still inconclusive. It can be argued that specific stressors in the workplace are more amendable to change than global frameworks like "work stress" or "job strain", therefore, further research addressing aspects like social relations in the workplace is highly warranted. Future investigations should be more precise about questions of operationalization and methodology: Does the study assess features of jobs or rather subjective perceptions of occupational environments, the latter reflecting both the stressor and its evaluation by the incumbent? Further research taking into account occupations and/or organizations which employees are nested in can shed more light on the factors that pose a danger to mental health.

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Publisher's Note

2.3 Early Retirement and Depressive Symptoms

Abstract

Background: Transition from employment to retirement is regarded a crucial event. However, there is mixed evidence on associations between retirement and mental health, especially regarding early retirement. In Germany, cases of early retirement due to ill health – particularly, mental ill health – are increasing. Therefore, we investigated the association between early retirement and depressive symptoms, including information on different types of early retirement.

Methods: We analyzed data from 4,808 participants of the population-based LIFE-Adult-Study (age: 40-65 years, 654 retired, 4,154 employed), controlling for sociodemographic information, social network, pre-existing health conditions and duration of retirement. Depressive symptoms were assessed using the Center for Epidemiological Studies Depression Scale. Regression analysis using entropy balancing was applied to achieve covariate balance between retired and employed subjects.

Results: We found no overall-differences in depressive symptoms between employed and retired persons (men: $b = -.52$; $p = 0.431$; women: $b = .05$; $p = .950$). When looking at different types of early retirement, ill-health retirement was linked to increased depressive symptoms in women ($b = 4.68$, 95% CI = 1.71; 7.65), while voluntary retirement was associated with reduced depressive symptoms in men ($b = -1.83$, 95% CI = -3.22; -.43) even after controlling for covariates. For women, statutory retirement was linked to lower depressive symptomatology ($b = -2.00$, 95% CI = -3.99; -.02).

Conclusion: Depressive symptomatology among early retirees depends on reason for retirement: For women, ill-health retirement is linked to higher levels of depressive symptoms. Women who retire early due to ill-health constitute a risk group for depressive symptoms that needs specific attention in the health care and social security system.

Depressive Symptomatology in Early Retirees Associated With Reason for Retirement—Results From the Population-Based LIFE-Adult-Study

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Background: Transition from employment to retirement is regarded a crucial event. However, there is mixed evidence on associations between retirement and mental health, especially regarding early retirement. In Germany, cases of early retirement due to ill health—particularly, mental ill health—are increasing. Therefore, we investigated the association between early retirement and depressive symptoms, including information on different types of early retirement.

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Conclusion: Depressive symptomatology among early retirees depends on reason for retirement: For women, ill-health retirement is linked to higher levels of depressive symptoms. Women who retire early due to ill-health constitute a risk group for

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depressive symptoms that needs specific attention in the health care and social security system.

INTRODUCTION

Retiring from employment is considered a crucial event, affecting social relationships and roles, daily activities, and possibly various health outcomes (1–3). However, evidence on associations between retirement and mental health remains inconclusive (4–7). This applies particularly to early retirement, i.e., withdrawal from the labor force before reaching the country-specific statutory retirement age. One possible explanation for the mixed results on associations between early retirement and mental health is that most existing studies focus on one specific type of retirement (e.g., retirement due to ill-health or due to layoffs) and/or do not assess different reasons for retirement (2, 8, 9). Comprehensive investigations simultaneously considering mental health in different subtypes of retirees are currently rare, especially in Germany.

Knowledge on the health situation of different types of retirees, however, is crucial e.g., for the design of effective prevention and treatment strategies. Information on mental health of different subgroups of retired people is also valuable for the design of effective policy tools. Many welfare systems currently rely on financial incentives in order to encourage people to stay in the labor force; however, these kinds of incentives might not yield the desired effects if workers retire early involuntarily, e.g., due to health impairments (10–12).

In the face of demographic changes and increased life expectancy, policy makers in several Western countries have implemented different strategies to reduce pathways into early retirement in order to prolong individual careers and increase the share of older employees in the workforce (11, 13, 14). This also applies to Germany, where the statutory retirement age has been increased to currently 65 years and 7 months for people born in or after 1964 and will be raised further until the age of 67 years in the year 2029. Furthermore, replacement rates were successively lowered and subsidies for private pension provisions were introduced (15). Despite these political measures and a noticeable increase in the average retirement age, evidence from cross-national studies indicates that retirement transitions in Germany still occur earlier than in other countries like e.g., England or Japan (16).

Ill-health was repeatedly found to be one of the main factors raising the probability of early retirement (2, 4, 8, 10, 14, 17, 18). Depression, among other mental disorders, constitutes a particularly relevant reason for early retirement (2, 17–19). According to data from the German pension insurance, claims

to disability pension due to psychiatric disorders have been increasing continuously during the last years from 20.1% in 1996 to 42.7% of all claims in 2018 (20). Currently, depressive episodes constitute the 3rd most important reason for sick leave days (21). On average, sick leave due to mental ill health lasts 26.1 days. Evidence from Germany revealed that sick leave due to depression is a significant predictor for early retirement (22). This highlights the crucial role of mental health in maintaining work ability and prolonging individual careers. Studies from Scandinavian countries found depression and depressive symptoms to be associated with disability pension due to mental ill-health, but also with retirement due to somatic causes and non-illness-based retirement (17, 18). Depression often occurs as a recurring disease, which is one reason why it can severely disrupt labor force participation (23). Representative data from Germany estimate a share of 60-75% of all cases of depression being recurring depressive disorders (24).

Disability benefits can be granted for those workers having contributed to the statutory pension insurance who have become unable to pursue gainful employment due to ill health or disability. These benefits are only granted if employment capacity cannot be regained through e.g., means of medical rehabilitation and if the applicant is unable to perform any kind of paid work he or she can reasonably follow (25). Receiving a disability pension therefore comes with many preconditions. In 2018, 43% of all applications were denied (20). However, receipt of disability pensions is at least somewhat selective, since not all workers in Germany contribute to the statutory pension insurance; moreover, some people—although maybe suffering from ill-health—might rather look for a less demanding occupation, reduce working hours or leave the working environment through other exit routes, e.g., by becoming a homemaker.

Aside from health reasons, prematurely leaving the work force can occur voluntarily or due to other reasons, e.g., layoffs or corporate reorganization. Voluntariness of the transition from employment to retirement has been found a crucial factor impacting mental health of retirees, with people retiring involuntarily experiencing higher levels of depressive symptoms and other mental health problems than employees retiring voluntarily or because they reached the statutory retirement age (7, 26–28). This is likely because involuntary early retirement severely affects personal retirement plans and comes with financial losses and increased uncertainty (29, 30). Moreover, the skills and experiences of older workers might not easily be transferrable to other occupations, reducing the chance for reemployment (7).

By comparison, people who describe their retirement status as "voluntary" can be expected to report better mental health. As retirement was actively chosen, the transition was likely

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anticipated and planned, i.e., people deciding to retire voluntarily should be more open to the new experiences and changes that retirement can entail than people who continue to work until the statutory retirement age (26, 31). Several studies investigating the reasons for early retirement found the wish to enjoy life while still being in good health an important factor (32, 33). Moreover, voluntarily leaving the labor force prematurely requires some sort of personal wealth and assets to rely upon. Therefore, it is reasonable to assume that people actively choosing to retire early can draw upon personal resources for retirement. Several studies found voluntary early retirement to be linked to improved mental health and health satisfaction, although the association tended to diminish over time (7, 29, 34).

Although the statutory retirement age in Germany currently amounts to 65 years, certain exceptions apply for employees who entered the labor market early in life and contributed to the statutory pension insurance for at least 45 years, offering the possibility to retire at the age of 63 at full benefit receipt. Special regulations also apply to certain occupational groups, allowing e.g., police officers, soldiers or miners to retire at an earlier age. As outlined above, different reasons for retirement have been found to relate differently to mental health. Therefore, statutory early retirees should be carefully differentiated from those who retired due to specific reasons.

Evidence on possible gender differences concerning the association between mental health and early retirement remains inconclusive, partly because previous studies often exclusively focused on men's retirement (35). Drawing on traditional societal norms emphasizing the role of employment for men's identities, it has been suggested that prematurely exiting the labor force might be an especially stressful experience for men, resulting in higher levels of psychological distress than in women who retire early (36). However, given the higher labor force attachment of younger cohorts of women and the changing of gender roles, it has to be questioned whether this assumption still holds true. Possible gender differences might prevail regarding both reasons for retirement and mental health in retirement (28). Previous studies on reasons for retirement found caring duties for a spouse or other family members to be more important for women's retirement decision than men's (37, 38). While the overall-rates of retirement due to disability have been decreasing in Germany during the last decades, the share of women receiving a disability pension has increased continuously, partly due to the increased labor force participation of women (39). Lastly, the overall-prevalence of depression is consistently reported higher in women than in men (40). These factors highlight the need for gender-specific information on the association of early retirement and mental health.

Against this background, it can be assumed that different reasons for retirement relate differently to mental health. We therefore hypothesize that **a)** ill-health related retirement is linked to increased depressive symptomatology, while **b)** voluntary early retirement is associated with less depressive symptoms. Involuntary early retirement is assumed to be linked to increased depressive symptomatology **c)**. For early retirement due to reaching the statutory retirement age, i.e.,

where none of these reasons apply, we suspect no association with depressive symptoms **d)**. To investigate possible gender differences in the association of early retirement and depressive symptoms, all analyses were conducted separately for men and women **e)**.

MATERIALS AND METHODS

Participants

Data were drawn from the LIFE-Adult-Study, a population-based cohort study conducted by the Leipzig Research Center for Civilization Diseases; 10,000 randomly selected citizens of Leipzig, Germany aged between 18 and 79 years completed the baseline examination between 2011 and 2014.

The LIFE-Study aims to investigate the prevalence, genetic predispositions, and modifiable lifestyle factors of major civilization diseases such as cardiovascular diseases, dementia, or depression. The baseline assessment consisted of physical examinations, structured interviews, and questionnaires which were administered to all participants. Pregnancy and insufficient command of the German language were exclusion criteria. For a detailed description of the study aims and concept, please see (41). The study included an age- and sex-stratified random sample of 10,000 community-dwelling German-speaking residents of the city of Leipzig who were randomly drawn from lists provided by the local registry office. These residents were sent an invitation letter, informing them about the aims and design of the study, and a response form. Residents who did not respond were sent a reminder invitation. Non-responders were searched in public phone directories and contacted by phone. For residents who refused to participate, residents of the same age and sex were randomly drawn from the registry office's lists and invited to participate. The study was approved by the responsible ethics board of the Medical Faculty of the University of Leipzig. All participants provided written informed consent to participate prior to enrolment.

Of the initial sample, we excluded cases younger than 40 and older than 65 years (n = 3,561) in order to exclude cases that had already left the labor market due to old-age retirement or who were too young to be reasonably compared to early retirees; however, there was only one observation younger than 40 years in early retirement. Observations were further excluded if they were neither in employment or retirement (e.g., homemakers, unemployed, on maternal leave; n = 772) or if information was missing on social network (n = 308), net equivalent income (n = 92), job status (n = 10), severe preexisting health conditions (n = 71), type of retirement (n = 5), or depressive symptoms (n = 373). The final sample thus consisted of 4,808 individuals.

Measures
Depressive Symptoms

Depressive symptoms were assessed using the German version of the Center for Epidemiologic Studies Depression Scale [CES-D (42)]. This self-report scale consists of 20 items, assessing symptoms such as depressed mood, hopelessness, or insecurity

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during the last week, using a 4-point-Likert-scale (0 = never/ almost none of the time; 3 = most or all of the time). Possible scores range from 0 to 60 points, with higher values indicating higher levels of current depressive symptomatology. Reference values from comparable population-based samples suggest a cut-off value of ≥ 23 points as an indicator for risk of depression (43).

Early Retirement

We investigated observations up to 65 years of age since this represents the legal retirement age in Germany to date. The age of 65 has long served as a benchmark in the German retirement system and is also often chosen for research conducted in other countries as an indicator for "on-time" or statutory retirement, making it feasible to embed our results in a wider international context. Due to certain exceptions in the German pension system (see *Background*), a certain amount of statutory early retirees is likely to be included in the sample, despite the focus on other subtypes of early retirement. This category is to be differentiated from voluntary early retirement: while statutory early retirees worked in their respective jobs until the statutory retirement age, voluntary early retirees exit the labor market prematurely. These early retirees usually rely upon personal assets like e.g., private pension insurance plans in old age or made additional voluntary contributions to the statutory pension insurance during their employment career, allowing for an early withdrawal from the labor force.

In LIFE-Adult, different types of retirement were identified by asking the question "which of the following best describes your situation?" if participants indicated having retired, with the following response categories: retirement due to reaching the statutory retirement age; early retirement due to ill-health; voluntary early retirement; involuntary retirement due to operational circumstances; involuntary retirement due to other reasons. We combined the last two options, resulting in the categories: *employed; statutory retirement; retirement due to ill-health; voluntary early retirement; involuntary early retirement.*

Other Covariates

We included gender, age, and marital status (married or living in a partnership *vs.* single, divorced, or widowed) as covariates. Moreover, we included education as measured by the CASMIN-scale [Comparative Analysis of Social Mobility in Industrial Nations (44)], net equivalent income, and job status (high/ middle/low) as sociodemographic characteristics. Categorization of jobs was conducted using a scoring algorithm for the measurement of socioeconomic status in epidemiological studies which is based on the International Socio-Economic Index of Occupational Status [ISEI; (45)]. Further, we included information on participants' social network using the short form of the Lubben Social Network Scale (LSNS-6). The LSNS-6 is a measure widely used for the assessment of social engagement and perceived social support, containing questions like: "how many relatives/friends do you see or hear from at least once a month?; how many relatives/ friends do you feel close to such that you could call on them for help?". Scores range from 0 to 30, with higher values indicating higher levels of social engagement. To control for pre-existing health conditions, we included information on lifetime diagnoses

of diabetes, myocardial infarction, or stroke, since these conditions were repeatedly found to increase the propensity of early retirement (46–48). Other conditions reported to be related to early retirement (cancer, arthritis, multiple sclerosis) were not investigated due to high numbers of missing values. If participants described themselves as retired, information on duration of retirement was included in the analyses.

Statistical Analyses

Comparisons between groups were conducted using Chi²-tests and one-way ANOVA as appropriate. We investigated the association of different types of early retirement and depressive symptoms by means of multivariate linear regression, calculating separate models for men and women, with a p-value < 0.05 indicating significance. Analyses were conducted using Stata 16.0 (SE). A weighting factor provided within the LIFE-data was used to adjust the age- and gender distribution to the German population in 2011 (1st year of baseline assessment). To precisely identify the links between different types of early retirement and depressive symptoms, we first matched retired and employed cases on a set of covariates, namely: age, gender, partnership status, education, job level, net equivalent income, social network size, and pre-existing health conditions. We used entropy balancing to reweigh a matrix of control observations, i.e., employed participants (49). Weighting control observations is performed to achieve maximum comparability between treatment- (i.e., retired) and control observations, even in cases where treatment- and control group differed in covariates before the treatment. This method is more effective than other matching approaches like e.g., propensity score matching since control observations are re-weighted to fulfill pre-specified assumptions like equal means and variances of covariates as in the treatment group (50). Unlike other matching techniques, this algorithm allows to use all available observations in the sample without discarding cases that cannot be matched to a control observation (49). Entropy balancing is a non-parametric approach that takes selection of observations based on time-invariant unobserved variables into account (51). To ensure robustness of our findings, we repeated our analyses using propensity score matching, leading to highly comparable results (not shown).

RESULTS

Descriptive Analyses

Among the 4,808 observations, 654 (13.6%) had already left the labor force (men *vs.* women: 39.8/60.2%). This group included 104 (15.9%) cases of early statutory retirement, 196 (30.0%) cases of ill-health retirement, 294 (45.0%) observations who had retired voluntarily and 60 (9.2%) cases of involuntary early retirement. The proportion of women was slightly higher in all subtypes of retirement (61.5, 55.1, 62.6, and 63.3%, respectively). For men, depressive symptoms were lowest in voluntary early retirees (mean = 7.8, SD = 5.7) and highest in the ill-health retirement subgroup (mean = 12.0, SD = 7.4; see **Table 1**). For women, the respective values were lowest in statutory early

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TABLE 1 | Sample description of employed and retired respondents, by subgroup (men).

Variable	Employed (unmatched)	Employed (matched)	Statutory early retirement	Ill-health retirement	Voluntary retirement	Involuntary retirement	F/chi² (unmatched)	P-value (unmatched)	F/chi² (matched)	P-value (matched)
Age, mean (SD)	51.0 (6.6)	62.2 (2.8)	64.4 (2.2)	59.2 (6.1)	63.9 (1.3)	63.7 (2.2)	189.28	P<0.001	129.20	P<0.001
Partnership %	81.0	89.8	85.0	71.6	94.5	90.1	20.04	P<0.001	6.72	P<0.001
Job status low %	9.2	17.9	2.5	19.3	19.1	22.7	30.33	P<0.001	1.13	P = 0.339
Job status middle %	83.5	76.2	90.0	78.4	76.4	77.3				
Job status high %	7.4	5.9	7.5	2.3	4.5	0.0				
Education low %	3.2	4.4	0.0.	4.5	6.4	4.5	18.80	P = 0.016	1.93	P = 0.053
Education middle %	60.4	59.0	42.5	71.6	61.8	68.2				
Education high %	36.4	36.7	57.5	23.9	31.8	27.3				
Net equivalent income, mean (SD)	2,236.8 (1,947.9)	1,565.9 (570.5)	1,642.5 (593.9)	1,377.1 (724.6)	1,435.1 (484.7)	1,424.4 (582.6)	10.69	P<0.001	11.67	P<0.001
Social resources (LSNS-6-score), mean (SD)	17.0 (5.3)	16.1 (5.7)	14.7 (5.9)	14.4 (6.0)	16.8 (6.1)	18.1 (4.8)	6.85	P<0.001	14.11	P<0.001
Stroke %	0.6	1.7	2.5	10.2	1.8	0.0	71.74	P<0.001	4.24	P = 0.002
Diabetes %	5.6	14.9	30.0	23.9	10.0	13.6	77.66	P<0.001	2.82	P = 0.0255
Myocardial infarction %	1.2	6.9	7.5	8.0	5.5	0.0	68.15	P<0.001	0.44	P = 0.7625
Pension duration, years			1.4 (1.7)	5.6 (6.0)	2.1 (2.1)	3.1 (2.4)	38.38	P<0.001	38.38	P<0.001
Depressive symptoms (CES-D-score), mean (SD)	9.1 (5.5)	9.7 (5.1)	9.7 (5.1)	12.0 (7.4)	7.8 (5.7)	9.6 (4.7)	7.52	P<0.001	27.93	P<0.001
n	1,894		40	88	110	22				

n = 2,154; table presents results for unmatched and matched controls (employed respondents); age reported in years; education assessed according to CASMIN (Comparative Analysis of Social Mobility in Industrial Nations)-classification categories low, middle, and high; social resources assessed by the Lubben Social Network Scale (LSNS-6); CES-D, Center for Epidemiologic Studies Depression Scale; stroke, diabetes, and myocardial infarction: lifetime diagnoses; p-values based on Chi²-tests and one-way ANOVA, as appropriate.

TABLE 2 | Sample description of employed and retired respondents, by subgroup (women).

Variable	Employed (unmatched)	Employed (matched)	Statutory early retirement	Ill-health retirement	Voluntary retirement	Involuntary retirement	F/chi² (unmatched)	P-value (unmatched)	F/chi² (matched)	P-value (matched)
Age, mean (SD)	50.6 (6.4)	62.1 (2.9)	64.2 (1.7)	58.2 (6.2)	63.2 (1.8)	63.1 (3.5)	302.72	P<0.001	163.55	P<0.001
Partnership %	75.0	72.2	82.8	59.3	81.0	81.6	20.77	P<0.001	4.05	P = 0.005
Job status low %	4.8	8.5	12.5	13.0	6.5	5.3	28.79	P<0.001	1.20	P = 0.294
Job status middle %	87.1	88.8	79.7	83.3	90.8	89.5				
Job status high %	8.1	2.7	7.8	3.7	2.7	5.3				
Education low %	2.1	3.7	0.0	4.6	4.3	2.6	20.96	P = 0.007	0.54	P = 0.811
Education middle %	62.1	72.5	76.6	71.3	66.8	71.1				
Education high %	35.8	23.8	23.4	24.1	28.8	26.3				
Net equivalent income, mean (SD)	1,966.9 (995.4)	1,316.2 (544.3)	1,546.2 (717.3)	1,260.7 (520.3)	1,466.2 (482.4)	1,174.2 (349.7)	32.75	P<0.001	21.80	P<0.001
Social resources (LSNS-6-score), mean (SD)	17.3 (5.0)	15.9 (5.2)	17.3 (4.5)	15.1 (5.0)	16.5 (4.4)	15.3 (4.0)	7.24	P<0.001	9.23	P<0.001
Stroke %	0.7	6.2	1.6	10.2	1.6.	5.3	84.28	P<0.001	1.30	P = 0.272
Diabetes %	3.6	16.0	10.9	18.5	12.5	13.2	80.96	P<0.001	0.438	P = 0.688
Myocardial infarction %	0.3	1.8	0.0	5.6	1.1	2.6	51.17	P<0.001	1.28	P = 0.280
Pension duration, years			1.5 (1.8)	7.6 (7.6)	2.1 (1.8)	3.6 (2.9)	627.17	P<0.001	627.17	P<0.001
Depressive symptoms (CES-D-score), mean (SD)	10.8 (7.4)	13.1 (7.1)	9.2 (5.8)	17.5 (11.2)	11.0 (5.3)	11.4 (7.7)	21.83	P<0.001	59.67	P<0.001
n	2,260		64	108	184	38				

n = 2,654; table presents results for unmatched and matched controls (employed respondents); age reported in years; education assessed according to CASMIN (Comparative Analysis of Social Mobility in Industrial Nations)-classification categories low, middle, and high; social resources assessed by the Lubben Social Network Scale (LSNS-6); CES-D, Center for Epidemiologic Studies Depression Scale; stroke, diabetes, and myocardial infarction: lifetime diagnoses; p-values based on Chi²-tests and one-way ANOVA, as appropriate.

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retirees (mean = 9.2, SD = 5.8) and highest for ill-health retirees (mean = 17.5, SD = 11.2; see **Table 2**). Mean age was significantly lower among employed than among retired subjects (men: mean = 51.0, SD = 6.6; women: mean = 50.6, SD = 6.4). Overall, 81.5% of men and 75.1% of women were married or living with a partner, with the lowest proportion among ill-health retirees, respectively (men: 71.6%, women: 59.3%). Men reporting involuntary early retirement more often belonged to the lowest job-status category (22.7%). Among women, this proportion was highest among ill-health retirees (13.0%). Regarding social networks, ill-health retirees had the lowest mean levels of social support (men: mean = 14.4, SD = 6.0; women: mean = 15.1, SD = 5.0), compared to employed and other retirement subgroups. Observations also differed in terms of education. While 57.5% of early statutory retired men had a high level of education, this proportion was 23.9% among ill-health, 31.8% among voluntary early retirees, and 27.3% among involuntary early retirees (employed: 36.4%). Among women, these educational differences were less pronounced (proportion of women with a high level of education in employment, statutory, ill-health, voluntary, and involuntary early retirement: 35.8, 23.4, 24.1, 28.8, 26.3%, respectively). For men, ill-health retirees had the lowest mean incomes (1,377.1, SD: 724.6), followed by involuntary, voluntary, and statutory retirees and highest values for employed men (mean = 2,236.8, SD = 1,947.9). In the female subsample, mean net equivalent

income was lowest among involuntary early retirees (1,174.2, SD = 349.7), followed by ill-health, voluntary, and early statutory retirees and highest values for employed women (1,966.9, SD = 995.4). Regarding pre-existing health conditions, a lifetime diagnosis of stroke was most often found in men retired due to ill-health (10.2%, respectively). Statutory early retired men (30.0%) and ill-health retired women (18.5%) had the highest prevalences for diabetes, while a lifetime diagnosis of myocardial infarction was most frequently found in ill-health retirees (men: 8.0%, women: 5.6%). Average duration of retirement was highest for ill-health retirees (men: mean = 5.6 years, SD = 6.0; women: mean = 7.6, SD = 7.5).

Descriptive sample statistics are provided in **Tables 1**, **2** for men and women, respectively. Results are presented for unmatched, i.e., before entropy balancing, and matched controls, the last four columns reporting information on significance of differences between early retirement subtypes and unmatched/matched control observations, respectively.

Multivariate Analyses

Tables 3, **4** report the results of multivariate linear regression models, stratified by gender. The results of a model comparing employed and retired observations without differentiating for early retirement reasons are shown in **model 1.** No association between retirement and depressive symptoms was detected in either men or women (men: b = −.52, p = 0.431; women: b = .05,

TABLE 3 | Multivariate linear regression, association of depressive symptomatology (CES-D), and early retirement, men.

	Men (n = 2,154)							
	Model 1				**Model 2**			
	Coeff.	**95% CI**		**P-Value**	**Coeff.**	**95% CI**		**P-value**
Employed	Ref.				Ref.			
Retired	−.52	−1.83	.78	0.431				
Statutory early retirement					.20	−1.66	2.06	0.831
Ill-health retirement					1.34	−.90	3.58	0.240
Voluntary retirement					**−1.83**	−3.22	−.43	0.010
Involuntary retirement					.28	−1.80	2.36	0.795
Age	−**.17**	−.33	−.01	0.034	−.10	−.25	.05	0.187
Partnership (Ref.: single)	.40			0.671	.69	−1.10	2.48	0.447
Job status low	Ref.				Ref.			
Job status middle	−.57	−2.10	.96	0.463	−.78	−2.26	.71	0.306
Job status high	2.48	−1.04	6.01	0.167	2.41	−1.10	5.92	0.178
Education low	Ref.				Ref.			
Education middle	−.56	−2.29	1.17	0.523	−.60	−2.30	1.11	0.491
Education high	−1.97	−3.99	.06	0.057	−1.99	−4.01	.03	0.053
Net equivalent income	−.00	−.00	.00	0.154	−.00	−.01	.00	0.123
Social resources	−**.28**	−.38	−.19	0.000	−**.27**	−.37	−.17	0.000
Stroke	.21	−5.43	5.85	0.941	−.27	−5.90	5.36	0.926
Diabetes	−.15	−1.39	1.09	0.810	−.55	−1.75	.66	0.376
Myocardial infarction	1.03	−1.31	3.38	0.387	1.09	−1.24	3.41	0.361
Pension duration, years	.12	−.13	.37	0.359	.04	−.23	.31	0.768
R²	0.1510				0.1718			

Coeff., coefficient; CI, confidence interval; education assessed according to CASMIN (Comparative Analysis of Social Mobility in Industrial Nations)-classification categories low, middle, and high; social resources assessed by the Lubben Social Network Scale (LSNS-6); CES-D, Center for Epidemiologic Studies Depression Scale; stroke, diabetes, myocardial infarction: lifetime diagnoses; significant associations presented in bold type.

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TABLE 4 | Multivariate linear regression, association of depressive symptomatology (CES-D) and early retirement, women.

	Women (n = 2,654)						
	Model 1				Model 2		
	Coeff.	95% CI		P-value	Coeff.	95% CI		P-value
Employed	Ref.				Ref.			
Retired	.05	−1.39	1.48	0.950				
Statutory early retirement					**−2.00**	−3.99	−.02	0.047
Ill–health retirement					**4.68**	1.71	7.65	0.002
Voluntary retirement					−.65	−2.00	.69	0.340
Involuntary retirement					−.66	−3.49	2.16	0.645
Age	**−.32**	−.51	−.12	0.002	−.15	−.36	.07	0.179
Partnership (Ref.: single)	**−3.37**	−5.33	−1.40	0.001	**−3.07**	−4.95	−1.19	0.001
Job status low	Ref.				Ref.			
Job status middle	.54	−1.16	2.24	0.532	.42	−1.34	2.19	0.638
Job status high	2.45	−1.27	6.18	0.197	2.35	−1.19	5.89	0.193
Education low	Ref.				Ref.			
Education middle	−2.26	−5.45	.94	0.166	−2.53	−6.01	.95	0.154
Education high	−3.05	−6.11	.66	0.115	−3.13	−6.75	.50	0.091
Net equivalent income	−.00	−.00	.00	0.077	−.00	−0.00	.00	0.159
Social resources	**−.34**	−.47	−.20	0.000	**−.31**	−.45	−.18	0.000
Stroke	2.95	−2.48	8.38	0.286	2.79	−2.56	8.14	0.306
Diabetes	**2.58**	.59	4.57	0.011	**2.18**	.25	4.11	0.027
Myocardial infarction	2.59	−.34	5.52	0.084	2.20	−.73	5.13	0.142
Pension duration, years	−.02	−.17	.16	0.978	−18	−.38	.02	0.071
R²	0.1697				0.2039			

Coeff., coefficient; CI, confidence interval; education assessed according to CASMIN (Comparative Analysis of Social Mobility in Industrial Nations)-classification categories low, middle, and high; social resources assessed by the Lubben Social Network Scale (LSNS-6); CES-D, Center for Epidemiologic Studies Depression Scale; stroke, diabetes, myocardial infarction: lifetime diagnoses; significant associations presented in bold type.

p = 0.950). Higher age and a larger social network were linked to lower depressive symptoms in both genders, whereas living in a partnership was associated with lower depressive symptoms only in women (b = −3.37; 95% CI: −5.33, −1.40). Women reporting a lifetime diagnosis of diabetes had increased depressive symptoms. The analyses did not reveal a link between a lifetime-diagnosis of myocardial infarction or stroke and depressive symptomatology. For both men and women, no association between sociodemographic factors (education, net equivalent income, job level) and depressive symptoms could be demonstrated.

Model 2 presents the results of a multivariate regression model differentiating between reasons for early retirement, i.e., statutory retirement, retirement due to ill-health, voluntary, and involuntary early retirement (reference group: employment). Men who retired voluntarily showed lower depressive symptoms (b = −1.83, 95% CI = −3.22; −.43), while no significant differences were detected for other groups of retirees in respect to depressive symptoms. A larger social network was linked to lower depressive symptoms. Results in the female subsample followed a different pattern. While women in statutory retirement showed lower levels of depressive symptoms (b = −2.00; 95% CI = −3.99; −.02), women reporting retirement due to ill-health had increased depressive symptoms (b = 4.68; 95% CI = 1.71; 7.65). Living in a partnership and a larger social network were associated with lower depressive symptomatology in women, while a lifetime diagnosis of diabetes was linked to increased depressive symptoms. No other associations between covariates and depressive symptoms were revealed in either men or women.

DISCUSSION

Overall, no differences between early retirees and men and women in employment regarding depressive symptoms were detected. However, on further investigation of different reasons for retirement, a more complex picture emerged. Possible interpretations of our findings are discussed below.

Voluntary early retirement was linked to lower depressive symptoms in men, but not in women. The negative association between voluntary early retirement and depressive symptoms in men might point toward the importance of voluntariness, i.e., whether a true choice to retire was present. This finding is supported by earlier studies, stating that voluntary retirement is protective for mental health, compared to other kinds of retirement (7, 26, 29, 34). For men retiring voluntarily, the expected benefits from retirement might outweigh the advantages of employment. Considering the higher proportion of women reporting voluntary early retirement, the non-significant association in women seems surprising at first. However, the female sample of voluntary early retirees might be more diverse than captured by our assessments. As e.g., ill-health retirement benefits come with many preconditions (see *Background*), certain women might not apply for the respective benefits or leave the labor market early for other reasons, e.g., to become a homemaker, and describe their decision as voluntary. This interpretation is in line with previous studies suggesting that different self-definitions of employment status between older men and women contribute to

gender differences in the association of retirement and depressive symptoms (9). Moreover, women still engage in care work more often than men even at higher ages and in retirement (52). Findings from German panel data and the Australian HILDA-Survey, reporting that caregiving duties have a stronger influence on women's decision to retire than on men's (37, 38), underscore this interpretation. This could have contributed to the non-significant association of voluntary retirement and depressive symptoms in women.

Early retirement due to *ill-health*, on the other hand, was linked to higher levels of depressive symptoms only in women. One possible explanation for this finding is health selection into ill-health retirement, since women experience higher overall-levels of depression than men in the general population. Furthermore, the causes for disability retirement might be gender-specific: Evidence from German pension insurance data revealed that mental disorders accounted for 36.3% of men's ill-health retirement cases, with 6.9% of these cases due to addictions; in women, mental disorders made up 48.7% of all disability pensions, with only 1.9% of these cases related to addictions. Disability retirement due to diseases of the circulatory system, on the other hand, were more prominent in men (13.6% of all cases) than in women [5.6%; (53)].

Contrary to our hypothesis, no association between *involuntary early retirement* and depressive symptoms was detected in our sample. However, there is evidence from studies on unemployment and mental health, suggesting that unemployed people experience lower levels of mental health problems if the reason for job loss is perceived as exogenous, e.g., in cases of plant closures or layoffs [for a review, please see (54)]. If the reason for losing one's job is not perceived as individual failure but rather as a result of a company's/employer's decision, involuntary early retirement might show no association with depressive symptoms. Moreover, the probability of health selection is rather small in cases of layoffs. However, our sample only contained a small number of involuntary early retirees, therefore, interpretation of these results should be made with caution.

Statutory early retirement was linked to lower depressive symptomatology only in women, suggesting that retirement due to reaching the statutory retirement age is beneficial for women's mental health. For these women, retirement might be perceived as a relief and a possibility to engage in other roles or enjoy a greater amount of leisure time. This corroborates findings from the US-American Health and Retirement Survey, reporting improved mental health in women following retirement (7). On the other hand, no association of statutory retirement and depressive symptoms was found in men. However, our study investigated men and women up to the age of 65, i.e., where statutory retirement was a rather recent event. Therefore, we cannot conclude whether these gender differences in mental health among statutory early retirees persist throughout retirement or whether an association of depressive symptoms and statutory retirement might emerge at a later time-point for men.

Social networks, as captured by the number of family and non-family contacts, were smaller in all subgroups of early retirees, compared to those in employment, a finding that is consistent with previous studies (27, 55). Larger social networks were linked to lower depressive symptoms both in men and women, corroborating previous studies reporting a protective effect for social networks and support (27). Retirement can bring about more time for leisure activities that can be enjoyed with friends, but our finding could also point toward the potentially buffering effect of friendships and social resources in times of meaningful transitions and change, e.g., the transition to retirement. A partnership, however, was only protective for female retirees, highlighting the importance of marriage and partnership for the mental health of women. This finding underscores previous studies reporting greater importance of marriage/partnership for female retiree's mental health (35, 56, 57).

The non-significant impact of income on the association of early retirement and depressive symptoms detected in our sample seems surprising at first sight. However, this factor draws upon information on net equivalent income at the time of the interview which is only one indicator of peoples' economic situation; another indicator could be e.g., net assets, which give a hint about savings people accumulated over their lifetime and can rely on when exiting the workforce (58). In the face of increasing life expectancy and, therefore, longer periods of retirement, being able to rely on personal assets for retirement is crucial (23). Certain longitudinal studies found associations between changes in income after retirement and mental health (59). Unfortunately, however, this information was not available since our study relied on cross-sectional data.

In line with findings from other investigations (59, 60), no association between level of education and depressive symptoms was found in our sample. This implies that the association of different types of retirement and depressive symptoms is rather independent of educational attainments. It has to be pointed out, however, that average levels of education were rather high in our sample and only a small fraction of observations belonged to the lowest education category.

Similar results were found for job status, with no impact on the association between early retirement and depressive symptoms in either men or women. However, job-level is a rather general descriptor of (previous) employment; possibly, there might be differences between certain occupations or job characteristics which provide different levels of resources for mental health. Further investigations on the mental health of retirees from different occupations might provide useful insights. Chandola et al. (61), using data from the Whitehall II study, found different trajectories of mental health between employment grades over time (improved mental health for retirees from high-grade jobs, but no similar trend for low-grade jobs), but no baseline differences between the respective groups. According to these findings, possible links between socioeconomic position and depressive symptoms might only emerge over a longer time span following retirement.

Strengths and Limitations

A major strength of our study lies in the use of a large, population-based sample, which might likely be less selective than samples from previous studies. Furthermore, our data included information

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on distinct reasons for early retirement, i.e., statutory, voluntary, involuntary, or ill-health-related retirement, allowing for nuanced statements about the links between retirement and depressive symptoms. Due to the extensive set of covariates included in the LIFE-Adult-Study, we were able to control for a number of important factors that possibly impact the relationship between retirement and depressive symptoms. We addressed possible heterogeneity between employed and retired subjects by using advanced techniques of covariate balancing, namely: entropy balancing, which should make our findings robust against selection bias, a problem shared by many comparable studies in the field. Further, we were able to provide information on the association of retirement status and depressiveness for both genders. Many previous studies primarily focused on men's retirement and mental health, often assuming a stronger labor market attachment in men or presuming single-earner households. However, since labor force participation of women has increased continuously in the last decades and gender roles are not fixed but changing over time, providing information on women's mental health in retirement is crucial for a comprehensive understanding of the association between retirement and depressiveness.

Certain limitations need to be kept in mind when interpreting our findings. A sizeable proportion of observations had to be discarded due to missing values in the variables of analysis. Although we controlled for several possible confounders in our analyses, other factors possibly impacting the link between early retirement and depressive symptoms were not available in the LIFE-Adult assessment. This applies e.g., to the health- and employment status of spouses/partners or care obligations for a spouse or other family members, factors found to have a significant impact especially on women's health in retirement (36, 38). Moreover, there were no information available on which diagnoses lead to ill-health retirement, a factor that could have shed light on the observed gender differences in the ill-health retirement subsample. Bearing in mind that depression diagnoses increase the risk of disability pensions, it is likely that a certain amount of ill-health retirees in our sample left the labor market due to depression. Therefore, health selection is likely to have contributed to our findings.

Since our study relied on cross-sectional data, we cannot draw conclusions as to a causal relationship between depressive symptoms and early retirement status or about the course of depressive symptoms post-retirement. Several studies have pointed out that the relationship between retirement and depressive symptoms is reciprocal, i.e., depressive symptoms increase the likelihood of retirement intentions (62) and actual retirement transitions (18, 63, 64), but retirement can also increase depressive symptoms (9) or psychological distress (36). Since the LIFE-Adult-Study has a longitudinal cohort design with an extensive follow-up-period, longitudinal investigations of the association between early retirement and depressive symptoms will be feasible in the near future.

Our study mainly included retirees who only recently transitioned to retirement. However, the link between retirement status and depressive symptoms might change over time as people adjust to retirement. Engagement in leisure activities and availability of alternative social relationships (apart from colleagues and co-workers) have been found important indicators of retirement adjustment (30, 65–67), and previous studies found an increase in social or physical leisure activities in retirement to be associated with decreased depressive symptoms (68). On the other hand, a recent meta-analysis reported a significant reduction of social engagement and integration in early retirees over time, which was not compensated by non-work related contacts (65). Therefore, longitudinal analyses investigating the association of social resources and mental health in early retirees seem worthwhile.

Previous studies investigating the impact of work-related factors on the decision to retire early stressed the importance of factors like job strain or high demands at work; high levels of job strain, increasing mental demands at work and conflicts in the workplace were found to raise the likelihood of early retirement (14, 69). The Danish SeniorWorkingLife study identified further work-related factors impacting older workers' retirement intentions: for lower-status and physically demanding jobs, poor physical health, and inability to perform their current job increased the intention to retire, while for higher-status and predominantly sedentary jobs, more personal freedom and a preference for leisure activities were important driving factors (66). On the other hand, previous investigations found evidence that positive job attributes like meaningful tasks and high levels of control are able to increase employees' intention to prolong their working life post retirement age (70). Unfortunately, no such information was available in our data. However, the first follow-up assessment of the LIFE-Adult-Study which is currently undertaken includes several instruments addressing work-related psychosocial factors, making respective investigations possible in the near future.

CONCLUSION

We were able to provide detailed insights on the association between early retirement and depressive symptoms, using data from a large population-based study. Although the German welfare system has been subject to major changes in the last decades, i.e., a departure from various possibilities for premature labor market exit toward an active ageing strategy and the promotion of prolonged employment careers, early retirement is still a common phenomenon. Hence, detailed information on the reasons for early retirement and the mental health situation of older workers and early retirees is urgently needed.

Our findings provide evidence that the group of early retired men and women is quite heterogeneous, whereby the reason for early labor market exit is critical for the association with depressive symptoms. Retirement due to ill-health was linked to higher levels of depressive symptoms for women, suggesting that this group is at an increased risk for depressiveness. This finding is of particular importance since many previous studies primarily focused on men's retirement. Further studies investigating different reasons for early retirement in both genders are highly desirable, since younger cohorts of women might likely show a stronger labor force attachment than in

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previous studies with older populations. Moreover, since care work and other non-work responsibilities still tend to be unequally distributed between men and women, future investigations should further account for the individual experience of and social roles fulfilled in early retirement and possible links to depressiveness in both women and men.

Regarding possible prevention strategies, a strong focus should be placed on maintaining mental health and preventing depressive symptoms in the workforce in order to prevent cases of ill-health related retirement. Data from German health- and pension insurances reveal that depression increases the risk for retirement due to a depression diagnosis, but also other cases of early withdrawal from the labor force. Future studies investigating specific stressors in the workplace that might be linked to depressiveness could provide useful insights on possible approaches for occupational health managers and political actors. Furthermore, studies investigating subjective reasons for retirement in different occupational groups could shed further light on the factors driving retirement transitions and possible relationships with mental health. This knowledge could help inform the design of tailored workplace interventions and policy strategies to prolong working lives and preserve mental health in different groups of older workers.

Other approaches should address the preservation of mental health in those women who already retired due to health reasons in order to avoid depressive symptoms. Our findings revealed evidence for the crucial role of social networks, therefore, prevention strategies against depressive symptoms should include encouragement for maintaining social contacts and relationships in retirement. Future studies investigating social roles and activities pursued in retirement could provide valuable insights into this complex association. Regarding possible back-to-work-strategies for this subgroup, job placement programs supporting workers in their re-entry into the competitive labor market, e.g., by the means of personal job coaches, have been found an effective approach for workers suffering from depression (71, 72). However, further research is needed to assess the feasibility of such programs for ill-health retirees.

DATA AVAILABILITY STATEMENT

The data analyzed in this study is subject to the following licenses/restrictions: the dataset analyzed during the current study is available from the corresponding author upon request.

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Requests to access these datasets should be directed to Andrea. Zuelke@medizin.uni-leipzig.de.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by Ethics board of the Medical Faculty of the University of Leipzig. The patients/participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

AZ conducted the statistical analyses, interpreted the data and drafted the manuscript. SR supported in interpreting the data and drafting the manuscript. MS, AW, AH, HG, ChE, SiZ, SaZ, and CoE revised the manuscript for intellectual content, read and approved the final version of the manuscript. ML and AV conceptualized and designed the study, revised the manuscript for intellectual content, read and approved the final version of the manuscript. SRH conceptualized and designed the study, supervised the drafting of the manuscript, supported in interpreting the data, revised the manuscript for intellectual content, read and approved the final version of the manuscript.

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3. General Discussion

Depression is a highly prevalent disease which can cause considerable suffering on the side of those affected and their relatives. Beyond that, depression and subthreshold depressive symptoms impose a tremendous burden on the healthcare- and social security system due to treatment costs, lost productivity, sickness absence and early retirement. Since employment constitutes an important source of identity in modern societies and most people spend a significant proportion of their adult life in paid work, investigating the links between employment status, quality of work and mental health is of crucial importance. The empirical studies of this thesis aimed to contribute to the knowledge on both early retirement and unemployment, as opposed to employment, and to psychosocial stressors in the workplace, therefore providing findings on different epidemiological aspects of the working environment and depressive symptoms.

Our first study investigated the link between unemployment and depressive symptoms, with a special focus on specific subgroups of unemployed persons. Many welfare states in industrialized countries have undergone extensive reforms during the last decades which are likely to affect the reality of unemployed persons (Bambra 2010; O'Campo et al. 2015). Against this background, in-depth investigations regarding the mental health of specific subgroups of unemployed are warranted for tailored interventions and back-to-work-approaches. We found elevated depressive symptoms in unemployed receiving means-tested benefits (*Arbeitslosengeld II*), with men and women being equally affected, suggesting that unemployed receiving means-tested benefits constitute a specific risk group for depression.

In the second study, the focus was shifted to psychosocial stressors in the workplace, specifically: social conflicts at work. Using objective measures of workplace social stressors, social conflicts at work were not linked to depressive symptomatology. Similar findings, i.e. associations of workplace stressors with mental health outcomes decrease or become non-significant when objective measures of stressors are used, have been reported in other studies (Stansfeld et al. 1995; van der Doef and Maes 1999; Waddell and Burton 2006). It is therefore suggested that possible links between experienced conflicts at work and depressive symptoms might be mediated by coping styles or subjective perceptions of experienced conflicts.

The third study explored the link between early retirement and depressive symptoms. So far, evidence on the association between retirement – especially, early retirement – and mental health remains mixed, in part because comprehensive investigations of different subtypes of retirees are currently lacking. Therefore, this study investigated simultaneously different types of early retirees regarding depressive symptoms. Our results indicated that depressive symptoms depend upon reason for retirement: No overall-differences between early retirees and employed persons regarding depressive symptoms were detected. However, upon investigation of different reasons for retirement, ill-health

retired women had higher depressive symptomatology, while both voluntary retired men and statutory retired women had lower depressive symptoms. Women in ill-health retirement might therefor constitute a risk group for depressive symptoms.

Several strengths of the three presented studies can be pointed out. These include large samples from a population-based cohort study, comprising a large variety of employment statuses and occupations and the use of a validated measure for depressive symptoms. Drawing upon detailed sociodemographic information allowed for sub-analyses of different types of retirees or unemployed persons. Beyond that, we were able to include moderating factors that have been pointed out as crucial for the investigation of employment status and mental health, but until now have only seldom been addressed, including social support (McKee-Ryan et al. 2005; Kroll and Lampert 2011). Our studies investigated possible differences between men and women, allowing for gender-specific statements. Therefore, the studies comprising this dissertation might provide useful results which add to the knowledge on employment status, psychosocial aspects of work and depressive symptoms.

Some methodological limitations need to be taken into consideration when interpreting the presented findings. The cross-sectional data set does not allow for conclusions regarding causality. It is therefore likely that a certain degree of health selection or a healthy worker-effect contributed to the findings. Depressive symptoms were assessed using a validated self-report instrument, the CES-D, suitable to obtain a dimensional diagnosis of depression. However, it cannot be assured whether the findings presented above would have been the same when using a clinical diagnosis of major depression.

3.1 Implications for Future Research

Longitudinal studies could provide useful evidence as to the temporal nature of the associations described in our studies and possible time trends. Regarding the first study on unemployment and depressive symptoms, such studies could help clarify whether the observed association – unemployed receiving means-tested benefits show higher depressive symptomatology – is due to longer unemployment spells and associated declines in material and psychosocial resources, or due to contextual factors like different jurisdictions for specific groups of unemployed. Our study also indicated a high rate of social isolation in unemployed men and women, a finding that deserves increased attention in research, political and social security systems. Social resources, e.g. ties with friends and family, are not only protective for mental health but also of high relevance when pursuing reemployment (Cingano and Rosolia 2012; Korpi 2001; McQuaid and Lindsay 2005; Krug et al. 2020; Gayen et al. 2019). Future studies should therefor investigate trends in social resources over time and possible associations with depressive symptoms in samples of unemployed persons. Furthermore, investigations of coping strategies and activities pursued in unemployment might yield valuable results. Certain studies were able to show that leisure activities that are perceived as meaningful are able to reduce depressive symptoms

in unemployed individuals (Waters and Moore 2002), especially if they include social activities (Goodman et al. 2017, 2016).

Respective investigations are also warranted regarding early retirement. Previous studies reported a decline in depressive symptoms in retirees with increased levels of social or physical leisure activities in retirement (Henning et al. 2020). Further investigations are needed to investigate whether these associations can also be detected in ill-health retirees. However, retirees tend to have smaller social networks (Topa et al. 2017), a finding which was also observed in our study. Studies with a longitudinal time frame could provide valuable insights into developments of mental health and social networks following early retirement.

Rehabilitation approaches constitute another promising field of research. Re-entering paid employment is generally associated with improved mental health and well-being among those formerly unemployed (Paul and Moser 2009), and there is growing evidence supporting the effectiveness of backto-work-approaches and supported employment for those suffering from depression (Richter et al. 2019; Hoffmann et al. 2014). Regarding early retirement, evidence from German insurance data suggests that only half of those retiring early due to mental ill-health received medical rehabilitation services prior to retirement (Riedel-Heller and Gühne 2015). Although not all ill-health retirees in our study sample might have retired due to mental ill-health, this indicates an enormous prevention potential. Future investigations studying possible work-related measures to maintain mental health of employees are therefore highly warranted. This also includes research on how to facilitate reemployment and modify workplaces for those suffering from depression in order to prevent unemployment and early withdrawal from the labor force (Olesen et al. 2013). Additionally, more research is needed on the mental health care situation of both early retirees and unemployed, since existing studies suggest an under-utilization of services for depression in both groups (Liwowsky et al. 2009; Zivin et al. 2013).

Regarding social conflicts at work and depressive symptoms as investigated in the second study, no association was detected. This might have been due to the objective assessment of social conflicts in our study which was chosen to counter common method bias, a problem frequently complicating studies on psychosocial stressors in the workplace. However, to date no consensus on more objective measures of stressors in the workplace has been reached (Waddell and Burton 2006; Rick and Briner 2000). Future studies might integrate both objective measures of working conditions or potential stressors, and subjective appraisals of these stressors. Respective studies could then provide further insights on the association between psychosocial stressors at work and their association with depressive symptoms by investigating interpersonal differences between employees exposed to the same stressors.

Further studies on psychosocial stressors in the workplace should aim to identify other specific stressors that contribute to depression. Regarding the design of effective workplace interventions, it can be assumed that specific stressors are more amendable to change than broad constructs like e.g. "work stress", therefor allowing for more precise efforts for intervention and prevention. Against this

background, investigations of specific aspects of work and their associations with depression could further elucidate our understanding of the association of work and mental health.

4. Conclusion

The empirical studies in this dissertation aimed to investigate the associations between employment status – i.e. employment, unemployment and early retirement – psychosocial stressors in the workplace and depressive symptoms in a population-based sample. By doing so, our studies were able to identify specific risk groups for depression, i.e. unemployed receiving means-tested benefits and women in ill-health retirement. These findings imply that employment status groups like retirees or unemployed do not constitute homogenous samples but that different subgroups might require specific attention in research and health care. Efforts are required to adjust working environments in order to facilitate employment for those with impaired mental health, but also to re-integrate those suffering from depression into the workforce. This could help prevent both early retirement transitions and cases of short- and long-term unemployment. In the face of population ageing and demographic changes challenging welfare and social security systems, respective efforts are of utmost importance. Regarding the known positive impact of work on mental health, maintaining of and reintegration into employment constitute a key priority not only for economic reasons but also for preserving the mental health of unemployed or older workers.

Regardless the mental health benefits of employment, however, psychosocial qualities of work should not be underestimated, since previous studies reported the mental health effects of work to depend upon the psychosocial qualities of specific jobs. This might be especially relevant for those workers already suffering from impaired mental health. It is therefore worthwhile to investigate both the links between employment status, i.e. employment, unemployment or retirement, and the psychosocial qualities of employment that are associated with mental health.

Summary

Cumulative Doctoral Dissertation submitted in fulfillment of the requirements for the academic degree Dr. rer. nat.

Employment Status and Psychosocial Quality of Work: Associations With Depressive Symptoms in a Population-Based Cohort Study

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Prepared at	University of Leipzig, Faculty of Medicine
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December 2020

Depression is a highly prevalent disorder with large-scale negative consequences both for those affected and their relatives and societies at large. Due to the economic costs of depression in form of healthcare costs and lost productivity on the one hand and the central role of employment for the individual in Western societies on the other, associations between employment and depression constitutes a highly important field of investigation. The overall beneficial effect of employment on mental health is well-established. However, in the face of economic and political changes challenging Western economies in the last decades, up-to-date knowledge on specific employment status groups, e.g. unemployed and retired persons, is highly warranted. Moreover, psychosocial factors of employment contribute to employees' mental health. The overall-aim of this dissertation was therefore to provide further insight both on employment status, i.e. unemployment and early retirement, as opposed to employment, and psychosocial qualities of work and associations with depressive symptoms.

The first study investigated the link between unemployment and depressive symptoms, assessed by the Center for Epidemiological Studies Depression Scale (CES-D) in the LIFE-Adult-Study, a large population-based sample of the population of Leipzig, Germany. Our sample comprised 4,842 men and women aged 18 to 65 years who were either employed, unemployed and receiving entitlement-based benefits (*Arbeitslosengeld I*) or unemployed and receiving means-tested benefits (*Arbeitslosengeld II*). Multivariate logistic regression models controlling for the effect of material and psychosocial resources revealed higher risk for depression (CES-D score ≥ 23) in unemployed receiving means-tested benefits (men: OR = 2.17, 95%-CI: 1.03 – 4.55; women: OR = 1.98, 95%-CI: 1.22 – 3.20), but not in recipients of entitlement-based benefits. Higher risk for depression was linked to social isolation in both men and women, while higher income and higher levels of education were linked to lower depression risk only

in women. However, material and psychosocial resources were not able to fully explain the link between unemployment and depression.

Psychosocial working environments and job characteristics are of vital importance for mental health. Whereas a large body of literature investigates the dimensions of demand vs. control or effort vs. reward in the workplace, research on other potential stressors at work is still scarce. Therefore, the second study focused on social conflicts in the workplace and the association with depressive symptoms, hypothesizing that social conflicts at work are linked to increased depressive symptomatology. To counter the risk of common method bias when assessing both stressors and outcomes as subjective measures, we used objective information on social conflicts commonly experienced in specific occupations, derived from the Occupational Information Network (O*NET). Data were drawn from the population-based LIFE-Adult-Study, including persons between 18 and 65 years of age who were currently employed. Multilevel linear regression models were applied, controlling for occupation- and individual-level characteristics (social conflicts in the workplace; sociodemographic factors and personality traits, i.e. neuroticism and extraversion, assessed with the NEO-16 AM). In our final sample (n = 2,164), social conflicts at work were not associated with depressive symptoms (men: p = .74; women: p = .72). Depressive symptoms were linked to individual characteristics, whereas neuroticism was linked to higher depressive symptoms in both genders, while extraversion, a high level of education and a larger social network were linked to lower depressive symptomatology in women only. Methodological deficiencies were discussed regarding the null-findings, especially concerning the objective assessment of social conflicts at work and alternative mechanisms of association.

Evidence on retirement and mental health, especially early retirement, remains mixed, partly due to a lack of comprehensive studies investigating different types of retirement. In our third study, we therefor investigated the link between early retirement and depressive symptoms, again drawing on data from the LIFE-Adult-Study. Applying multivariate linear regression models using balancing techniques (i.e. entropy balancing), we compared different subtypes of early retirees to employed persons. The sample comprised 4,808 individuals ($n_{employed}$: 4,154; $n_{retired}$: 654) aged 40 to 65 years. While no overalldifferences between employed and retired subjects were detected (men: p = .43; women: p = .95), exploring subtypes of retirees revealed a different pattern. Women in ill-health retirement showed higher depressive symptoms (b = 4.68, 95% CI = 1.71 – 7.65), whereas voluntary early retired men and statutory early retired women had lower depressive symptoms (b= −1.83, 95% CI = -3.22 – -.43; b = -2.00, 95% CI = -3.99 – -.02). Social resources were linked to lower depressive symptomatology in men and women, while living in a partnership was linked to lower depressive symptoms in women only. For women, a history of diabetes was associated with higher depressive symptoms.

The empirical studies of this dissertation revealed a large heterogeneity in both unemployed and early retired persons. Unemployed receiving means-tested benefits and women retired due to ill-health might constitute specific risk groups for depressive symptoms in need of attention in the health care-

and social security system. Bearing in mind the mental health benefits of employment, our results point out the need to facilitate employment for those impaired by depressive symptoms in order to prevent cases of ill-health retirement, but also to enable re-entry into the workforce for those currently unemployed. Furthermore, future studies investigating specific psychosocial qualities of work could reveal valuable insights into the relationship of employment and mental health. Whereas our second study did not find an association between social conflicts and depressive symptoms, identifying other specific stressors at work might help point out possibilities of intervention, aiming to improve and maintain employees' mental health. Respective attempts could help sustain employment and prevent cases of unemployment and early withdrawal from the labor force.

List of publications in the cumulative doctoral dissertation:

1.   Zuelke, A.E., Luck, T., Schroeter, M.L., Witte, A.V. Hinz, A., Engel, C., Enzenbach, C., Zachariae, S., Löffler, M., Thiery, J., Villringer, A., Riedel-Heller, S.G. (2018). The association between unemployment and depression – Results from the population-based LIFE-adult-study. *Journal of Affective Disorders*, *235*, 399-406.

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Appendix A: Declaration of the Doctorate's Contribution

Darstellung des wissenschaftlichen Beitrags der Promovendin Andrea Zülke zur folgenden Publikation im Rahmen einer kumulativen Promotion

Zuelke, A.E., Luck, T., Schroeter, M.L., Witte, A.V, Hinz, A., Engel, C., Enzenbach, C., Zachariae, S., Loeffler, M., Thiery, J., Villringer, A., Riedel-Heller, S.G. (2018). The association between unemployment and depression – Results from the population-based LIFE-adult-study. *Journal of Affective Disorders*, 235, 399-406.

Hiermit bestätige ich als Koautor/in der o.g. Publikation, dass die Promovendin Andrea Zülke den wesentlichen Beitrag zur Erstellung und Veröffentlichung der Publikation geleistet hat. Ihr Beitrag umfasste dabei im Einzelnen:

- Literaturrecherche
- Entwicklung der Forschungsfrage
- Datenaufbereitung
- Datenanalyse
- Interpretation der Ergebnisse
- Erstellung des Manuskripts
- Manuskripteinreichung und -überarbeitung im Gutachterprozess

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Ort, Datum

Andrea Zülke, M.A.

Leipzig, 23.11.2020
Ort, Datum

Prof. Dr. rer. med. Tobias Luck

Leipzig, 16.11.2020
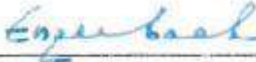Ort, Datum

PD Dr. rer. nat. Veronica Witte

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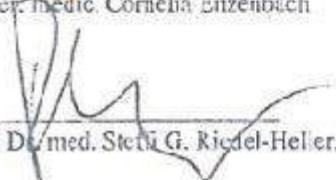
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Ort, Datum

PD Dr. med. Christoph Engel

Leipzig, 20.11.2020
Ort, Datum

Dr. rer. medic. Cornelia Enzenbach

Leipzig, 11.11.2020
Ort, Datum

Prof. Dr. med. Steffi G. Riedel-Heller, MPH

Darstellung des wissenschaftlichen Beitrags der Promovendin Andrea Zülke zur folgenden Publikation im Rahmen einer kumulativen Promotion

Zuelke, A.E., Roehr, S., Schroeter, M.L., Witte, A.V., Hinz, A., Engel, C., Enzenbach, C., Thiery, J., Loeffler, M., Villringer, A., Riedel-Heller, S.G. (2020). Are social conflicts at work associated with depressive symptomatology? Results from the population-based LIFE-Adult-Study. *Journal of occupational medicine and toxicology, 15*(1), 1

Hiermit bestätige ich als Koautor/in der o.g. Publikation, dass die Promovendin Andrea Zülke den wesentlichen Beitrag zur Erstellung und Veröffentlichung der Publikation geleistet hat. Ihr Beitrag umfasste dabei im Einzelnen:

- Literaturrecherche
- Entwicklung der Forschungsfrage
- Datenaufbereitung
- Datenanalyse
- Interpretation der Ergebnisse
- Erstellung des Manuskripts
- Manuskripteinreichung und -überarbeitung im Gutachterprozess
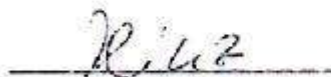
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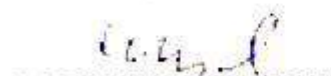
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Dr. rer. med. Susanne Röhr

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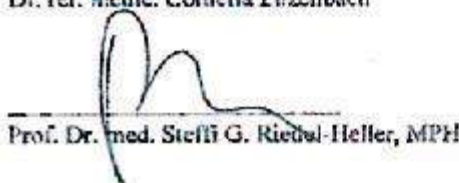Leipzig, 12.11.2020
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Leipzig, 12.11.2020
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Dr. rer. medic. Cornelia Enzenbach

Leipzig, 11.11.2020
Ort, Datum

Prof. Dr. med. Steffi G. Riedel-Heller, MPH

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Darstellung des wissenschaftlichen Beitrags der Promovendin Andrea Zülke zur folgenden Publikation im Rahmen einer kumulativen Promotion

Zueike, A.E., Rohr, S., Schroeter, M.L., Witte, A.V., Hinz, A., Glaesmer, H., Engel, C., Enzenbach, C., Zacharias, S., Zeynalova, S., Löffler, M., Villringer, A., Riedel-Heller, S.G. (2020). Depressive symptomatology in early retirees associated with reason for retirement - Results from the population-based LIFE-Adult-Study. *Frontiers in Psychiatry.* 11, 565442

Hiermit bestätige ich als Koautorin der o.g. Publikation, dass die Promovendin Andrea Zülke den wesentlichen Beitrag zur Erstellung und Veröffentlichung der Publikation geleistet hat. Ihr Beitrag umfasste dabei im Einzelnen:

- Literaturrecherche
- Entwicklung der Forschungsfrage
- Datenaufbereitung
- Datenanalyse
- Interpretation der Ergebnisse
- Erstellung des Manuskripts
- Manuskripteinreichung und -überarbeitung im Gutachterprozess

Leipzig, 21.11.2020
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Andrea Zülke, M.A.

Dublin, 25.11.2020
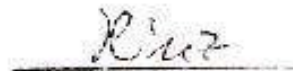Ort, Datum

Dr. rer. med. Susanne Röhr

Leipzig, 16.11.2020
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PD Dr. rer. nat. Veronica Witte

Leipzig, 12.11.2020
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Prof. Dr. rer. nat. Andreas Hinz

Leipzig, 12.11.2020
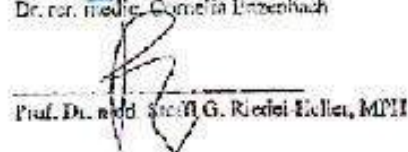Ort, Datum

PD Dr. med. Christoph Engel

Leipzig, 16.11.2020
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Dr. rer. medic. Cornelia Enzenbach

Leipzig, 11.11.2020
Ort, Datum

Prof. Dr. med. Steffi G. Riedel-Heller, MPH

Appendix B: Statement of Authorship

I confirm that, to the best of my knowledge, the doctoral dissertation represents my own work and was prepared independently without any impermissible help or sources. I assure that third parties have not received indirect or direct monetary incentives for work in connection to the contents of the present dissertation, and that the doctoral dissertation contains no material which has been presented for the award of any other degree or diploma in any other university, tertiary education institution, and national or foreign examination board. I certify that, to the best of my knowledge and belief, this doctoral dissertation contains no material previously published or written by another person, except where due reference has been made in the text. All persons directly involved in the present work have been indicated by name. Current legal standards in regard to clinical studies, animal welfare, genetic engineering as well as data protection regulations have not been violated. I assure to know and to adhere to the regulations of good scientific practice of the University of Leipzig.

Erklärung über die eigenständige Abfassung der Arbeit

Hiermit erkläre ich, dass ich die vorliegende Arbeit selbstständig und ohne unzulässige Hilfe oder Benutzung anderer als der angegebenen Hilfsmittel angefertigt habe. Ich versichere, dass Dritte von mir weder unmittelbar noch mittelbar eine Vergütung oder geldwerte Leistungen für Arbeiten erhalten haben, die im Zusammenhang mit dem Inhalt der vorgelegten Dissertation stehen, und dass die vorgelegte Arbeit weder im Inland noch im Ausland in gleicher oder ähnlicher Form einer anderen Prüfungsbehörde zum Zweck einer Promotion oder eines anderen Prüfungsverfahrens vorgelegt wurde. Alles aus anderen Quellen und von anderen Personen übernommene Material, das in der Arbeit verwendet wurde oder auf das direkt Bezug genommen wird, wurde als solches kenntlich gemacht. Insbesondere wurden alle Personen genannt, die direkt an der Entstehung der vorliegenden Arbeit beteiligt waren. Die aktuellen gesetzlichen Vorgaben in Bezug auf die Zulassung der klinischen Studien, die Bestimmungen des Tierschutzgesetzes, die Bestimmungen des Gentechnikgesetzes und die allgemeinen Datenschutzbestimmungen wurden eingehalten. Ich versichere, dass ich die Regelungen der Satzung der Universität Leipzig zur Sicherung guter wissenschaftlicher Praxis kenne und eingehalten habe.

Leipzig, December 2020   Andrea Zülke

Appendix C: Curriculum Vitae

Aus Gründen des Datenschutzes ist mein Lebenslauf in der elektronischen Version meiner Doktorarbeit nicht aufgeführt.

Appendix D: Academic Contributions

Publications

2020

Roehr, S., **Zuelke, A.**, Luppa, M., Brettschneider, C., Weißenborn, M., Kühne, F., Zöllinger, I., Samos, F., Bauer, A., Döhring, J., Krebs-Hein, K., Oey, A., Czock, D., Frese, T., Gensichen, J., Haefeli, W.E., Hoffmann, W., Kaduszkiewicz, H., König, H.H., Thyrian, J. R., Wiese, B., Riedel-Heller, S.G. (2020). Recruitment and baseline characteristics of participants in the AgeWell.de study – A pragmatic clusterrandomized controlled lifestyle trial against cognitive decline. *International Journal of Environmental Research and Public Health,* under review.

Zuelke, A., Roehr, S., Schroeter, M. L., Witte, A. V., Hinz, A., Glaesmer, H., Engel, C., Enzenbach, C., Zachariae, Zeynalova, S., Loeffler, M., Villringer, A., Riedel-Heller, S. G. (2020). Depressive symptomatology in early retirees associated with reason for retirement - Results from the populationbased LIFE-Adult-Study. *Frontiers in Psychiatry,* 11, 565442. DOI: 10.3389/fpsyt.2020.565442

Zuelke, A., Roehr, S., Schroeter, M. L., Witte, A. V., Hinz, A., Engel, C., Enzenbach, C., Thiery, J., Loeffler, M., Villringer, A., Riedel-Heller, S. G. (2020). Are social conflicts at work associated with depressive symptomatology? Results from the population-based LIFE-Adult-Study. *Journal of occupational medicine and toxicology*, *15*(1), 1. DOI: 10.1186/s12995-020-0253-x

2019

Treudler, R., Zeynalova, S., Riedel-Heller, S. G., **Zuelke, A**., Roehr, S., Hinz, A., Glaesmer, H., Kage, P., Loeffler, M., Simon, J. C. Depression, anxiety and quality of life in subjects with atopic eczema in a population-based cross-sectional study in Germany. *Journal of the European Academy of Dermatology and Venereology*, *34*(4), 810-816. DOI: 10.1111/jdv.16148

Zuelke, A., Luck, T., Pabst, A., Hoffmann, W., Thyrian, J. R., Gensichen, J., Kaduszkiewicz, H., König, H.H., Haefeli, W.E., Czock, D., Wiese, B., Frese, T., Roehr, S., Riedel-Heller, S.G. (2019). AgeWell. de–study protocol of a pragmatic multi-center cluster-randomized controlled prevention trial against cognitive decline in older primary care patients. *BMC Geriatrics*, *19*(1), 203. DOI: 10.1186/s12877019-1212-1

Keil, J., Brendler, V., Sachse, C., **Zuelke, A**., Zeynalova, S., Engel, C., Loeffler, M., Riedel-Heller, S.G., König, H.H., Stengler, K. (2019). Geschlechterspezifische Inanspruchnahme von Gesundheitsleistungen in einer urbanen Erwachsenenpopulation. *Das Gesundheitswesen*, *82*(03), e17e23. DOI: 10.1055/a-0820-3584

2018

Zuelke, A., Luck, T., Schroeter, M. L., Witte, A. V., Hinz, A., Engel, C., Enzenbach, C., Zachariae, S., Thiery, J., Loeffler, M., Villringer, A., Riedel-Heller, S.G. (2018). The association between unemployment and depression–Results from the population-based LIFE-adult-study. *Journal of affective disorders*, *235*, 399-406. DOI: 10.1016/j.jad.2018.04.073

Zuelke, A. E., Kersting, A., Dietrich, S., Luck, T., Riedel-Heller, S. G., & Stengler, K. (2018). Screeninginstrumente zur Erfassung von männerspezifischen Symptomen der unipolaren Depression – Ein kritischer Überblick. *Psychiatrische Praxis*, *45*(04), 178-187. DOI: 10.1055/s-0043-120289

McCool-Myers, M., Theurich, M., **Zuelke, A.,** Knuettel, H., Apfelbacher, C. (2018): Predictors of female sexual dysfunction: a systematic review and qualitative analysis through gender inequality paradigms. *BMC Women's Health,* **18:** 108. DOI: 10.1186/s12905-018-0602-

2016

McCool, M. E., **Zuelke, A**., Theurich, M. A., Knuettel, H., Ricci, C., & Apfelbacher, C. (2016). Prevalence of female sexual dysfunction among premenopausal women: a systematic review and metaanalysis of observational studies. *Sexual medicine reviews*, *4*(3), 197-212. DOI: 10.1016/j.sxmr.2016.03.002

Conference oral presentations

2020

Zuelke, A., Roehr, S., Riedel-Heller, S.G. Are social conflicts in the workplace associated with depressive symptoms? Results from the population-based LIFE-Adult-Study. 60th annual meeting of the Deutsche Gesellschaft für Arbeits- und Umweltmedizin (DGAUM), September 2nd – 5th, 2020, Munich, Germany

2019

Zuelke, A., Roehr, S., Riedel-Heller, S.G. Social relationships in the workplace and depressive symptoms. Results from the population-based LIFE-Adult-Study. Joint Congress of the Deutsche Gesellschaft für Sozialmedizin und Prävention (DGSMP) and Deutsche Gesellschaft für Medizinische Soziologie (DGMS), September 16th - 18th, 2019, Düsseldorf, Germany

Zuelke, A., Roehr, S., Riedel-Heller, S.G. Social relationships in the workplace and depressive symptoms. Results from the population-based LIFE-Adult-Study. Congress ot the Deutsche Gesellschaft für Psychiatrie und Psychotherapie, Psychosomatik und Nervenheilkunde (DGPPN) November 27th – 30th, Berlin, Germany

2018

Zuelke, A., Luck, T., Schroeter, M.L., Witte, A.V., Hinz, A., Engel, C., Enzenbach, C., Zachariae, Z., Loeffler, M., Thiery, J., Villringer, A., Riedel-Heller, S.G. The association between unemployment and depression - Results from the population-based LIFE-Adult-Study. 19th Congress of the European Psychiatric Associaton (EPA), Epidemiology and Social Psychiatry Section, April 4th – 7th, 2018, Vienna, Austria.

Zuelke, A., Luck, T., Schroeter, M.L., Witte, A.V., Hinz, A., Engel, C., Enzenbach, C., Zachariae, Z., Loeffler, M., Thiery, J., Villringer, A., Riedel-Heller, S.G. The association between unemployment and depression - Results from the population-based LIFE-Adult-Study. 54th Congress of the Deutsche Gesellschaft für Sozialmedizin und Prävention (DGSMP), September 12th - 14th, 2018, Dresden, Germany

Zuelke, A., Luck, T., Schroeter, M.L., Witte, A.V., Hinz, A., Engel, C., Enzenbach, C., Zachariae, Z., Loeffler, M., Thiery, J., Villringer, A., Riedel-Heller, S.G. The association between unemployment and depression - Results from the population-based LIFE-Adult-Study. 13th Congress of the Deutsche Gesellschaft für Epidemiologie (DGepi), September 26th - 28th, 2018, Bremen, Germany

Conference poster presentations

2019

Zuelke, A., Roehr, S., Riedel-Heller, S.G. for the AgeWell.de-Study group. AgeWell.de – a pragmatic multi-centric cluster-randomized controlled prevention trial against cognitive decline in older primary care patients. Joint Congress of the Deutsche Gesellschaft für Sozialmedizin und Prävention (DGSMP) and Deutsche Gesellschaft für Medizinische Soziologie (DGMS), September 16th - 18th, 2019, Düsseldorf, Germany

2018

Zuelke, A., Kersting, A., Dietrich, S., Luck, T., Riedel-Heller, S.G., Stengler, K. Screening instruments for the detection of male-specific symptoms of unipolar depression - a critical overview. 54th Congress of the Deutsche Gesellschaft für Sozialmedizin und Prävention (DGSMP), September 12th - 14th, 2018, Dresden, Germany

Appendix E: Acknowledgement

Aus Gründen des Datenschutzes ist meine Danksagung in der elektronischen Version meiner Doktorarbeit nicht aufgeführt.