Mental health of young workers

On the relationship between the psychosocial work environment and mental health complaints of young adults at the start of their career work life

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VRIJE UNIVERSITEIT

MENTAL HEALTH OF YOUNG WORKERS

On the relationship between the psychosocial work environment and mental health complaints of young adults at the start of their career work life

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Malte van Veen

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promotoren:	prof.dr. C.R.L. Boot prof.dr.ir. P.M. Bongers
copromotoren:	dr. R.M.C. Schelvis dr. K.M. Oude Hengel
promotiecommissie:	prof.dr.mr. C.H. Vinkers dr. K. Nieuwenhuijsen dr. T.H.J. van Noorden prof.dr. T.J. Akkermans prof.dr. M. Fekkes dr. I.E.H. Madsen

Content

Chapter

1

General Introduction

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General Introduction

Dear reader of my doctoral thesis "Mental health of young workers" let's get right into the topic by unpacking the dissertation's title. After providing a brief background laying out why research on mental health is relevant, I define the central outcome mental health, then introduce how the psychosocial work environment has been linked to mental health in the existing literature, followed by a short introduction as to why young workers deserve particular attention in the context of mental health and work. I then present the aim of the doctoral thesis, followed by a brief outline of the included studies. Here we go!

Mental health of young workers – what is it and why should we care?

In a communication for the European Parliament from 2023, the European Commission stated that "Better mental health is both a social and an economic imperative" (1). This spirited call to action is substantiated by a large body of research showing the importance of a mentally healthy population. On a societal level poor population-wide mental health has been linked to extensive costs, estimated at more than €600 billion for the European Union in 2015 (2). On an individual level poor mental health has been associated with a myriad of undesirable consequences. These include stigmatization and social rejection (3), and difficulties obtaining and maintaining work (4). Furthermore, the presence of mental health complaints has been associated with lower income (5, 6) and a reduced life expectancy (7). Action is necessary because the number of individuals who are reporting poor mental health has been increasing over the last years (8).

In this doctoral thesis I focus on mental health as the presence of adverse mental health conditions which – according to the WHO's definition of mental health – "include mental disorders and psychosocial disabilities as well as other mental states associated with significant distress, impairment in functioning, or risk of self-harm." (9). Mental health is thus an umbrella term that includes numerous mental states characterized by different symptoms and varying degrees of severity. Accordingly, conceptualizing mental health and distinguishing different mental health conditions remains an ongoing process in both clinical (10) and research practice (11-13). Concerning symptoms, non-settled disagreements within the clinical realm are for instance whether burnout, anxiety, and depression are different phenomena (14, 15). Concerning severity, one can distinguish diagnosed mental disorders from less severe subclinical mental health complaints (16). Mental health complaints are more prevalent in the work domain than the more severe diagnosed mental disorders (17), because the latter are associated with absenteeism (despite many workers also working while having a diagnosed mental disorder) (18). For this reason, my research focuses on subclinical symptom severity, i.e. mental health complaints.

Mental health complaints with subclinical symptom severity, too, have been shown to be associated with adverse outcomes for individuals and organizations. Mental health complaints can escalate into a dysfunctional state if left untreated (17, 19) and thus deserve attention. However, the subclinical severity makes differentiating specific mental health outcomes extra challenging. Occupational mental health scholars regularly conduct research on so called Common Mental Disorders (CMD's) and their symptoms (20, 21). CMD's are mental health problems from the anxiety and depression domain, which are also referred to as internalizing problems (22), because they primarily cause distress for the person expressing the symptoms (23). Central characteristics of these mental health problems are a loss of energy and a loss of pleasure (24). Conceptually close to CMD's and internalizing problems respectively are burnout and burnout-complaints. Burnout and burnout-complaints are characterized by physical and emotional exhaustion and are other widely studied mental health outcomes in occupational mental health research (25). In line with other occupational

mental health research (26-28) I employ a broad conceptualization of mental health complaints in this thesis, encompassing the different mental states outlined above.

Mental health of young workers – how is the psychosocial work environment and its relation to mental health conceptualized?

Mental health complaints not only affect the functioning and prospering of workers, the psychosocial work environment is also widely considered to contribute to mental health complaints of workers (29). This is substantiated by several reviews and meta-reviews (30-32). The focus on the psychosocial aspects of the working environment is part of the history of occupational mental health research (16).

The International Labour organization ILO offers a widely used (33) definition of psychosocial work factors, dating back to 1986: "Psychosocial factors at work refer to interactions between and among work environment, job content, work organization and workers' capacities, needs, culture, personal extra-job considerations that may, through perceptions and experience, influence health, work performance and job satisfaction." (34)

The effect of the psychosocial work environment is formalized in two prominent occupational mental health models. The effort-reward imbalance (ERI) model, developed in the 1980s (35), and the job-demand resource (JDR) model (26), developed in the early 2000s. The ERI model is based on the central assumption that workers have expectations concerning material and psychological rewards that they should receive in exchange for their efforts (e.g. contractually agreed upon salary, proper tools to work with, respectful interactions between coworkers). Objective as well as perceived violations of these expectations can lead to mental health complaints (36). According to the JDR model, mental health complaints are the result of a health impairment process in which job demands require exhausting efforts from the worker. Job resources as well as personal resources can buffer the adverse impact of job demands on mental health. According to the JDR model any work characteristic can function as job demand or job resource (26). Consequently, the JDR model, does not limit itself to psychosocial job characteristics while one of its two core outcomes is burnout (26). Nevertheless, job characteristics reported in the context of the JDR model (e.g. [26, 36]) are dominantly those that would be considered psychosocial ones according to the definitions above (e.g. role ambiguity, workload, job control). Both models are considered to be complementary (35) in describing how the adverse psychosocial work environment and mental health complaints are related. This relationship is the focal topic of my research presented in this thesis.

Mental health of young workers – what is young?

This doctoral thesis focusses a particular group of workers: young workers. No consensus exists on what the maximum age is at which one can still consider oneself a young worker. Upper age limits that can be found in policy documents and research articles are 25 (37), 30 (38, 39), and 35 years (40). A more theoretically driven demarking attempt has been made with the theory of emerging adulthood (41). This theory describes emerging adulthood as a life stage spanning the late teens till mid-to-late 20's and suggests these years to be of crucial influence for the later life course, particularly in the work domain, but does not offer guidelines on operationalizing young workers. For the studies conducted for this doctoral research, I use varying age maxima, depending on the purpose of the study and the available data.

Aim of the thesis

To date, few studies have specifically researched young workers' mental health complaints and their relationship with the psychosocial work environment (38) and evidence is lacking as to whether knowledge from the general population can be applied to young workers. In fact, researchers have hypothesized that young workers might systematically differ from older workers in terms of how the psychosocial work environment is affecting their mental health (42, 43).

Across the life span, young adulthood is a time with a relatively high risk of developing mental health complaints as most mental health disorders are diagnosed early in life (44). Also, the prevalence of anxiety and depression symptoms are considerably higher in young adults than in older adults (45). During young adulthood, the start of career work life might be a particularly vulnerable chapter. This is because the transition from not working to career work can form the foundation for building self-esteem and financial independence in one's life (46). On the other hand, a less successful transition might result in being increasingly disadvantaged compared to one's mentally healthy peers.

The studies in this doctoral thesis aim to better understand the relationship between the psychosocial work environment and mental health of young workers, the accompanying research questions are:

1. Which aspects of the psychosocial work environment are associated with the mental health of young workers? (chapters 2 and 3)
2. How do groups of young workers who are experiencing a variety of psychosocial work environments differ regarding their mental health? (chapter 4 and 5)
3. Is a high level of psychosocial work adversities a necessity for work-related emotional exhaustion in young workers? (chapter 6)

Outline of the thesis

The three research questions form the structure of this doctoral thesis, which includes five empirical studies. The first part (chapters 2 and 3) focuses on different aspects within the psychosocial work environment on young workers that might be relevant for mental health complaints of young workers. In Chapter 2 we took an inventory of the current scientific evidence base by conducting a systematic review on psychosocial work factors affecting mental health complaints of young workers. To assess the certainty of the evidence base we used the GRADE method (47). In chapter 3, we interviewed 36 young workers to investigate how the psychosocial work environment contributed to potential mental health complaints. We identified the mentioned psychosocial work factors and mapped them onto the existing COPSOQ-framework (48). This was done to firstly examine if known factors affect young workers in a way that is typical for this group and secondly to identify potentially novel factors, which are relevant for young workers.

The second part (chapters 4 and 5) focusses on the heterogeneity of the group of young workers. In chapter 4 we analyzed how mental health complaints of young workers changed when they first started with career work, depending on the psychosocial work quality that they encountered. We additionally modelled whether mental health complaints during adolescence modified the psychosocial work quality-dependent change in mental health complaints. We used fixed-effects regression analysis with data from 850 young adults from the Dutch TRAILS data set (49).
In Chapter 5 we aimed at identifying subgroups of young workers based on their psychosocial work circumstances. We used Latent Class Analysis on an existing data set of 7,301 young workers from the Netherlands Working Condition Survey (50). After having identified subgroups of young workers we compared how the subgroups differed on a measure of mental health complaints, namely work-related emotional exhaustion.

Chapter 6 offers a different causal perspective on the psychosocial work environment and mental health complaints, i.e. necessity logic. We conducted a Necessary Condition Analysis on 5,791 young adults from the Netherlands Working Condition Survey. With this analysis we aimed to study whether psychosocial work adversities are a necessary condition for work-related emotional exhaustion in young workers. Additionally, we tested whether the potential necessity threshold of psychosocial work adversities shifts when comparing young workers with lower or higher job resources.

The thesis concludes with a general discussion, in which I first summarize the results from the empirical chapters, offering an answer to the research questions. Second, I discuss methodological considerations of our empirical findings. Third, I suggest directions for future research and give some practical recommendations based on our findings. I end this thesis with providing a main conclusion of my doctoral research.

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Malte van Veen
Karen M. Oude Hengel
Roosmarijn M. C. Schelvis
Paulien M. Bongers
Johannes C. F. Ket
Allard J. van der Beek
Cécile R. L. Boot

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Chapter

2

Psychosocial work factors affecting mental health of young workers:

a systematic review

two

Psychosocial work factors affecting mental health of young workers: a systematic review

Abstract

Objective: For the general working population, robust evidence exists for associations between psychosocial work exposures and mental health. As this relationship is less clear for young workers, this systematic review aims at providing an overview of the evidence concerning psychosocial work factors affecting mental health of young workers.

Methods: The electronic databases used were PubMed, Web of Science, and PsycINFO and were last searched in October 2021. The eligible outcomes included depression-, stress-, burnout- and anxiety-related complaints, and fatigue, excluding clinical diagnoses and suicide-related outcomes. Only studies with workers aged 35 years or younger were included, which reported at least one association between a psychosocial work factor as exposure and a mental health complaint as outcome. Studies had to be in English, German or Dutch. Risk of bias was assessed using an instrument from the National Heart, Lung, and Blood Institute. Data synthesis was conducted using GRADE.

Results: In total 17 studies were included in this systematic review, including data from 35,600 young workers in total. Across these studies 86 exposure-outcome associations were reported. Nine exposure-outcome associations could be synthesised. The application of the GRADE framework led to one “low” assessment for the association between psychosocial job quality and mental health. The certainty of evidence for the other eight associations in the synthesis was very low.

Conclusions: The current systematic review disclosed a high degree of uncertainty of the evidence due to conceptually fuzzy outcomes and exposures as well as large heterogeneity between studies.

Keywords: Systematic review, Psychosocial work factors, Mental health, Young workers

Introduction

Adverse psychosocial working conditions are widely recognized to play an important role for workers' mental health, which in turn has consequences for individuals, organizations, and society as a whole. For individuals and organizations these consequences include temporary or sustained sickness absence from work and lower productivity (1). On a societal level, the OECD has estimated that within Europe the costs of mental health complaints, both clinical and subclinical, were more than € 600 billion in 2015 (4.1% of EU GDP) (2). Psychosocial working conditions have been found to be crucial for a worker's mental health and improving these conditions will diminish their negative impact (3, 4).

Several established models formulate how poor psychosocial work can lead to workers' mental health complaints (e.g., the job-demand-control model, the effort-reward-imbalance model and the organizational justice model) (5). A meta-review on work-related mental health complaints, qualitatively synthesizing 37 systematic reviews lists three broad, partially overlapping, work-related risk factor categories associated with mental health complaints: (1) imbalanced job design (e.g., high job demands), (2) occupational uncertainty (e.g., high job insecurity), and (3) lack of value and respect in the workplace (e.g., workplace conflict/bullying) (6). Other risk factors allocated to more than one category, e.g., job control as part of imbalanced job design and occupational uncertainty, and effort-reward imbalance as part of imbalanced job design and lack of value and respect in the workplace were also associated with mental health complaints (6). Another meta-review, assessing a broad spectrum of work-related health outcomes, including mental health outcomes (7), and a systematic review on stress-related disorders, only including prospective cohort studies (8), both have reported similar conclusions, supporting that high job demands, effort-reward imbalance, job insecurity, and low organizational justice are associated with mental health complaints. For job insecurity, van der Molen et al. (8) only found an association for men. Evidence is mixed for job control, which shows a weaker association with mental health complaints than the other mentioned factors (8). Niedhammer et al. (7) combined job demands and job control into job strain as one factor, so that the role of job control cannot be assessed individually.

The reviews above concern the general working population. However, young workers deserve particular attention. This is, firstly, because research suggests a cohort effect for today's young adults' mental health that might persist into later life (9) with young people reporting increasingly worse mental health compared to older people (10). Secondly, being unable to work or being unable to work as much as one wants due to mental health issues in early life can turn into a lifelong disadvantage for young adults. To prevent mental health complaints early, a proper understanding of the work-related factors that affect young workers' mental health is crucial.

The findings from the general working population cannot naturally be assumed to be applicable to young workers. Research on job satisfaction during school-to-work transition and from lifespan developmental psychology suggests that young workers systematically differ from their older colleagues in terms of work-related psychosocial needs and accompanying risks for mental health complaints. Instability around one's work, for instance, can have more impact on younger workers than on older workers (11). Additionally, young workers are exposed more often to some risk factors than older workers, such as conflicts at work and temporary working arrangements (12).

Two systematic reviews assessed the effect of psychosocial work conditions on mental health complaints of young workers 13, 14). Law et al. (13) identified ten work-related risk factors that are in line with those for the general population listed by Harvey et al. (6), except for job boredom, which Harvey et al. (6) did not address. Law et al. (13) did not provide an assessment of the certainty of the evidence across studies. Shields et al. (14) concluded that some low-certainty evidence exists for an association of low job control, sexual harassment, and low psychosocial job quality with mental health complaints of young workers.

The current systematic review builds on the two aforementioned earlier reviews by applying a broader conceptualization of mental health complaints, including burnout and related concepts such as mental fatigue. Regarding the exposures, particularly factors that might affect young workers, such as fear of

missing out, role stress, and social support at work, are included in the search strategy. In contrast to the two previous reviews, that defined young workers as not older than 30 years, the current systematic review defines young workers as individuals who are 35 years or younger. The extension of the age criterion for this review can be considered appropriate, because a growing share of the population follows longer education trajectories, leading to a later entry into the labour market as reflected by a recent OECD definition of young adults as those being between 25 and 34 years old (15). Thus, the current study includes a broader scope on both the exposure and outcome. Hence, this systematic review provides not only an updated, but also a more complete picture of the state of the literature including a more systematic assessment of the certainty of the evidence by applying the GRADE approach (16).

This systematic review aims at providing an overview of the evidence concerning psychosocial work factors affecting mental health of young workers.

Methods

This systematic is reported according to the PRISMA statement (17) and the review protocol was submitted beforehand to PROSPERO (PROSPERO ID CRD42021259886).

Search strategy and study selection

Titles and abstracts were retrieved from the databases PubMed, Clarivate Analytics/Web of Science Core Collection, and Ebsco/APA PsycINFO up to and including October 7th, 2021 by MVV and JCFK, using search terms related to (1) young workers, (2) psychosocial factors, (3) mental health, and (4) study design. The full search strategy is provided in supplementary file 1.

Regarding the population, only studies with workers aged 35 years or younger were included. Regarding the exposures and outcomes, studies were included if they reported an association between a psychosocial work factor as exposure and a mental health complaint as outcome. The eligible outcomes include depression-, stress-, burnout-, exhaustion- and anxiety-related complaints, as well as fatigue, excluding clinical diagnoses and suicide-related outcomes. Intervention studies and qualitative studies were excluded. Studies had to be in English, German or Dutch.

Two reviewers (MVV and KOH) independently assessed titles and abstracts for eligibility using Rayyan (18). If consensus on eligibility could not be reached, then a third author (CB) was asked as tie-breaker. Subsequently, two reviewers (MVV and KOH) independently assessed the full text of the selected articles. Authors of potentially eligible studies were contacted when maximum age was not explicitly reported in the article. Again, if consensus on inclusion could not be reached, a third author (CB) was consulted.

In addition to the primary search, a complimentary citation search based on the included studies was conducted. This was done backwards by one author (MVV) by screening the reference list of the included studies and forwards by using Google Scholar to find studies that cited the included studies.

Risk of bias assessment

Risk of bias assessment per study was conducted independently by two researchers (MVV and KOH) using the items from the Quality Assessment Tool for Observational Cohort and Cross-Sectional Studies from the National Heart, Lung, and Blood Institute (19). Risk of bias items were: clear statement of research questions; specification of study population; participation rate above 50%; sample size justification; measuring of exposure prior to outcome; sufficient timeframe for seeing effect; examination of different levels of exposure; measurement of exposure clearly defined, and valid, reliable, consistently implemented across all study participants; repeated measures of exposure; measurement of outcome clearly defined, and valid, reliable, and consistently implemented across all study participants; statistical adjustment of potential key confounding variables; and: overall risk of bias assessment per study. For the current systematic review, gender and education were considered key confounders that an analysis had to include in order to get a no risk of bias judgement on the respective item. Following the tool's guidelines, the overall risk of bias assessment was not

mechanically determined but determined using the overall judgement of the authors based on all items.

Data extraction

Data from the included studies was extracted by one author (MVV) using a pre-piloted form that was developed for this systematic review. The extracted data items were: authors; year of publication; sample origin country; sample size; occupational information; age range; outcome; outcome measurement; exposure; exposure measurement; type of analysis; included control variables; and statistical coefficient to describe the exposure-outcome association. Whenever confounder-adjusted coefficients were available, those were extracted. Three authors (KOH, CB, and AvdB) checked two studies each for optimizing the data extraction.

Data synthesis and certainty assessment

A quantitative synthesis of the data was not planned due to the expected inhomogeneity of outcomes and exposures. All decisions concerning harmonization of terminology (hereafter referred to as harmonization) were made after data extraction. For a tabulated overview, all exposure-outcome associations are sorted by outcome. For further synthesis, conceptually equivalent exposures were harmonized and data was synthesized using the GRADE framework (16).

Within the GRADE framework each exposure-outcome association starts with an initial quality level of evidence judgement. Based on nine items this initial level can be downgraded or upgraded. The level of evidence is downgraded when individual studies show biases (based on study-level risk of bias assessment), estimates are imprecise (based on confidence intervals), evidence is inconsistent, exposures or outcomes are measured indirectly, and when publication bias is likely for the particular association. The level of evidence is upgraded when there is evidence for a dose–response relationship, when the effect size is substantial, and when confounding is unlikely to affect the overall association. All studies found for this review were observational studies. The initial level of evidence for observational studies is “low quality of evidence”, indicating that “our confidence in the effect estimate is limited: the true effect may be substantially different from the estimate of the effect” (16).

Results

The flow of studies into the review is shown in Figure 1. The full texts of 113 original studies were assessed in our primary search after having screened 11,837 deduplicated titles and abstracts. Five studies selected for full text reading based on title and abstract could not be retrieved. Finally, the primary search resulted in inclusion of 14 studies (20-33). Of the 99 excluded studies, 62 studies did not fit the study population criteria, 16 studies did not report an eligible outcome, ten studies did not fit the design criteria, and six studies did not report an eligible exposure. Four studies were in a non-eligible language and one study contained data duplicate with another study. Citation searching led to additional inclusion of three studies (12, 34, 35), adding up the total count of included studies to 17 for the current systematic review.

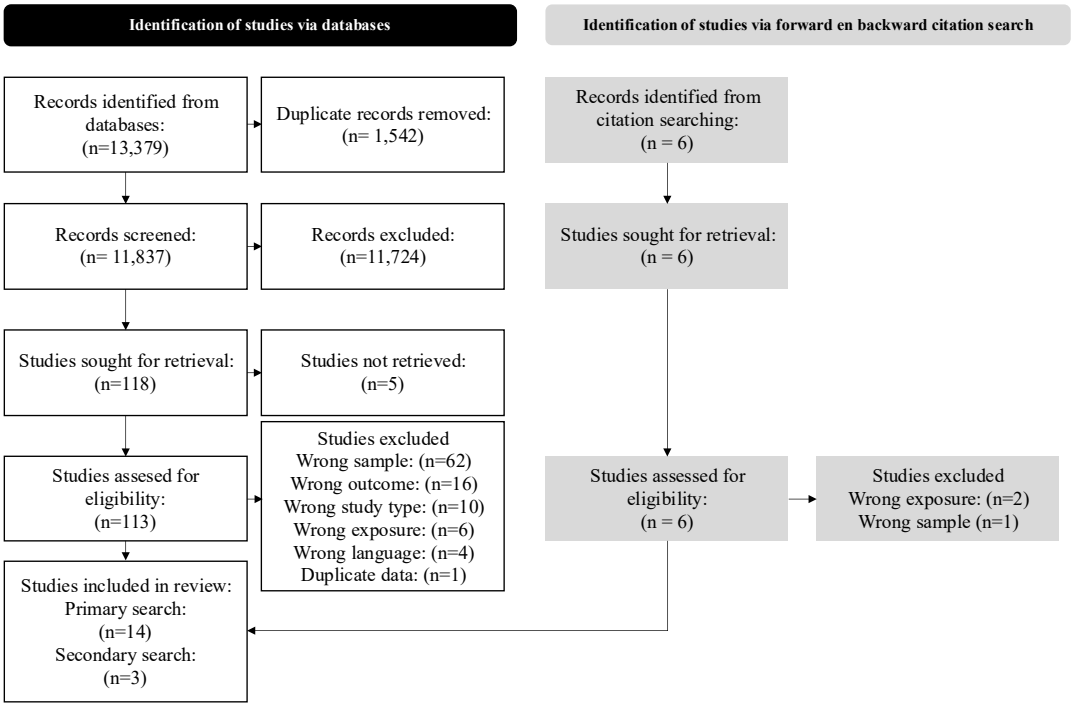

Figure 1. Flow diagram of literature search

Study characteristics

Table 1 shows a detailed description of the characteristics of the 17 included studies. Within seven studies the study population had a maximum age of 35 years, six studies took 30 years as the maximum age, and for four other studies the maximum age was 25 (20), 28 (31), 31 (35), and 33 (22) years. For eight studies, participants were sampled from particular occupational domains (manufacturing, transport, finance, education, combination of network services, administration, and chemistry, and three times healthcare). In the other nine studies young workers from the general working population participated. Sixteen studies used questionnaires to obtain exposure data and one study (32) used a job exposure matrix for exposure measurement. Across all 17 studies, 14 different outcomes and 59 different exposures were reported leading to 86 exposure-outcome associations. Three studies had a longitudinal design with Akkermans et al. (21) measuring the exposure prior to the outcome to be analysed with a structural equation model, and Milner et al. (12) and Klug (25) applying a longitudinal fixed-effects analysis to estimate within effects. The other 14 studies applied cross-sectional designs. All studies combined included 35,600 young workers.

Table 1. Study characteristics of the included studies

First Author (Year), Sample Origin Country	Study Design	Sample	Age in years	Outcome	Outcome Measurement	Exposure	Exposure Measurement[a,b]
Akkermans et al. (2009), the Netherlands	Cross-sectional	2,535 workers from Netherlands working condition survey 2007	18-25	Emotional exhaustion	Based on Utrecht Burnout Scale	Autonomy	Based on JCQ
						Cognitive demands	Self-constructed scale
						Emotional demands	Based on COPSOQ
						Social support from supervisor	Based on JCQ
						Social support from colleagues	Based on JCQ
						Task variation	Based on JCQ
						Workload	Based on JCQ
Akkermans et al. (2013 a), the Netherlands	2 waves longitudinal; exposure on wave 1, outcome wave 2	1,284 workers, wave 1 from Netherlands working condition survey 2008, wave 2 follow-up	18-30	Emotional exhaustion	Based on Utrecht Burnout Scale	Job resources	Latent Factor based on autonomy, supervisor support, colleague support (based on JCQ)
						Job demand	Latent factor based on work pressure, emotional workload, physical workload (based on JCQ)
Akkermans et al. (2013 b), the Netherlands	Cross-sectional	305 workers from a Dutch educational institution and a Dutch multinational	16-30	Emotional exhaustion	Subscale from Utrecht Burnout Scale	Job demands	Latent factor based on work pressure, physical demands, and emotional demands
						Job resources	Latent factor based on social support, autonomy, and opportunities for development
Berth et al. (2003), Germany	Cross-sectional	411 workers from a sample that was representative for the GDR at study begin	28-33	Anxiety	HADS (Hospital Anxiety and Depression Scale - German version)	Job insecurity	Self-constructed scale
				Depression	HADS (Hospital Anxiety and Depression Scale - German version)	Job insecurity	Self-constructed scale

Table 1 (continued). Study characteristics of the included studies

Berth et al. (2003), Germany	Cross-sectional	411 workers from a sample that was representative for the GDR at study begin	28-33	Fatigue	Subscale from GBB-24 (Gießen Symptom Checklist)	Job insecurity	Self-constructed scale
				Psychological distress	Subscale from SCL-9 (symptom check list)	Job insecurity	Self-constructed scale
Cheng et al. (2013), Taiwan	Cross-sectional	4,892 workers randomly sampled from general work population	20 - 29	Burnout	Personal burnout subscale of Chinese version of Copenhagen Burnout Inventory	Job insecurity	Self-constructed scale
						Job control	Chinese version of JCQ
						Workplace justice	Validated Scale
						Psychological job demands	Based on Chinese version of JCQ
Elovainio et al. (2007), Finland	Cross-sectional	3,873 workers from birth cohort	31	Psychological distress	SCL-25	Job control	Self-constructed scale
						Job demands	Self-constructed scale
						Job strain	Composite measure based on job control and job demands; high job strain = high demand & low control
Haley et al. (2013), South Africa	Cross-sectional	134 junior managers financial sector	18-30	Exhaustion (subscale of burnout)	Self-constructed burnout scale	Colleague support	Self-constructed scale
						Emotional load	Self-constructed scale
						Job pressure	Self-constructed scale
						Job information	Self-constructed scale
						Mental load	Self-constructed scale
						Participation in decision making	Self-constructed scale
						Role clarity	Self-constructed scale
						Supervisor support	Self-constructed scale
Klug (2020), Germany	Longitudinal	963 young workers from representative household panel study	18-30	Mental health	Mental health component scale from SF-12	Subjective job insecurity	Self-constructed scale
Lachmann et al. (2020), Germany	Cross-sectional	390 doctors	<= 35	Burnout-risk	COPSOQ	Effort-reward-imbalance	ERI
						Effort	Subscale from ERI
						Reward	Subscale from ERI

Table 1 (continued). Study characteristics of the included studies

Lee et al. (2015), South Korea	Cross-sectional	1,141 female workers at manufacturing plant	18-35	Anxiety symptoms	Korean version of Beck Anxiety Inventory	Interpersonal conflict	KOSS-SF
						Insufficient job control	KOSS-SF
						Job demand	KOSS-SF
						Job insecurity	KOSS-SF
						Lack of reward	KOSS-SF
						Occupational climate	KOSS-SF
						Organizational system	KOSS-SF
Milner et al. (2017), Australia[c]	Longitudinal	9,723 workers from the representative HILDA study	<= 30	Mental health	Mental component summary of Sf-36	Psychosocial job quality (trichotomized based on number of adverse adversities)	Validated scale
Raspe et al. (2020), Germany	Cross-sectional	1,060 doctors and nurses	<= 35	Burnout	Burnout scale from COPSOQ	Career mobility	Subscale from ERI-16
						Collaboration	Work Situation Questionnaire for physicians (FAÄ) and for nurses (FAP)
						Effort	Subscale from ERI-16
						Effort-reward-imbalance	ERI16 - subscales aggregated in 1 ratio
						Experienced aggression	Self-constructed scale
						Job security	Subscale from ERI-16
						Recognition	Subscale from ERI-16
Salmela-Aro and Upadyaya (2018), Finland	Cross-sectional	263 workers from three large organizations	<35	Work burnout	Bergen burnout Inventory	Authoritarian management	Self-constructed scale
						ICT demands	Self-constructed scale
						Interpersonal work demands	Self-constructed scale
						Multicultural demands	Self-constructed scale
						Role in the organization	Self-constructed scale
						Team climate	Self-constructed scale

Table 1 (continued). Study characteristics of the included studies

Shi et al. (2018), China	Cross-sectional	696 novice nurses (<3 service years)	19-35	Anxiety	Scale based on previous research (36)	Workplace incivility	Self-constructed scale
				Burnout	Chinese version of the Maslach Burnout Inventory-general survey	Workplace incivility	Self-constructed scale
Wiesner et al. (2005), United States	Cross-sectional	583 workers earlier graduating from suburban New York high schools	21-28	Depressive symptoms	Center for Epidemiological Studies - Depression Scale (CES-D)	High cognitive demands	Adapted from (37)
						High job boredom	Scale from (38)
						High workload	Adapted from (39)
						Low autonomy	Adapted from (39)
						Low skill variety	Adapted from (40)
Zimmerman et al. (2004), United States	For outcome one wave of longitudinal cohort is used, for exposure job factors were taken from O*Net based on job codes	7278 workers from a cohort that was nationally representative at cohort begin	27-35	Depressive symptoms	Center for Epidemiological Studies - Depression Scale (CES-D)	Job Security	scores from occupations profiles taken from O*Net database
						Moral	scores from occupations profiles taken from O*Net database
						Opposition	scores from occupations profiles taken from O*Net database
						Physical discomfort	scores from occupations profiles taken from O*Net database
						Recognition	scores from occupations profiles taken from O*Net database
						Sociability	scores from occupations profiles taken from O*Net database
Zoer et al. (2011), the Netherlands	Cross-sectional	69 workers from railway company	22-35	Burnout	Utrecht Burnout Scale	Emotional load	From (41)
						Lack of social support from colleagues	From (41)
						Lack of social support from supervisor	From (41)
						Low work autonomy	From (41)
						Mental load	From (41)
						Work pressure	From (41))

Table 1 (continued). Study characteristics of the included studies

Zoer et al. (2011), the Netherlands	Cross-sectional	69 workers from railway company	22-35	Stress complaints	Distress subscale from Dutch version of 4DSQ	Emotional load	From (41)
						Lack of social support from colleagues	From (41)
						Lack of social support from supervisor	From (41)
						Low work autonomy	From (41)
						Mental load	From (41)
						Work pressure	From (41)
				Work-related fatigue	Scale for need for recovery after working time	Emotional load	From (41)
						Lack of social support from colleagues	From (41)
						Lack of social support from supervisor	From (41)
						Low work autonomy	From (41)
						Mental load	From (41)
						Work pressure	From (41)

[a] Self-constructed scale: Scale is not reported to be based on previous research.
[b]JCQ: Job Content Questionnaire; COPSOQ: Copenhagen Psychosocial Questionnaire; KOSS-SF: Korean Occupational Stress Scale (Short Form); ERI: Effort Reward Imbalance Scale; ERI 16: ERI short form.
[c]Data is taken from supplementary material in which the analysis are reported for workers only, excluding students and unemployed.

Table 2. Risk of Bias Assessment per study using the National Heart, Lung, and Blood Institute framework

First author (year)	Research questions clearly stated?	Specified study population?	Participation rate of 50% of higher?	Justification of the sample size?	Exposure measured prior to outcome?	Sufficient timeframe to see an effect?	Exposure measurement	Outcome measurement	Appropriate dealt with confounders?	Overall rating: good/fair/poor
Akkermans et al. (2009)	yes	yes	un-clear	no	no	no	yes	yes	yes	fair
Akkermans et al. (2013 a)	yes	yes	un-clear	no	yes	yes	yes	yes	yes	fair
Akkermans et al. (2013 b)	yes	yes	yes	no	no	no	yes	yes	no	poor
Berth et al. (2003)	no	yes	yes	no	no	no	no	yes	no	poor
Cheng et al. (2013)	yes	yes	yes	no	no	no	yes	yes	no	poor
Elovainio et al. (2007)	yes	yes	yes	no	no	no	yes	yes	no	poor
Haley et al. (2013)	yes	yes	un-clear	no	no	no	no	no	no	poor
Klug (2020)	yes	yes	yes	no	yes	yes	yes	yes	yes	good
Lachmann et al. (2020)	yes	yes	no	no	no	no	yes	yes	yes	poor
Lee et al. (2015)	yes	yes	yes	no	no	no	yes	yes	no	poor
Milner et al. (2017)	yes	yes	yes[b]	no	yes	yes	yes	yes	yes	good
Raspe et al. (2020)	yes	yes	no	no	no	no	yes	yes	no	poor
Salmela-Aro and Upadyaya (2018)	yes	yes	no	no	no	no	no	yes	no	poor
Shi et al. (2018)	yes	yes	yes	no	no	no	yes	yes	yes	fair
Wiesner et al. (2005)	yes	yes	yes	no	no	no	yes	yes	yes	fair
Zimmerman et al. (2004)	yes	yes	yes	no	no	no	no	yes	yes	poor
Zoer et al. (2011)	yes	yes	no	no	no	no	yes	yes	no	poor

[a]Following the tool's guidelines, the overall risk of bias assessment was not mechanically determined, but determined using the overall judgement of the authors based on all items

[b]Retention from wave to wave is >90%, but over time this might have ended up in an overall attrition of >50%. Overall attrition is not provided in the article.

Risk of bias assessment

Table 2 shows a risk of bias assessment. Two studies reported a repeated measurement of the exposure. Eight of the 17 studies took potential confounding by education level and gender into account. Eleven studies were rated as poor, four as fair and two studies as good.

Harmonization of exposures and outcomes for data synthesis

Exposures and outcomes that were conceptually equivalent were given the same term for a more comprehensible overview and data synthesis. The decisions on what constitutes conceptual equivalence in the context of the current systematic review was consensual and based on the experience and domain knowledge of the authors.

Concerning the exposures this applies to interpersonal conflict (including workplace incivility, experienced aggression, interpersonal work demands), rewards (including recognition), job control (including autonomy, work autonomy), job demands (including psychological job demands, work pressure, workload, job demands, job pressure), emotional demands (including emotional load), and cognitive demands (including mental load). For all other exposures the original terms were used.

The same was done for outcomes that were conceptually equivalent: anxiety symptoms (27) were harmonized as anxiety; work burnout (29), burnout-risk (26), exhaustion as burnout-subscale (24), and emotional exhaustion (20, 21, 34), were harmonized as burnout; depressive symptoms (31, 32) were harmonized as depression; Work-related fatigue (33) and fatigue (22), were harmonized as fatigue. Stress complaints (33) and psychological distress (22; 35) were harmonized as stress.

In Table 1 the original terms are used for outcomes and exposures, whereas the harmonized terms are used in Tables 3, 4. This harmonization of terminology reduced the number of outcomes from 14 to 6, the number of exposures from 59 to 44.

Overview of exposures and outcomes

Three studies measured anxiety (22, 27, 30). Ten studies measured burnout (20, 21, 23, 24, 26, 28, 29, 30, 33, 34). Three studies measured depression (22, 31, 32). Two studies measured fatigue. Two studies measured mental health (12, 25), and three studies measured stress (22, 33, 35).

Table 3 shows the results of the included studies, by displaying all 86 exposure-outcome associations sorted by the six outcomes (anxiety, burnout, depression, fatigue, mental health, stress).

Main findings after data synthesis and certainty assessment

Table 4 shows the data synthesis. Exposure-outcome associations were included in this table when at least three studies reported a particular exposure-outcome association. Also, associations reported in the two studies with low risk of bias (12, 25) were included. This resulted in the synthesis of nine exposure-outcome associations: (1) Burnout in association with (a) cognitive demands, (b), colleague support, (c) emotional demands, (d) interpersonal conflict, (e) job control, (f) job demands, and (g) supervisor support; (2) Mental health in association with (a) psychosocial job quality and (b) job insecurity. Publication bias was very unlikely to have systematically altered the results. Across the included studies, statistically insignificant associations between exposures and outcomes were reported. An incentive to only publish significant results was unlikely to play a role, because there are no indications that authors were committed to particular theories or models.

The application of the GRADE framework led to eight certainty assessments of “very low” and one “low” assessment. The latter concerned the study by Milner et al. (12) and the association between low psychosocial job quality and poor mental health. As the certainty of the evidence was either low or very low, the nature of the synthesized associations is not further reported.

Table 3. Associations between work-related exposures and mental health complaints

Exposure	Study	Exposure levels	Association coefficient (incl. p-value or 95% confidence interval)[a]
Anxiety			
Job Insecurity	Berth, 2003[b]	4-point-scale, 4 is most insecurity	**F(3,408) = 10.21; p <.001 4>1; 4>2; 3>1; 3>2**
	Lee, 2015[c]	Trichotomized; reference: low risk/least insecurity	OR Moderate: 1.54 [0.99:2.4] **OR High: 4.52 [2.86:7.13]**
Interpersonal Conflict	Lee, 2015[c]	Trichotomized; reference: low risk/least conflict	OR Moderate: 1.18 [0.75:1.86] **OR High: 2.26 [1.55:3.3]**
	Shi, 2018[d]	Continuous, higher = more conflict	**β = 0.364; p <.01**
Insufficient Job Control	Lee, 2015[c]	Trichotomized; reference: low risk/most control	Moderate: no observations OR High: 1.05 [0.75:1.47]
Job Demand	Lee, 2015[c]	Trichotomized; reference: low risk/least demand	Moderate: no observations **OR High: 3.19 [2.27:4.49]**
Lack of Reward	Lee, 2015[c]	Trichotomized; reference: low risk/most reward	**OR Moderate: 1.65 [1.01:2.69] OR High: 2.75 [1.86:4.08]**
Occupational Climate	Lee, 2015[c]	Trichotomized; reference: low risk/most supportive climate	**OR Moderate: 2.53 [1.67:3.85] OR High: 4.52 [2.9:7.04]**
Organizational System	Lee, 2015[c]	Trichotomized; reference: low risk/most supportive system	**OR: Moderate: 1.61 [1.01:2.58] OR High: 2.32 [1.58:3.4]**
Burnout			
Job demands	Akkermans, 2009[e]	Continuous, higher = more demands	Low Education: **B = 0.55; p <.01** Intermediate Education: **B = 0.43; p <.01** High Education: **B = 0.43; p <.01**
	Akkermans, 2013a[f]	Continuous, higher = more demands	Low Education: **Path coeff.: 0.14** High Education: **Path coeff.: 0.26**
	Akkermans, 2013b[g]	Continuous, higher = more demands	**Path coefficient: 0.28**
	Cheng, 2013[h]	Trichotomized; reference: low risk/least demands	Male: OR Moderate: 1.3 [0.8:1.9] **OR High: 3.2 [2.1:4.8]** Female: OR Moderate: 1.3 [0.9:1.8] **OR High: 3.7 [2.6:5.2]**
	Haley, 2013[i]	Continuous, higher = more demands	**β = 0.24; p=.03**
	Zoer, 2011[j]	Trichotomized; reference: low risk/least demands	OR Moderate: 5.2 [0.5:50.2] **OR High: 17.2 [1.2:242.3]**
Cognitive demands	Akkermans, 2009[e]	Continuous, higher = more demands	Low Education: B = -0.05 Intermediate Education: B = -0.06 High Education: B = -0.03
	Haley, 2013[i]	Continuous, higher = more demands	β = -0.03; p=.79
	Zoer, 2011[j]	Trichotomized; reference: low risk/least demands	OR Moderate: 4.7 [0.2:98.8] OR High: 0.5 [0:14.6]

Colleague support	Akkermans, 2009[e]	Continuous, higher = more support	Low Education: **B = -0.39; p <.01** Intermediate Education: **B = -0.16; p <.01** High Education: B = -0.13
	Haley, 2013[i]	Continuous, higher = more support	β = -0.14; p=.12
	Zoer, 2011[j]	Trichotomized; reference: low risk/high support	OR Moderate: 0.1 [0:3.7] OR High: 6.9 [0.4:128.8]
Emotional demands	Akkermans, 2009[e]	Continuous, higher = more demands	Low Education: **B = 0.5; p <.01** Intermediate Education: **B = 0.46; p <.01** High Education: **B = 0.5; p <.01**
	Haley, 2013[i]	Continuous, higher = more demands	**β = 0.33; p<.01**
	Zoer, 2011[j]	Trichotomized; reference: low risk/least demands	OR Moderate: 19.9 [0.9:452.7] **OR High: 33.9 [1.7:678.6]**
Job control	Akkermans, 2009[e]	Continuous, higher = more control	Low Education: **B = -0.13; p <.01** Intermediate Education: **B = -0.29; p <.01** High Education: B = 0.03
	Cheng, 2013[h]	Trichotomized; reference: low risk/most control	Male: OR Moderate: 0.9 [0.6:1.2] OR High: 0.5 [0.4:0.8] Female: OR Moderate: 1.2 [0.8:1.6] OR High: 1.1 [0.8:1.6]
	Zoer, 2011[j]	Trichotomized; reference: low risk/most control	OR Moderate: 0.2 [0:2.4] OR High: 1 [0:22]
Interpersonal conflict	Raspe, 2020[k]	Continuous, higher = more conflict	**B = 2.1 [0.33:3.81]**
	Salmela-Aro, 2018[l]	Continuous, higher = more conflict	**Path coefficient: 0.21**
	Shi, 2018[i]	Continuous, higher = more conflict	**β = 0.24; p < .01**
Supervisor support	Akkermans, 2009[e]	Continuous, higher = more support	Low Education: **B = -0.3; p <.01** Intermediate Education: **B = -0.35; p <.01** High Education: **B = -0.33; p <.01**
	Haley, 2013[i]	Continuous, higher = more support	β = 0.04; p=.75
	Zoer, 2011[j]	Trichotomized; reference: low risk/high support	OR Moderate: 0.2 [0:3.4] OR High: 2.8 [0.2:51.6]
Effort	Lachmann, 2020[m]	Dichotomized; reference: low risk/least effort	**OR: 1.04 [1.02:1.05]**
	Raspe, 2020[k]	Continuous, higher = more effort	**B = 0.8 [0.22:1.35]**
Effort-Reward-Imbalance	Lachmann, 2020[m]	Dichotomized; reference: low risk/beneficial balance	**OR: 7.022 [3.139:15.709]**
	Raspe, 2020[k]	Continuous, higher = more imbalance	**B = 8.8 [6.57-11.12]**

Reward	Lachmann, 2020[l]	Dichotomized; reference: low risk/most reward	**OR: 0.96 [0.93:0.99]**
	Raspe, 2020[k]	Continuous, higher = more reward	**B = -1.5 [-2.22:-0.8]**
Job resources	Akkermans, 2013a[f]	Continuous, higher = more resources	Low Education: **Path coeff.: -0.18** High Education: **Path coeff.: -0.16**
	Akkermans, 2013b[g]	Continuous, higher = more resources	**Path coefficient: -0.13**
Job security	Cheng, 2013[h]	Dichotomous Item; reference: low risk/most security	Male: OR: 1 [0.7 : 1.3] Female: OR: 0.9 [0.7:1.1]
	Raspe, 2020[k]	Continuous, higher = more security	B = -0.8 [-0.15:0.02]
Authoritarian management	Salmela-Aro, 2018[l]	Continuous, higher = more authoritarian	**Path coefficient: 0.21**
Career mobility	Raspe, 2020[k]	Continuous, higher = more mobility	**B= -0.8 [-1.34:-0.19]**
Collaboration	Raspe, 2020[k]	Continuous, higher = more collaboration	**B = -1.2 [-1.97:-0.44]**
ICT demands	Salmela-Aro, 2018[l]	Continuous, higher = more demands	**Path coefficient: 0.13**
Job information	Haley, 2013[i]	Continuous, higher = more information	β = 0; p=.99
Participation in decision making	Haley, 2013[i]	Continuous, higher = more participation	β = -.18; p=0.1
Multicultural demands	Salmela-Aro, 2018[l]	Continuous, higher = more demands	Path coefficient: 0
Role clarity	Haley, 2013[i]	Continuous, higher = more clarity	β = -0.09; p=.43
Role in the organization	Salmela-Aro, 2018[l]	Continuous, higher = higher position in hierarchy	Path coefficient: 0
Task variation	Akkermans, 2009[e]	Continuous, higher = more variation	Low Education: **B = -0.1; p <.05** Intermediate Education: B = -0.01 High Education: B = 0.08
Team climate	Salmela-Aro, 2018[l]	Continuous, higher = more beneficial work-relationships	Path coefficient: 0
Workplace justice	Cheng, 2013[h]	Trichotomized; reference: low risk/high justice	Male: **OR Moderate: 1.6 [1:2.4]** **OR Low: 5.5 [3.7:8.2]** Female: OR Moderate: 1.2 [0.8:1.8] **OR Low: 4.8 [3.4:6.8]**
Depression			
Job insecurity (Berth)/ Job security (Zimmerman)	Berth, 2003[b]	4-point-scale, 4 is most insecurity	**F(3,408) = 17.91; p <.001** **4 > 1; 4 > 2; 3 > 1; 3 > 2**
	Zimmerman, 2004[n]	Continuous, higher = more security	Male: SR[o]: 0.992 [0.943:1.044] Female SR[o]: 1.018 [0.968:1.069]
Cognitive demands	Wiesner, 2005[p]	Continuous, higher = more demands	β = -0.04
Job boredom	Wiesner, 2005[p]	Continuous, higher = more boredom	**β = 0.13; p <.001**
Low skill variety	Wiesner, 2005[p]	Continuous, higher = less variety	**β = 0.11; p < .01**

Low job control	Wiesner, 2005[p]	Continuous, higher = less control	**β = 0.08; p < .05**
Moral (involvement in situations that are morally difficult)	Zimmerman, 2004[n]	Continuous, higher = more moral difficulties	Male: SR^{o}: 1.026 [0.974:1.08] Female: SR^{o}: 0.995 [0.932:1.062]
Opposition (opposition to others)	Zimmerman, 2004[n]	Continuous, higher = more opposition	Male: **SR^{o}: 1.075 [1.01:1.145]** Female: SR^{o}: 1.004 [0.94:1.072]
Physically Uncomfortable	Zimmerman, 2004[n]	Continuous, higher = more discomfort	Male: SR^{o}: 0.97 [0.926:1.017] Female: **SR^{o}: 1.07 [1.014:1.129]**
Recognition (social status of the job)	Zimmerman, 2004[n]	Continuous, higher = more recognition	Male: **SR^{o}: 0.897 [0.822:0.977]** Female: SR^{0}: 0.994 [0.926:1.065]
Sociability (Opportunities for social interaction at work)	Zimmerman, 2004[n]	Continuous, higher = more social interaction	Male: SR^{o}: 1.033 [0.974:1.095] Female: SR^{o}: 0.971 [0.927:1.017]
Workload	Wiesner, 2005[p]	Continuous, higher = more workload	β = 0.03
Fatigue			
Job Demands	Zoer, 2011[n]	Trichotomized; reference: low risk/least demands	OR Moderate: 5.1 [0.9:30.4] **OR High: 17.8 [2.1:149.7]**
Cognitive Demands	Zoer, 2011[n]	Trichotomized; reference: low risk/least demands	No association concluded and no statistics reported
Emotional Demands	Zoer, 2011[n]	Trichotomized; reference: low risk/least demands	OR Moderate: 1.7 [0.3:10.3] OR High: 5.2 [0.9:30]
Low supervisor support	Zoer, 2011[n]	Trichotomized; reference: low risk/high support	OR Moderate: 0.2 [0:1.6] OR High:1.5 [0.3:8.3]
Low colleague support	Zoer, 2011[n]	Trichotomized; reference: low risk/high support	OR Moderate: 0.2 [0:1.6] OR High: 0.6 [0.1:4.8]
Low job control	Zoer, 2011[n]	Trichotomized; reference: low risk/most control	No association concluded and no statistics reported
Job insecurity	Berth, 2003[b]	4-point-scale, 4 is most insecurity	**F(3,408)=5.7; p <.01** **4 > 1; 4 > 2; 3 > 1**
Mental Health			
Job Insecurity	Klug, 2020[q]	Continuous, higher = more insecurity	β = .06
Psychosocial Job Quality	Milner, 2017[r]	4 groups based on number of psychosocial job adversities	**0 adversities: β = 0.85 [0.42:1.27]** 1: β = 0.4 [-0.26:0.53] **2: β = -0.68 [-1.11:-0.25]** **>=3: β = -1.96 [-2.55:-1.37]**

Stress			
Job Demands	Zoer, 2011[n]	Trichotomized based on tertiles; reference: low risk/least demands	OR Moderate: 4.3 [0.9:20.5] **OR High: 6.2 [1.2:33.8]**
	Elovainio, 2007[s]	Continuous, higher = more demands	β = 0.03
Job Control	Elovainio, 2007[s]	Continuous, higher = more control	**β = -0.15; p < .001**
	Zoer, 2011[n]	Trichotomized; reference: low risk/most control	No association concluded and no statistics reported
Cognitive Demands	Zoer, 2011[n]	Trichotomized; reference: low risk/least demands	OR Moderate: 2 [0.5:8.4] OR High: 1.5[0.3:7.7]
Colleague support	Zoer, 2011[n]	Trichotomized; reference: low risk/most support	OR Moderate: 0.5 [0.1:3.0] OR High: 1.7 [0.3:9.5]
Emotional demands	Zoer, 2011[n]	Trichotomized; reference: low risk/least demands	OR Moderate: 1.1 [0.3:4.9] OR High: 1.7 [0.4:7.7]
Job insecurity	Berth, 2003[b]	4-point-scale, 4 is most insecurity	**F(3,408) = 3.49; p <.05** Scheffé Post Hoc: non
Job strain	Elovainio, 2007[s]	Continuous, higher = more strain	**β = 0.16; p <.001**
Supervisor support	Zoer, 2011[n]	Trichotomized; reference: low risk/most support	OR Moderate: 0.2 [0:1.1] OR High: 0.9 [0.2:4.6]

[a] Bold font indicates statistical significance as reported by the authors; "low", "moderate", high" in last column refers to risk level as specified in column "exposure groups"
[b] Berth: analysis: one-way ANOVA with Scheffé test for post hoc contrasts; Confounder: none
[c] Lee: analysis: multivariable logistic regression; Confounder: sleep quality, smoking habit, risky drinking
[d] Shi: analysis: multivariable linear regression; Confounder: age, gender, hospital level, working years, education level, department distribution
[e] Akkermans (2009): analysis: multivariable linear regression; Confounder: other "demand" exposures (workload, emotional demands, cognitive demands), gender, age
[f] Akkermans (2013a): analysis: structural equation modelling; Confounder: age, gender, job change in last 12 months, partly other exposure-outcome associations in final structural equation model.
[g] Akkermans (2013b): Analysis: structural equation modelling; Confounder: non
[h] Cheng: analysis: multivariable logistic regression; Confounder: other exposures, working hours
[i] Haley: analysis: multivariable linear regression; Confounder: Other exposures
[j] Zoer: analysis: multivariable logistic regression; Confounder: gender, other exposures
[k] Raspe: analysis: multivariable regression with backward selection; Confounder: other exposures, age, gender, occupation
[l] Salmela-Aro: analysis: Structural equation modeling; Confounder: personal resources, personal demands, gender, and other outcome-associations in final structural equation model
[m] Lachmann: analysis: multivariable logistic regression; Confounder: age, gender, type of work, working hours.
[n] Zimmerman: analysis: univariable zero-inflated negative binomial regression; Confounder: all other exposures, machine pace, physical discomfort, "wage premium", highest grade completed, income, age, employer-provided insurance, private insurance, government insurance, being married, being divorced, being black, being Latino
[o] SR symptom ratio
[p] Wiesner: analysis: multivariable logistic regression, statistics reported here from model including control variables, but not other exposures; Confounder: age, gender, marital status, children, years of education, type of occupation, part-time working, labour-force experience, negative affectivity, stressful life events, work-family conflict, prior mental health problems, parental mental health problem history
[q] Klug: analysis: longitudinal linear fixed effects regression; Confounder: age, tenure, household context, working in public sector, job change, temporary employment, interaction of education and subjective job insecurity
[r] Milner: analysis: longitudinal linear fixed effects regression; Confounder: age, highest level of education, disability/long term health condition, household structure, household income; Column "Association coefficient" indicates "Association of within-person changes in psychosocial job quality and time-varying covariates with changes in mental health"
[s] Elovainio: analysis: multivariable linear regression; Confounder: gender

Table 4. Certainty of the evidence using GRADE approach

Outcome		Exposure	Number of Studies	Number of participants	GRADE: Risk of Bias within studies↓	GRADE: Impreci-sion ↓	GRADE: Inconsistency of Evidence↓	GRADE: Indirectness (measurement and sample) ↓	GRADE: Publicati-on bias↓	GRADE: Dose-re-sponse relation-ship↑	GRADE: Size of effect↑	GRADE: Confoun-ding↑	Overall certainty of evidence
Burnout		Cognitive Demands	3 (Akkermans et al., 2009; Haley et al., 2013; Cheng et al., 2013)	2,738	yes ↓	yes ↓	Incon-sistent ↓	no	unclear	no	no	unclear	very low
		Colleague Support	3 (Akkermans et al., 2009; Haley et al., 2013; Cheng et al., 2013)	2,738	yes ↓	yes ↓	Incon-sistent ↓	no	unclear	no	no	unclear	very low
		Emotional Demands	3 (Akkermans et al., 2009; Haley et al., 2013; Cheng et al., 2013)	2,738	yes ↓	yes ↓	Consis-tent	no	unclear	yes↑	no	unclear	very low
		Interper-sonal Conflict	3 (Raspe et al. 2020; Salmela-Aro and Upadyaya 2018; Shi et al. 2018)	2,019	yes ↓	yes ↓	Consis-tent	no	unclear	no	no	unclear	very low
		Job Control	3 (Akkermans et al, 2009; Cheng et al., 2013; Zoer et al., 2011)	7,496	yes ↓	yes ↓	Incon-sistent ↓	no	unclear	no	no	unclear	very low
		Job Demands	6 (Akkermans et al, 2009; Akkermans 2013a, Akkermans, 2013b, Cheng et al., 2013, Haley at al, 2013; Zoer et al., 2011)	9,219	yes ↓	yes ↓	Consis-tent	no	unclear	yes↑	no	unclear	very low
		Supervisor Support	3 (Akkermans et al., 2009; Haley et al., 2013; Cheng et al., 2013)	2,738	yes ↓	yes ↓	Incon-sistent ↓	no	unclear	no	no	unclear	very low
Mental Health		Psychosocial Job Quality	1 (Milner et al. 2017)	9,723	no	no	n.a.	no	unclear	yes ↑	no	unclear	low[a]
	Job Insecurity		1 (Klug 2020)	963	no	yes ↓	n.a.	no	unclear	no	no	unclear	very low

Discussion

This systematic review generally concludes a very low certainty of evidence on the effect of psychosocial work factors on mental health complaints of young workers. The included studies contain a myriad of exposures and outcomes as well as a substantial risk of bias. Both contributed to judgements of either very low (eight times) or low (one time) certainty in the evidence for the exposure-outcome associations.

These findings are in line with conclusions from two previous systematic reviews among young workers (13, 14). Both reviews concluded that the knowledge body is insufficient and called for more and better research on the topic. This conclusion is substantiated by the current review. By choosing a broad scope concerning the outcome and exposure search terms and by applying the GRADE framework, this systematic review disclosed the substantial degree of uncertainty in a more systematic way than was presented in both of the previous reviews. Nevertheless, this systematic review and the previous two reviews did find individual associations between psychosocial work factors and mental health, even though with a high degree of uncertainty. For the general population robust associations were reported between high job demands, effort-reward imbalance, job insecurity, low organizational justice and mental health complaints (6-8). It is likely that at least some of these exposures also play a role in work-related health of young workers. However, it is not clear which exposures have which effect and what the underlying mechanisms are for young workers.

Mental health is a complex phenomenon with a lack of consensus on definition and measurement. There is an ongoing debate in academia and practice about the uniqueness of the outcome constructs included in the current systematic review, e.g. discussing to which extent self-reported burnout symptoms are distinct from self-reported symptoms of depression, or whether anxiety and depression are sufficiently distinct (42). This debate is particularly relevant for the sub-clinical populations in the current systematic review, for which symptoms are less clearly manifested. This makes systematically reviewing and synthesizing the literature challenging and becomes particularly visible in this review due to the relatively low number of studies.

While some of the included studies integrated different types of job demands into one latent construct (21, 34), other studies (33) report job demands as discrete construct that exists next to other types of work-related demands. In general, studies barely provided reasonings as to why a particular exposure was chosen to be studied. Another issue is that the theoretical models behind the exposures are–despite their merits in understanding occupational mental health–justifiably described as “ways of thinking” (5) that are not leading to clear and testable hypotheses when it comes to applying them, so that these models can also not iteratively be improved.

Based on the studies included in the current systematic review, it appears that research on the effect of psychosocial work exposures on mental health complaints of young workers is for the biggest part inspired by the existing, classic occupational health models (i.e., job demand control [resources] model, Effort-Reward Imbalance). To date, research has paid insufficient attention to exposures that are potentially getting more relevant in an increasingly digitalized and intensified work environment–such as interruptions at work, and challenges related to increased standardization and documentation of work, while these exposures might be particularly relevant for young workers’ mental health. Based on the same need for better capturing the contemporary psychosocial work environment, the DYNAMIK questionnaire has been developed, which is explicitly aimed at reflecting modern day work including risk factors such as interruption of work, usability of technology used at work, and work during leisure time (43). An overarching framework integrating existing models and new insights can help guiding research and can facilitate knowledge accumulation. The model suggested by Harvey et al. (6) as a result of their meta-review might be helpful. Nevertheless, this model is more a framework in the sense that it categorizes concepts, while it does not facilitate deduction of testable hypotheses and it does not articulate interdependencies of psychosocial work factors.

Still, using such a broadly accepted framework does not address another potential issue affecting research and practice, namely that a worker’s mental health is part of a complex system, which includes the workplace. Harvey et al. (6) conclude in their meta-review that there is no one “toxic

factor" underlying mental health complaints. For practice this means that there is not one universally applicable aspect of the psychosocial work environment, i.e. the "toxic factor" that must be fixed in order to improve work-related mental health complaints. For scientific research this implies to reconsider the way research is designed, conducted, and analysed, because occupational mental health research currently follows a reductionist approach in which researchers are trying to identify the most parsimonious unidirectional exposure-outcome relationships, aiming at identifying the most toxic exposures for mental health complaints.

By simply adding more up to date exposures to studies that better reflect contemporary workspaces, complexity is still not taken into account and researchers implicitly keep on looking for the toxic factors ought to explain mental health complaints. Understanding a worker's health as a complex system implies that a psychosocial work exposure that might not appear in research on one-on-one associations with mental health complaints, could play a crucial role within the actual system by triggering effects that are then manifested by more obvious and bigger changes in other constructs (44). Translating a complexity approach into research practice arguably has a huge potential for the field of occupational mental health research (45).

Strengths

This systematic review attempts to be the most comprehensive and up to date overview of the effect of psychosocial work factors on mental health complaints of young workers. All search terms were selected with having this particular group in mind and with no time limit, making it an extensive systematic review that covers all relevant mental health outcomes and psychosocial work exposures. The application of the GRADE framework made it more explicit than two previous reviews that the certainty of evidence is generally very low.

Limitations

By excluding clinical outcomes, it is possible that some informative articles have been missed. Also, studies were excluded if it could not be ruled out that workers older than 35 years were included in the sample, which can be considered a too strict inclusion criterion given that a sample might still be representative for young workers even if it included a few workers older than 35. We could not retrieve five studies, which might have resulted in an uncomplete picture. Finally, the harmonization of outcomes and exposures was not determined a priori. The aim of the harmonization was to enable the synthesis of results. It can be argued that the harmonization choices that were made after data extraction are open to debate and that, for example, psychological job demands and job pressure should not be given the same term, because they are conceptually close but still distinct.

Implications for future research

Arguably, research on effects of psychosocial work factors on mental health complaints is often guided by which variables happen to be in a questionnaire that mostly serves several other purposes. Instead of testing ill-specified hypotheses on observational data and running confirmatory analyses, more exploratory research has the potential to help shape better hypotheses. These hypotheses can then be answered using more tailored data and in a methodologically sound manner, a priori making the hypothesized causal structure of the assessed exposure-outcome association explicit. Such exploratory research should address the aforementioned challenges of occupational mental health research. This can firstly be achieved by integrating recent developments on mental health complaint classifications and psychosocial work factor frameworks, including contemporary exposures. Secondly, research designs and analyses methods should be able to reflect the features of worker's mental health as a complex system. This can be facilitated by making more use of longitudinal data and qualitative designs and by applying recently advanced analysis methods that can model complexity (46).

Across the studies included in the current systematic review, the authors expect systematic differences between younger and older workers concerning which psychosocial work factors affect mental health based on the literature underlying their studies (12, 20, 21, 23- 25, 29, 30, 33). Some hypothesizing

on unique work-related needs of young workers can be found. It is argued that the changes and increase of responsibility that young workers are facing puts them in more need of job resources (21, 30, 34) (e.g., job control) (12) and that perceived job insecurity plays a central role for young workers (20, 23, 25).

As mentioned above, robust evidence for associations between psychosocial working conditions and mental health complaints can be found for the general working population including workers of all ages. The knowledge on these known associations can systematically be integrated with insights from lifespan research in order to propose work-related vulnerabilities that are particularly relevant for young workers. To give an example, lifespan research suggests that the age in which workers begin their working life is marked by a "shift in motivation from striving for gains to maintenance and prevention of losses" and "change from extrinsic to intrinsic motives for working" (47). It can consequently be hypothesized that for young workers, low organizational justice, which has shown to be associated with mental health complaints in the general working population, is more problematic when it concerns extrinsic motivational aspects of the job such as the distribution of salary, rather than intrinsic motivational aspects of the job such as the distribution of interesting and challenging tasks.

Using this input, even with a lack of research focusing on young workers, a more informed theoretical inference can be made on how to translate evidence form the general working population including young workers to young workers in particular.

Conclusion

Work-related ill mental health is a persistent and potentially increasing phenomenon among young workers. The psychosocial quality of the workplace should be created and maintained in such a way that work positive contribution to the mental health of young workers. The certainty of evidence on psychosocial work factors and mental health outcomes was found to be very low, therefore not enough is known on which psychosocial work factors affect the mental health of young workers to give evidence-based guidance to practice. This leaves practitioners with potentially inaccurate or incomplete information for creating healthy work.

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An asterisk before a reference indicates that the study is included in the systematic review. In tables "Akkermans (2013a)" refers to Akkermans J, Brenninkmeijer V, Van Den Bossche SNJ, Blonk RW, Schaufeli WB (2013), "Akkermans (2013b)" refers to Akkermans J, Schaufeli W, Brenninkmeijer V, Blonk R (2013).

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Appendix

Supplementary File 1 – Full Search Strategy and Prisma Checklist

Full Search Strategy

Search strategy for PubMed (7 October 2021)

Search	Query	Results
#6	#1 AND #2 AND #3 AND #4 AND #5	4,835
#5	"Personal Autonomy"[Mesh] OR "Professional Autonomy"[Mesh] OR "Workload"[Mesh] OR "Recreation"[Mesh:NoExp] OR "Reward"[Mesh:NoExp] OR "amount of work"[tiab] OR "choice overload*"[tiab] OR "cognitive demand*"[tiab] OR "collegial support"[tiab] OR "computer anger*"[tiab] OR "computer rag*"[tiab] OR "co-worker support*"[tiab] OR "decision authorit*"[tiab] OR "decisional latitude*"[tiab] OR "device related anger*"[tiab] OR "device related anxiet*"[tiab] OR "emotional demand*"[tiab] OR "fear of better option*"[tiab] OR "fear of missing out"[tiab] OR "job demand*"[tiab] OR "job insecurit*"[tiab] OR "job securit*"[tiab] OR "managerial support*"[tiab] OR "mental load*"[tiab] OR "mental work load*"[tiab] OR "mental workload*"[tiab] OR "organisational climate*"[tiab] OR "organisational culture*"[tiab] OR "organizational climate*"[tiab] OR "organizational culture*"[tiab] OR "over choice"[tiab] OR "personal develop*"[tiab] OR "personal grow*"[tiab] OR "procedural fairness"[tiab] OR "procedural justice"[tiab] OR "psychological safet*"[tiab] OR "quality demand*"[tiab] OR "role ambiguit*"[tiab] OR "role uncertaint*"[tiab] OR "role unclarit*"[tiab] OR "social cohesi*"[tiab] OR "social comparison*"[tiab] OR "social support"[tiab] OR "supervisor support*"[tiab] OR "support by colleag*"[tiab] OR "support by the manager*"[tiab] OR "task difficult*"[tiab] OR "time pressure*"[tiab] OR "unclear task*"[tiab] OR "work load*"[tiab] OR "workload*"[tiab] OR appreciati*[tiab] OR autonom*[tiab] OR interruption*[tiab] OR overchoice[tiab] OR participation*[tiab] OR recover*[tiab] OR recreati*[tiab] OR relax*[tiab] OR reorganisation*[tiab] OR reorganization*[tiab] OR reward*[tiab] OR technostress*[tiab]	1,494,131
#4	"Mental Fatigue"[Mesh] OR "Stress, Psychological"[Mesh] OR "Mental Health"[Mesh] OR "Quality of Life"[Mesh] OR burnout*[tiab] OR "burn out*"[tiab] OR anxi*[tiab] OR depress*[tiab] OR stress*[tiab] OR "mental health"[tiab] OR "quality of life"[tiab] OR "psychological health"[tiab] OR exhaust*[tiab] OR "psychological fatigue*"[tiab] OR "mental fatigue*"[tiab]	2,012,271
#3	"Epidemiologic Studies"[Mesh] OR cohort[tiab] OR (case[tiab] AND (control[tiab] OR controll*[tiab] OR comparison[tiab] OR referent[tiab])) OR risk[tiab] OR causation[tiab] OR causal[tiab] OR "odds ratio"[tiab] OR etiol*[tiab] OR aetiol*[tiab] OR "natural history"[tiab] OR predict*[tiab] OR prognos*[tiab] OR outcome[tiab] OR course[tiab] OR retrospect*[tiab]	7,399,545
#2	"Work"[Mesh] OR "Employment"[Mesh:NoExp] OR "Workplace"[Mesh] OR work*[tiab] OR occupation*[tiab] OR profession*[tiab] OR job[tiab] OR jobs[tiab] OR employ*[tiab] OR labor[tiab] OR laborer*[tiab] OR labour*[tiab] OR vocation*[tiab]	2,763,377
#1	"Young Adult"[Mesh] OR young*[tiab] OR "early career*"[tiab] OR "job starter*"[tiab] OR "short work experience"[tiab]	1,581,767

Search strategy for Clarivate Analytics/Web of Science Core Collection (7 October 2021)

Set	Query	Results
#7	#5 AND #4 AND #3 AND #2 AND #1	2819
#5	TS=("amount of work" OR "choice overload*" OR "cognitive demand*" OR "collegial support" OR "computer anger*" OR "computer rag*" OR "co-worker support*" OR "decision authorit*" OR "decisional latitude*" OR "device related anger*" OR "device related anxiet*" OR "emotional demand*" OR "fear of better option*" OR "fear of missing out" OR "job demand*" OR "job insecurit*" OR "job securit*" OR "managerial support*" OR "mental load*" OR "mental work load*" OR "mental workload*" OR "organisational climate*" OR "organisational culture*" OR "organizational climate*" OR "organizational culture*" OR "over choice" OR "personal develop*" OR "personal grow*" OR "procedural fairness" OR "procedural justice" OR "psychological safet*" OR "quality demand*" OR "role ambiguit*" OR "role uncertaint*" OR "role unclarit*" OR "social cohesi*" OR "social comparison*" OR "social support" OR "supervisor support*" OR "support by colleag*" OR "support by the manager*" OR "task difficult*" OR "time pressure*" OR "unclear task*" OR "work load*" OR "workload*" OR "appreciati*" OR "autonom*" OR "interruption*" OR "overchoice" OR "participation*" OR "recover*" OR "recreati*" OR "relax*" OR "reorganisation*" OR "reorganization*" OR "reward*" OR "technostress*")	2641496
#4	TS=("burnout*" OR "burn out*" OR "anxi*" OR "depress*" OR "stress*" OR "mental health" OR "quality of life" OR "psychological health" OR "exhaust*" OR "psychological fatigue*" OR "mental fatigue*")	3363595
#3	TS=("cohort" OR ("case" NEAR/3 ("control" OR "controll*" OR "comparison" OR "referent")) OR "risk" OR "causation" OR "causal" OR "odds ratio" OR "etiol*" OR "aetiol*" OR "natural history" OR "predict*" OR "prognos*" OR "outcome" OR "course" OR "retrospect*")	8638122
#2	TS=("work*" OR "occupation*" OR "profession*" OR "job" OR "jobs" OR "employ*" OR "labor" OR "laborer*" OR "labour*" OR "vocation*")	5955900
#1	TS=("young*" OR "early career*" OR "job starter*" OR "short work experience")	1046947

Search strategy for Ebsco/APA PsycINFO (7 October 2021)

#	Query	Limiters / Expanders	Results
S8	S7 AND S3 AND S4 AND S5 AND S6		5,725
S7	S1 OR S2		573,704
S6	DE "Autonomy" OR DE "Work Scheduling" OR DE "Division of Labor" OR DE "Recreation" OR DE "Social Support" OR DE "Computer Anxiety" OR DE "Decision Making" OR DE "Job Security" OR DE "Job Satisfaction" OR DE "Supervisor Employee Interaction" OR DE "Organizational Crises" OR DE "Organizational Characteristics" OR DE "Organizational Change" OR DE "Organizational Climate" OR DE "Organizational Structure" OR DE "Decentralization" OR DE "Organizational Behavior" OR DE "Employee Interaction" OR DE "Organizational Citizenship Behavior" OR DE "Organizational Effectiveness" OR DE "Organizational Politics" OR DE "Professional Development" OR DE "Professional Competence" OR DE "Professionalism" OR DE "Professional Recognition" OR DE "Professional Socialization" OR DE "Professional Networking" OR DE "Professional Specialization" OR DE "Occupational Safety" OR DE "Social Networks" OR DE "Online Social Networks" OR DE "Social Support" OR DE "Rewards" OR TI("amount of work" OR "choice overload*" OR "cognitive demand*" OR "collegial support" OR "computer anger*" OR "computer rag*" OR "co-worker support*" OR "decision authorit*" OR "decisional latitude*" OR "device related anger*"		95,551

	OR "device related anxiet*" OR "emotional demand*" OR "fear of better option*" OR "fear of missing out" OR "job demand*" OR "job insecurit*" OR "job securit*" OR "managerial support*" OR "mental load*" OR "mental work load*" OR "mental workload*" OR "organisational climate*" OR "organisational culture*" OR "organizational climate*" OR "organizational culture*" OR "over choice" OR "personal develop*" OR "personal grow*" OR "procedural fairness" OR "procedural justice" OR "psychological safet*" OR "quality demand*" OR "role ambiguit*" OR "role uncertaint*" OR "role unclarit*" OR "social cohesi*" OR "social comparison*" OR "social support" OR "supervisor support*" OR "support by colleag*" OR "support by the manager*" OR "task difficult*" OR "time pressure*" OR "unclear task*" OR "work load*" OR "workload*" OR appreciati* OR autonom* OR interruption* OR overchoice OR participation* OR recover* OR recreati* OR relax* OR reorganisation* OR reorganization* OR reward* OR technostress*) OR AB("amount of work" OR "choice overload*" OR "cognitive demand*" OR "collegial support" OR "computer anger*" OR "computer rag*" OR "co-worker support*" OR "decision authorit*" OR "decisional latitude*" OR "device related anger*" OR "device related anxiet*" OR "emotional demand*" OR "fear of better option*" OR "fear of missing out" OR "job demand*" OR "job insecurit*" OR "job securit*" OR "managerial support*" OR "mental load*" OR "mental work load*" OR "mental workload*" OR "organisational climate*" OR "organisational culture*" OR "organizational climate*" OR "organizational culture*" OR "over choice" OR "personal develop*" OR "personal grow*" OR "procedural fairness" OR "procedural justice" OR "psychological safet*" OR "quality demand*" OR "role ambiguit*" OR "role uncertaint*" OR "role unclarit*" OR "social cohesi*" OR "social comparison*" OR "social support" OR "supervisor support*" OR "support by colleag*" OR "support by the manager*" OR "task difficult*" OR "time pressure*" OR "unclear task*" OR "work load*" OR "workload*" OR appreciati* OR autonom* OR interruption* OR overchoice OR participation* OR recover* OR recreati* OR relax* OR reorganisation* OR reorganization* OR reward* OR technostress*) OR KW("amount of work" OR "choice overload*" OR "cognitive demand*" OR "collegial support" OR "computer anger*" OR "computer rag*" OR "co-worker support*" OR "decision authorit*" OR "decisional latitude*" OR "device related anger*" OR "device related anxiet*" OR "emotional demand*" OR "fear of better option*" OR "fear of missing out" OR "job demand*" OR "job insecurit*" OR "job securit*" OR "managerial support*" OR "mental load*" OR "mental work load*" OR "mental workload*" OR "organisational climate*" OR "organisational culture*" OR "organizational climate*" OR "organizational culture*" OR "over choice" OR "personal develop*" OR "personal grow*" OR "procedural fairness" OR "procedural justice" OR "psychological safet*" OR "quality demand*" OR "role ambiguit*" OR "role uncertaint*" OR "role unclarit*" OR "social cohesi*" OR "social comparison*" OR "social support" OR "supervisor support*" OR "support by colleag*" OR "support by the manager*" OR "task difficult*" OR "time pressure*" OR "unclear task*" OR "work load*" OR "workload*" OR appreciati* OR autonom* OR interruption* OR overchoice OR participation* OR recover* OR recreati* OR relax* OR reorganisation* OR reorganization* OR reward* OR technostress*)		

S5	DE "Fatigue" OR DE "Stress" OR DE "Academic Stress" OR DE "Chronic Stress" OR DE "Environmental Stress" OR DE "Financial Strain" OR DE "Occupational Stress" OR DE "Physiological Stress" OR DE "Posttraumatic Stress" OR DE "Psychological Stress" OR DE "Social Stress" OR DE "Stress Reactions" OR DE "Distress" OR DE "Mental Health" OR DE "Mental Status" OR DE "Quality of Life" OR DE "Health Related Quality of Life" OR DE "Quality of Work Life" OR DE "Quality of Life Measures" OR DE "Anxiety" OR DE "Anxiety Sensitivity" OR DE "Performance Anxiety" OR DE "Social Anxiety" OR DE "Depression (Emotion)" OR TI(burnout* OR "burn out*" OR anxi* OR depress* OR stress* OR "mental health" OR "quality of life" OR "psychological health" OR exhaust* OR "psychological fatigue*" OR "mental fatigue*") OR AB(burnout* OR "burn out*" OR anxi* OR depress* OR stress* OR "mental health" OR "quality of life" OR "psychological health" OR exhaust* OR "psychological fatigue*" OR "mental fatigue*") OR KW(burnout* OR "burn out*" OR anxi* OR depress* OR stress* OR "mental health" OR "quality of life" OR "psychological health" OR exhaust* OR "psychological fatigue*" OR "mental fatigue*")		146,592
S4	DE "Epidemiology" OR DE "Cohort Analysis" OR DE "Causal Analysis" OR DE "Causality" OR DE "Etiology" OR DE "Prognosis" OR DE "Longitudinal Studies" OR DE "Prospective Studies" OR TI(cohort OR (case N3 (control OR controll* OR comparison OR referent)) OR risk OR causation OR causal OR "odds ratio" OR etiol* OR aetiol* OR "natural history" OR predict* OR prognos* OR outcome OR course OR retrospect*) OR AB(cohort OR (case N3 (control OR controll* OR comparison OR referent)) OR risk OR causation OR causal OR "odds ratio" OR etiol* OR aetiol* OR "natural history" OR predict* OR prognos* OR outcome OR course OR retrospect*) OR KW(cohort OR (case N3 (control OR controll* OR comparison OR referent)) OR risk OR causation OR causal OR "odds ratio" OR etiol* OR aetiol* OR "natural history" OR predict* OR prognos* OR outcome OR course OR retrospect*)		253,303
S3	DE "Employment Status" OR DE "Occupations" OR DE "Reemployment" OR DE "Child Care Workers" OR DE "Emergency Personnel" OR DE "Fire Fighters" OR DE "First Responders" OR DE "Paramedics" OR DE "Police Personnel" OR DE "Rescue Workers" OR DE "Social Workers" OR DE "Professional Personnel" OR DE "Personnel" OR DE "Anthropologists" OR DE "Clinicians" OR DE "Counselors" OR DE "Counselor Characteristics" OR DE "Counselor Trainees" OR DE "Rehabilitation Counselors" OR DE "School Counselors" OR DE "Vocational Counselors" OR DE "Educational Personnel" OR DE "School Administrators" OR DE "School Counselors" OR DE "School Nurses" OR DE "Teacher Aides" OR DE "Teachers" OR DE "Health Personnel" OR DE "Allied Health Personnel" OR DE "Caregivers" OR DE "Medical Personnel" OR DE "Mental Health Personnel" OR DE "Information Specialists" OR DE "Librarians" OR DE "Legal Personnel" OR DE "Attorneys" OR DE "Judges" OR DE "Law Enforcement Personnel" OR DE "Physicists" OR DE "Psychologists" OR DE "Clinical Psychologists" OR DE "Counseling Psychologists" OR DE "Educational Psychologists" OR DE "Experimental Psychologists" OR DE "Industrial Psychologists" OR DE "Military Psychologists" OR DE "Social Psychologists" OR DE "Scientists" OR DE "Sociologists" OR DE "Therapists" OR DE "Occupational Therapists" OR DE "Physical Therapists" OR DE "Psychotherapists" OR DE "Speech Therapists" OR DE "Therapist Trainees" OR DE "Working		140,203

	Conditions" OR DE "Occupational Safety" OR DE "Working Space" OR TI(work* OR occupation* OR profession* OR job OR jobs OR employ* OR labor OR laborer* OR labour* OR vocation*) OR AB(work* OR occupation* OR profession* OR job OR jobs OR employ* OR labor OR laborer* OR labour* OR vocation*) OR KW(work* OR occupation* OR profession* OR job OR jobs OR employ* OR labor OR laborer* OR labour* OR vocation*)		
S2	TI(young* OR "early career*" OR "job starter*" OR "short work experience") OR AB(young* OR "early career*" OR "job starter*" OR "short work experience") OR KW(young* OR "early career*" OR "job starter*" OR "short work experience")		76,548
S1		Limiters - Age Groups: Young Adulthood (18-29 yrs)	573,704

Prisma Checklist

Section and Topic	Item #	Checklist item	Location where item is reported
TITLE			
Title	1	Identify the report as a systematic review.	Title
ABSTRACT			
Abstract	2	See the PRISMA 2020 for Abstracts checklist.	Abstract
INTRODUCTION			
Rationale	3	Describe the rationale for the review in the context of existing knowledge.	Introduction
Objectives	4	Provide an explicit statement of the objective(s) or question(s) the review addresses.	Introduction
METHODS			
Eligibility criteria	5	Specify the inclusion and exclusion criteria for the review and how studies were grouped for the syntheses.	Methods
Information sources	6	Specify all databases, registers, websites, organisations, reference lists and other sources searched or consulted to identify studies. Specify the date when each source was last searched or consulted.	Methods
Search strategy	7	Present the full search strategies for all databases, registers and websites, including any filters and limits used.	Supplementary file
Selection process	8	Specify the methods used to decide whether a study met the inclusion criteria of the review, including how many reviewers screened each record and each report retrieved, whether they worked independently, and if applicable, details of automation tools used in the process.	Methods
Data collection process	9	Specify the methods used to collect data from reports, including how many reviewers collected data from each report, whether they worked independently, any processes for obtaining or confirming data from study investigators, and if applicable, details of automation tools used in the process.	Methods
Data items	10a	List and define all outcomes for which data were sought. Specify whether all results that were compatible with each outcome domain in each study were sought (e.g. for all measures, time points, analyses), and if not, the methods used to decide which results to collect.	Methods
	10b	List and define all other variables for which data were sought (e.g. participant and intervention characteristics, funding sources). Describe any assumptions made about any missing or unclear information.	Methods
Study risk of bias assessment	11	Specify the methods used to assess risk of bias in the included studies, including details of the tool(s) used, how many reviewers assessed each study and whether they worked independently, and if applicable, details of automation tools used in the process.	Methods
Effect measures	12	Specify for each outcome the effect measure(s) (e.g. risk ratio, mean difference) used in the synthesis or presentation of results.	n.a.
Synthesis methods	13a	Describe the processes used to decide which studies were eligible for each synthesis (e.g. tabulating the study intervention characteristics and comparing against the planned groups for each synthesis (item #5)).	Methods
	13b	Describe any methods required to prepare the data for presentation or synthesis, such as handling of missing summary statistics, or data conversions.	n.a.
	13c	Describe any methods used to tabulate or visually display results of individual studies and syntheses.	n.a.
	13d	Describe any methods used to synthesize results and provide a rationale for the choice(s). If meta-analysis was performed, describe the model(s), method(s) to identify the presence and extent of statistical heterogeneity, and software package(s) used.	Methods
	13e	Describe any methods used to explore possible causes of heterogeneity among study results (e.g. subgroup analysis, meta-regression).	n.a.
	13f	Describe any sensitivity analyses conducted to assess robustness of the synthesized results.	n.a.

Prisma Checklist (continued)

Section and Topic	Item #	Checklist item	Location where item is reported
Reporting bias assessment	14	Describe any methods used to assess risk of bias due to missing results in a synthesis (arising from reporting biases).	Results
Certainty assessment	15	Describe any methods used to assess certainty (or confidence) in the body of evidence for an outcome.	Methods
RESULTS			
Study selection	16a	Describe the results of the search and selection process, from the number of records identified in the search to the number of studies included in the review, ideally using a flow diagram.	Results
	16b	Cite studies that might appear to meet the inclusion criteria, but which were excluded, and explain why they were excluded.	Not reported
Study characteristics	17	Cite each included study and present its characteristics.	Table 1
Risk of bias in studies	18	Present assessments of risk of bias for each included study.	Table 2
Results of individual studies	19	For all outcomes, present, for each study: (a) summary statistics for each group (where appropriate) and (b) an effect estimate and its precision (e.g. confidence/credible interval), ideally using structured tables or plots.	Table 3
Results of syntheses	20a	For each synthesis, briefly summarise the characteristics and risk of bias among contributing studies.	Table 4
	20b	Present results of all statistical syntheses conducted. If meta-analysis was done, present for each the summary estimate and its precision (e.g. confidence/credible interval) and measures of statistical heterogeneity. If comparing groups, describe the direction of the effect.	n.a.
	20c	Present results of all investigations of possible causes of heterogeneity among study results.	n.a.
	20d	Present results of all sensitivity analyses conducted to assess the robustness of the synthesized results.	n.a.
Reporting biases	21	Present assessments of risk of bias due to missing results (arising from reporting biases) for each synthesis assessed.	Results
Certainty of evidence	22	Present assessments of certainty (or confidence) in the body of evidence for each outcome assessed.	Table 4
DISCUSSION			
Discussion	23a	Provide a general interpretation of the results in the context of other evidence.	Discussion
	23b	Discuss any limitations of the evidence included in the review.	Discussion
	23c	Discuss any limitations of the review processes used.	Discussion
	23d	Discuss implications of the results for practice, policy, and future research.	Discussion
OTHER INFORMATION			
Registration and protocol	24a	Provide registration information for the review, including register name and registration number, or state that the review was not registered.	Introduction
	24b	Indicate where the review protocol can be accessed, or state that a protocol was not prepared.	Methods
	24c	Describe and explain any amendments to information provided at registration or in the protocol.	n.a.
Support	25	Describe sources of financial or non-financial support for the review, and the role of the funders or sponsors in the review.	Abstract
Competing interests	26	Declare any competing interests of review authors.	Discussion
Availability of data, code and other materials	27	Report which of the following are publicly available and where they can be found: template data collection forms; data extracted from included studies; data used for all analyses; analytic code; any other materials used in the review.	n.a.

From: Page MJ, McKenzie JE, Bossuyt PM, Boutron I, Hoffmann TC, Mulrow CD, et al. The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. BMJ 2021;372:n71. doi: 10.1136/bmj.n71

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Malte van Veen
Roosmarijn M. C. Schelvis
Paulien M. Bongers
Karen M. Oude Hengel
Cécile R. L. Boot

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Chapter

A qualitative study of young workers' experience of the psychosocial work environment and how this affects their mental health

3

three

A qualitative study of young workers' experience of the psychosocial work environment and how this affects their mental health

Abstract

Background: The evidence base for the relationship between psychosocial work factors and mental health focuses primarily on the general working population but little is known about young workers. The aim of this qualitative study is to identify psychosocial work factors that affect the mental health of young workers, with a focus on (1) novel factors of the psychosocial work environment that are relevant for young workers but have not been described in the literature and (2) experiences of psychosocial work factors associated with mental health that are specific to and typical for young workers.

Methods: Semi-structured interviews were held with 36 workers aged up to 30. Participants were asked to describe work situations that affected their mental health. Factors were identified using a combination of inductive and deductive coding and open-coded factors were mapped onto the Copenhagen Psychosocial Questionnaire (COPSOQ), which is widely used as a framework for psychosocial work factors.

Results: Most of the psychosocial factors mentioned by the young workers could be mapped onto the COPSOQ framework and were therefore similar to the general working population. Novel factors identified by this study were "Procedural support" and "Responsibility for others". We also identified young-worker-specific experiences of psychosocial work factors associated with mental health (i.e. Quantitative Demands, Influence at Work, Commitment to the Workplace, Job Insecurity, Quality of work, Job satisfaction, and Vertical Trust). Lastly, young workers did not report the COPSOQ factor Insecurity over working conditions and Work-life conflict was reported as an indicator of mental health status rather than being perceived as a factor of the psychosocial work environment.

Conclusions: Psychosocial work factors and their influence on mental health reported by young workers in this qualitative study are comparable to what is reported for the general working population. There are however some young-worker-specific experiences of psychosocial work factors and two novel factors. The novel factors, "Procedural support" and "Responsibility for others" are not found in common psychosocial work factor frameworks and might be studied specifically in relation to young workers. Our results provide organisations with levers that can be used to create a psychosocial work environment that benefits the mental health of young workers.

Keywords: Mental health, Young workers, Psychosocial work factors, Interview study

Background

Most young workers (aged ≤ 30) starting their professional career find that work contributes positively to their mental health (1). Yet poor psychosocial work circumstances can have an adverse effect on mental health (2, 3). In particular, the experience of poor psychosocial working conditions on entering the job market has been shown to lead to worsening mental health for young workers (4). Psychosocial work factors found to be associated with mental health among the general working population are high job demands, effort-reward imbalance, job insecurity, and low organisational justice (5). However, systematic reviews focusing on young workers have shown that the evidence base on how and which psychosocial work factors affect the mental health of this population is weak, mainly due to the limited number of studies on this topic (6, 7).

Since it is open to question whether, and how, the findings from the general working population are applicable to young workers, it is important to study young workers as a distinct group. It is hypothesised that first jobbers and young workers in general have certain work-related needs that affect their mental health and that these needs are distinct from those of their older colleagues. In an overview article, Zacher and Froidevaux (2021) (8) present data from a systematic review, a meta-analysis and an original study respectively to suggest that younger workers are less capable of regulating their emotions than older workers (9), less committed to organisations (10) and have higher intentions to leave (11) ; however the authors also acknowledge that much remains unknown. Taris et al. (1992) (12) suggest that the mental health of young workers in particular is affected by having to juggle loyalties to different people at work and that young workers have more need for clear procedures in their jobs than their older colleagues. Ebner et al. (2006) (13) found that younger workers' personal goal orientation is more focused on promotion (i.e. motivation to achieve gains), whereas older workers' personal goal orientation is more focused on prevention (i.e. motivation to avoid losses). This may lead to age-related differences on the work floor in terms of how young workers act and appraise the psychosocial work environment compared to older workers. However, a recent systematic review we performed acknowledged that much is still unknown about psychosocial work factors that affect the mental health of young workers given the high uncertainty of the evidence due to fuzziness in the conceptualization of outcomes and high study heterogeneity (7).

The assessment of how the psychosocial work environment affects mental health in ways that are typical for young workers is potentially limited because studies on the topic are mainly based on the existing traditional occupational health models (i.e. job demand-control-resource model [14] and effort-reward imbalance model [15]), leaving little room to identify novel factors and consider age-related particularities. As so little is known about the work-related mental health of young workers, research is needed to examine whether these existing models capture all aspects of the psychosocial work environment that are relevant for young workers. A primarily inductive, qualitative exploratory study not guided by existing models, with a targeted sample of young workers, allows for the identification of previously overlooked psychosocial work factors. Such an approach also allows for the identification of known psychosocial work factors associated with mental health that are perceived and experienced in ways that are specific to and typical for young workers.

Against the background described above, the aim of the current study is to identify psychosocial work factors that affect mental health of young workers, with a focus on (1) novel factors of the psychosocial work environment that are relevant for young workers but have not been described in the literature and (2) young-worker-specific experiences of psychosocial work factors that are well-described in the literature.

Methods

Study design

We applied a qualitative research design, using semi-structured interviews. All interviews were conducted online via Microsoft Teams. Since we are interested in the experiences of young workers, rather than providing them with a definition that would be used throughout the interview, we asked

the study participants to define mental health in their own words. Specifically, they were asked to describe experiences, emotions, feelings, behaviours, and mental states they associate with their personal mental health. We used this description throughout the interview. Following the suggestions by Braun and Clarke (2006) (16) for conducting thematic analysis, we attempt to make explicit the epistemological underpinnings of our study: we believe that the psychosocial work circumstances that the young workers are describing are commonly experienced by young adults in Dutch workplaces. We adhere to COREQ Reporting Guidelines (17) (the COREQ checklist can be found in Additional file 1). By using these guidelines we also attempt to make explicit issues of reflexivity (i.e. the way our own personal biases may have affected the results).

Participant selection and recruitment

We employed purposive sampling based on the criteria of sex (male versus female), educational level (vocational education versus (at least) a college degree), and whether the young worker had an interpersonal or non-interpersonal job. We used these sampling criteria in light of research indicating that mental health at work differs according to sex (18), across educational groups (19), and by type of work (20). Young workers only qualified for inclusion if they were between 18 and 30 years old and worked at least 16 h per week. Eligibility for inclusion was double-checked at the beginning of each interview.

Participants were recruited through the social media platforms LinkedIn and Instagram with a poster and a video in which author MVV asked young workers to participate. The team of authors reposted the message on their LinkedIn profiles to increase the reach. Additionally, we approached young worker and young adult advocacy groups, some of which shared our recruitment request on their own channels and platforms. Interested participants could sign up for the study by clicking a link in the poster and social media posts. This led them to a landing page where they completed an application form, noting their age, sex, educational level, role and job title. They were then redirected to an online scheduling tool where they could choose a date and time for the interview from the time slots offered by the researchers. As a token of appreciation for their participation, the participants received a €25 online gift card. Participants were categorised as having an interpersonal or non-interpersonal job based on their responses. This categorisation into type of work was done by author MVV.

The online recruitment procedure was successful and quickly yielded a large number of applications for the interviews. However, the fast pace of applications and scheduled interviews made it difficult for the researchers to adhere to the specified purposive sampling criteria and highly educated females were overrepresented in the initial sample. Therefore, in a second recruitment request issued through the same online channels, we specifically asked males and persons with vocational-level education to apply for an interview.

Ultimately, the study population consisted of 36 young workers: 29 females and seven males. Eight had completed vocational education and 28 had at least a college degree. Of the 36 interviewees, 15 were working in interpersonal jobs and 21 in non-interpersonal jobs. Males with a college degree and a non-interpersonal job were not represented in the final sample. Non-response was limited: one participant did not show up for a scheduled interview for reasons unknown and did not respond to subsequent contact attempts.

Data collection

Semi-structured interviews were held between April and June of 2023. The first set of interview questions concerned the interviewee's past and current work life. This was followed by a set of questions on the interviewee's mental health in general. In the central section of the interview, interviewees were asked to describe situations at work that affected their mental health in some way. These situations were then explored with loosely structured follow-up questions to identify the psychosocial work factors involved. This meant that all results concerning the psychosocial work environment were discussed in the context of their impact on personal mental health. The interview protocol, which can be found in Additional file 2, was piloted by researchers interviewing each other (RS interviewing MVV and MVV interviewing LA).

Participants were asked to choose a setting where they could be interviewed without interruption. The interviews lasted between 40 and 60 min. All but two interviews were conducted in Dutch, which was the native language of those interviewed in Dutch. None of the individuals involved in the two interviews conducted in English spoke English as a native language. All interviews were conducted by two researchers in varying roles, with MVV being present at all interviews. One researcher led the interview, the other took notes and asked follow-up questions if they felt it would be informative.

A summary of the interview based on the notes taken by the second researcher was shared with the participant for confirmation and possible amendments. Audio recordings of the interviews were made and transcribed by an external party.

At the beginning of the interview the interviewers briefly introduced themselves by name and explained their professional background and the context in which the study was being conducted, i.e. as part of MVV's doctoral research. After the interview, we sent the participant a summary of the interview to check that we had understood them correctly. We also asked for feedback on the interview. This did not yield any feedback that required us to make changes to the interview protocol.

Interviewer characteristics

Author MVV, MSc, 32-year-old male, background in social psychology and epidemiology, was present at all interviews. Three interviews were conducted with author RS, PhD, 37-year-old female, 32 interviews were conducted with JM, MSc, 25-year-old female, and one interview was conducted with LA, MSc 28-year-old female (for the latter two interviewers see the Acknowledgements). All interviewers were employed by the Amsterdam UMC Department of Public and Occupational Health at the time of data collection. All interviewers were experienced in conducting interviews.

Data analysis

We combined an inductive and deductive approach, giving primacy to the inductive components (see Figure 1. Flowchart of coding process). Data analysis began after all interviews had been conducted. Coding was done using MAXQDA software. In the inductive phase, MVV and RS open-coded the first three interviews and reached a consensus on further open coding. MVV then open-coded another seven interviews. In the deductive phase, the codes of these ten interviews were grouped, using the third version of the Copenhagen Psychosocial Questionnaire COPSOQ (21) as a framework, and discussed by three of the authors (MVV, RS, CB) in a consensus meeting. The framework was thought to encompass the most common and important psychosocial work factors for the general working population divided into eight domains, of which our study included the first six, namely Demands at Work, Work Organisation and Job Content, Interpersonal Relations and Leadership, Work-Individual Interface, Social Capital, and Conflicts and Offensive Behaviour. We did not include the last two domains Health and well-being and Personality as they do not characterise the psychosocial work environment. Where open codes could not be mapped onto the COPSOQ reference framework, they constituted a novel (not previously described) psychosocial work factor perceived and appraised by young workers. Young-worker-specific experiences of COPSOQ factors plus potential novel factors constitute the main themes of the analysis. With the aim of analysing information from different groups of young workers, another four interviews were open-coded in order to achieve a more equal distribution of the background characteristics on which the purposive sampling strategy was based. With these 14 open-coded interviews serving as a basis, the summaries of all remaining interviews were checked for potential new themes. This led to the open-coding of another four interviews, such that 18 of the interview transcripts were open-coded and grouped using the COPSOQ framework. The summaries of the other 18 interviews were rechecked by author MVV for potential new topics that may have revealed new themes. This check involved reading the summary with all identified themes in mind and noting any new themes that appeared. When no new themes appeared, authors MVV and CB agreed that data saturation had been reached.

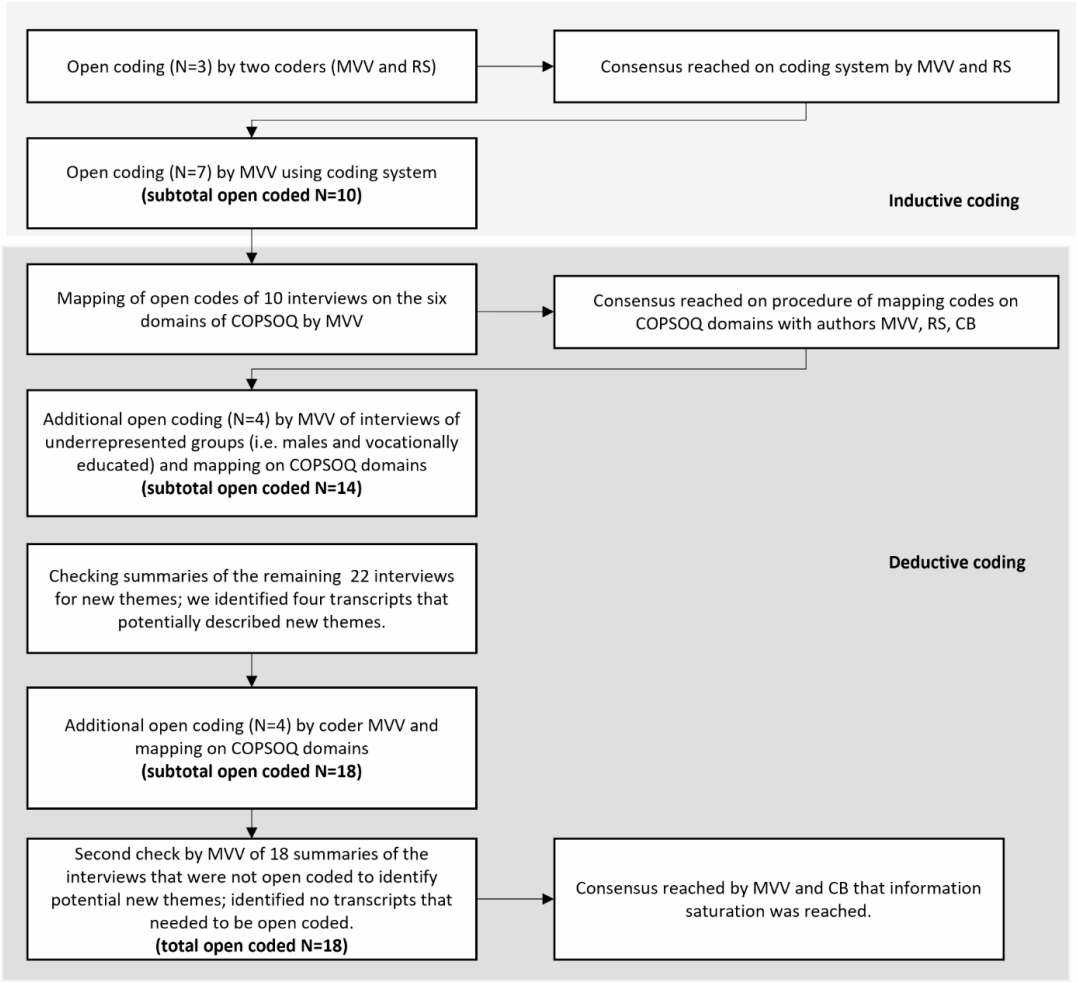

Figure 1. Flowchart of the coding process. Initial inductive coding was based on ten interviews, followed by a deductive process of mapping open codes on the six COPSOQ domains as well as additional open coding of interviews until information saturation was reached. This resulted in 18 interviews being coded in total.

The identified themes (i.e. psychosocial work factors) were then grouped into four categories: (1) experience of the psychosocial work factor is more specific to and typical for young workers in terms of its relationship to mental health, (2) factor appears to be comparable to the general working population and not typical for young workers in terms of its relationship to mental health, (3) factor is not covered by COPSOQ, and (4) factor is not mentioned by young workers. We considered the experience of a factor to be more specific to and typical for young workers (category 1), when age, life course and/or early career-related aspects were included in the way the factor was described by the young worker. We used COPSOQ guidelines and the author team's knowledge of the literature to make the comparison with the general working population (category 2) and discussed this in a consensus meeting (MVV, RS, CB) and after each draft of the manuscript.

We present quotes to support our analysis of young worker experiences of psychosocial work factors (category 1) and novel factors (category 3), selecting one or two quotes that are most illustrative of the point we want to make. In the case of the psychosocial work factors that are comparable to the general working population (category 2), we only present a quote if this adds to the understanding of the psychosocial work factor.

Results

Mental health

Young workers associate good personal mental health with having enough energy to spend their days the way they want, including work and leisure activities. Indicators of poor mental health are feeling exhausted and irritable, and lacking the energy to engage in social activities after work. Young workers also mentioned "not feeling oneself" as an indicator of poor mental health.

> "[when thinking about good mental health] I mainly think: getting through the day with ease. And fortunately, if you are mentally healthy then you are happy and life comes easy to you. That's what I would classify as that. Well let's say things are going well, do I have a lot of energy? Do I have a lot of headspace to meet people and do new things? Those kind of things. And suppose my mental health was lower (sic.), then I don't have those things. So then I have less energy, I am more introverted. Then life just looks less rosy."

Interviewee #9, college-educated female in a non-interpersonal job

> "I think a good work-life balance, partly, in terms of energy and such. Mental health means that you yourself… Yes, I really think: finding a good balance. And that you are really enjoying yourself and make yourself comfortable. Also in private life, but also at work, in this case. That you find your challenges. That you continue to develop. To me, that is my mental health".

Interviewee #36, vocational-level educated male in a non-interpersonal job

Psychosocial work environment

Per COPSOQ domain, we discuss the psychosocial work factors, and combinations of psychosocial work factors, that affect mental health in a way that is typical for young workers. The category system used can be found in Additional file 3. We also discuss novel factors and factors that appeared similar to what we know from the literature on the general working population (see Table 1 for an overview).

Domain A: demands at work

Young workers described all but one of the psychosocial work factors in this domain in ways that appeared to be similar to the COPSOQ description for the general working population. Only the experience of Quantitative demands was typical for young workers. Additionally, young workers described the novel factor "Responsibility for others" (Table 1).

Experiences more typical for young workers. Concerning Quantitative demands, young workers said that having too little work was undesirable and being told that this was normal during an onboarding period did not help. At the same time young workers also mentioned the risk of creating a problematically high workload for themselves when being asked to do tasks because of the difficulty of saying no. Young workers said it was sometimes difficult to reject work because they felt they had to prove themselves.

> "If someone says, do this and this, then I will not immediately say in a new position, 'no, I am not going to do this', or 'I don't think that is how it should be done'. Then I'll accept it anyway."

Interviewee #27, college-educated male in an interpersonal job

> "That is really something of which I thought: when I have put this together, then I really have something nice to put in my track record. Very cool in the beginning, [it gave] a lot of energy. It also took up a lot of my time. But I had to do that in consultation with my boss. My boss and the boss of [other organisation] we worked with continuously disagreed […] At a certain point we made a call ourselves […]. My boss ultimately did not agree with that although I had run it by him, maybe his thoughts were elsewhere. So that was very confusing for me. And that particular day that we went live, I had my first panic attack."

Interviewee #1, college-educated female in an interpersonal job

Table 1. Overview of psychosocial work factors per domain, categorised as typical for young workers, similar to the general working population, novel with regard to the COPSOQ and not mentioned

Psycho-social Work Factor Domain	**Psychosocial work factor experiences and appraisals more typical for young workers**	**Psychosocial work factors experienced by the general working population**	**Novel psychosocial work factors not covered by the COPSOQ**	**Psychosocial work factors not mentioned**
A Demands at Work	Quantitative demands	Work pace, Cognitive demands, Emotional demands, Demand for hiding emotions	Responsibility for others	NA
B Work Organisation and Job Content	Influence at work	Possibilities for development, Variation of work, Control over working time, Meaning of work	None	NA
C Interpersonal Relations and Leadership	None	Recognition, Role clarity, Illegitimate tasks, Quality of leadership, Social support from colleagues, Social support from supervisors, Sense of community at work, Predictability	Procedural Support	NA
D Work-Individual Interface	Commitment to the workplace, Job insecurity, Quality of work, Job satisfaction	Work engagement	None	Insecurity over working conditions, Work-life conflict
E Social Capital	Vertical trust	Horizontal trust[a], Organisational justice	None	NA
F Conflicts and Offensive Behaviour	None	Harassment and gender-based discrimination	None	NA

[a] Horizontal trust is conceptually closely related to the Domain C COPSOQ factor Sense of community at work. The distinctive sign of a lack of horizontal trust as defined by the COPSOQ, namely "withholding information" from colleagues or management, was not reported by young workers
NA = Not applicable

Experiences similar to the general working population. Work pace, Cognitive demands, Emotional demands, and Demand for hiding emotions were all mentioned by young workers but were not perceived in ways that appeared to be more typical for young workers than for the general working population.

Novel factor. Responsibility for others. A factor mentioned by young workers but not covered by the COPSOQ framework was "Responsibility for others". Having a role that meant that one's work might negatively affect others (such as colleagues, patients, students, and interns) was sometimes perceived as a burden for young workers.

> "I had the feeling that without me nothing would happen and that was the case indeed. If I didn't go to work, people wouldn't have an internship."

Interviewee #4, college-educated male in an interpersonal job

> "I felt a great responsibility towards the students. Like: okay, then there will be nothing prepared for them [the students]. I want that there is something prepared for them."

Interviewee #8, college-educated female in an interpersonal job

Domain B: work organisation and job content

Young workers' association of mental health with psychosocial work factors belonging to the domain of Work Organisation and Job Content appears to be mostly similar to the COPSOQ description for general working population. Only the experience of Influence at work as a psychosocial work factor was specific to and typical for young workers (Table 1).

Experience more typical for young workers. Concerning Influence at work, young workers said they wanted to have influence on the way they carry out tasks at work, particularly when they have developed the necessary skills through education or earlier work experience. This was less important to them when doing tasks for which they felt they lacked competence. Young workers also said that they did not raise issues at work because they felt too junior to object.

> "I remember, I had just graduated and had two master's degrees […] and had skills and then I had to crop images in photoshop and pick up the mail. [When I said something about it] I received feedback that I should first take a closer look at how an organisation was put together before I started doing my own things."

Interviewee #22, college-educated female in a non-interpersonal job

> "At my previous job I had to figure out everything myself, how everything worked and how it all… While I was actually not trained for that, not sufficiently trained for it."

Interviewee #4, college-educated male in an interpersonal job

Experiences similar to the general working population. Possibilities for development, Variation of work, Control over working time, and Meaning of work were all mentioned by young workers but were not perceived in ways that appeared to be more typical for young workers than for the general working population.

Domain C: interpersonal relations and leadership

We did not find any experiences that were specific to or more typical for young workers. All factors were similar to the COPSOQ description for general working population. These factors are Recognition, Role clarity, Illegitimate tasks, Quality of leadership, Social support from colleagues, Social support from supervisors, Sense of community at work, and Predictability. In addition, we identified a novel factor that we labelled "Procedural support" (Table 1).

Novel factor. A factor described by young workers but not covered by the COPSOQ was "Procedural support". Young workers expressed a need to be presented with clear procedures and a desire for established ways of doing things within an organisation. While young workers felt it was important to have influence on how they carried out their tasks, they appreciated having established structures to fall back on.

> "Yes, I think there is clarity in the state of affairs, that if you are busy carrying out your work, that you know if A happens, then I can go to B to get C done, so to speak, that you just know where you stand, I need that in any case."

Interviewee #4, college-educated male in an interpersonal job

> "I enter a company and you just notice: the systems are not set up, things are shared via WhatsApp groups. Declarations… how the declarations are shared via WhatsApp groups. So I can already see a bit of: this is an up and coming company, while, it was not even really an up and coming company."

Interviewee #33, vocational-level educated female in a non-interpersonal job

Domain D: work-individual interface

All but one of the psychosocial work factors in this COPSOQ domain were associated with mental health in ways that were typical for young workers. The only factor not perceived in a way that was specific to young workers was Work engagement. No novel factors were identified (Table 1).

Experiences more typical for young workers. To feel Commitment to the workplace, young workers had to experience their work as meaningful, i.e. their employer had to contribute to a societally relevant goal they identified with to secure their commitment to the organisation. One young worker's impression was that commitment to the workplace increases with tenure. Young workers also explicitly stated that not being too committed to one's workplace could be a healthy buffer against exceeding one's limits in a way that would negatively affect mental health.

> "Money is nice, but I deliberately chose this job and this employer, because it is a socially very relevant topic, like the energy transition. There's just a lot happening and it affects everyone."

Interviewee #5, college-educated female in a non-interpersonal job

Concerning Job insecurity, having a temporary contract with an uncertain prospect of contract renewal was a significant stressor for young workers. Conversely, job security meant that young workers were less likely to exceed their limits and therefore less prone to mental health issues.

> "Of course I can also say: okay, I'm just going to work less hard, or I'll just deliver less work, less good work, but of course I never wanted that up until now. I just wanted to perform well and show my best side. But I also think that because I have now been given that permanent position and somewhat more the guarantee that I'm good. I now dare to let go a little more. Like: okay, I'm not going to work the whole evening now, then they'll just have to wait for that report."

Interviewee #8, college-educated female in an interpersonal job

Concerning Quality of work, experiencing a lack of competence to deliver work of sufficient quality was perceived as stressful. Another frustration related to quality of work was that more senior colleagues expressed an unwillingness to adapt their work even if that would lead to better results. Additionally, young workers said they could feel insecure about their own skills when comparing themselves to the older colleagues. Being aware that their work was sloppy due to poor mental health was seen as part of a vicious circle that increasingly undermined the quality of their work.

> "I noticed that I was underperforming and becoming sloppy and no longer paying close attention to the details. So those were signals for me, and especially if you do that… at some point you end up in a vicious circle. The situation makes you function less, but if it is also emphasized that you are not doing things right, you get even deeper into it."

Interviewee #2, college-educated male in an interpersonal job

Concerning the salary aspect of Job satisfaction, some young workers said satisfaction with their salary was sufficient for well-being, at least for a side job. Other young workers were inclined to see satisfaction with their salary as a necessary but not sufficient condition for well-being.

Experience similar to the general working population. Concerning Work engagement, young workers said they did not like to experience a lower level of work engagement since this led them to spend less time on work activities and adversely affected the quality of their work. In other words, they saw reduced work engagement as a consequence and not just a cause of worsened mental health. More specifically, a lower level of work engagement was described as a way of coping with poor mental health, particularly for those who aspired to do societally relevant work.

> "I just don't really know what I could have done differently, except maybe trying my best a bit less. But I find that very difficult. […] Maybe also be more patient and distance myself a little more mentally or emotionally from my work. I could have done that, but I actually don't want to."

Interviewee #32, college-educated female in an interpersonal job

Notably, Insecurity over working conditions was not mentioned by the young workers and Work-life conflict was described as an indicator of mental health status rather than being perceived as a factor of the psychosocial work environment.

Domain E: social capital

In this domain only the factor of Vertical trust was perceived in a way that was typical for young workers. Their experiences of the factors of Horizontal trust and Organisational justice were similar to the COPSOQ description for the general working population (Table 1).

Experience more typical for young workers. Concerning Vertical trust, young workers said it was important that they did not feel controlled by their supervisor, since this made them feel insecure, especially if the young worker lacked confidence in their own competence. Young workers illustrated vertical trust as being able to do a 'sanity check' with a trusted supervisor in a disagreement with colleagues.

> "If I notice that my work is being monitored, from which I infer that the other person either wants to take over, or if I notice that the manager […] is having a kind of suspicious idea, like "did you actually do it like this", or "did you actually do it in this particular way?" And I think it is important to be trusted in how I do it and what I do."

Interviewee #2, college-educated male in an interpersonal job

Domain F: conflicts and offensive behaviour

Overall experiences associated with this domain were occasionally reported by young workers and described as having a detrimental effect on their mental health. Nevertheless, being a young worker was not reported to be a key factor in the experience (Table 1).

Discussion

Young workers reported a broad set of mental health-related psychosocial work factors that are also described in the COPSOQ. There is therefore considerable similarity between young workers and the general working population. This implies that factors known to affect mental health in the general working population, such as Emotional demands, Possibilities for development and Recognition (2) also affect the mental health of young workers. Across the different COPSOQ domains, this similarity was particularly evident for factors in domains C Interpersonal Relations and Leadership and F Conflicts and Offensive Behaviour. However, some psychosocial work factors were perceived in ways that appeared to be specific to and typical for young workers (i.e. Quantitative Demands (A), Influence at Work (B), Commitment to the workplace (D), Job insecurity (D), Quality of work (D), Job satisfaction (D) and Vertical Trust (E)). We found this to be the case particularly for factors in the COPSOQ domain D Work-Individual Interface and for one of the factors in domains A Demands at Work, B Work Organisation and Job Content and E Social Capital. Additionally, we identified two novel factors, which appear to be typical for young workers. We labelled these (1) "Procedural support" and (2) "Responsibility for others" internal and external to the organisation.

Experiences of psychosocial factors specific to young workers

Some psychosocial factors were perceived in ways that were specific to young workers (Quantitative Demands, Influence at Work, Commitment to the Workplace, Job Insecurity, Quality of work, Job satisfaction and Vertical Trust). We offer two lines of reasoning as to why the experiences reported by the group of young workers differed from the known relationships between the psychosocial work environment and mental health for the general working population. The first line of reasoning focuses on the fact that many of the young workers were in their first career job or reported situations they encountered in their first career job (typically referred to by the participants as their first "real job" as opposed to a side job they had as a student). This meant that many of the young workers did not have a frame of reference for workplace norms and their first work experiences were their only point of reference for what they considered normal in working life. This is illustrated by young workers exceeding their personal limits in ways they now say they would no longer do. While evidence is scarce for effects of lacking experiences with workplace norms on mental health, young workers' lack of confidence to address problems at work has been identified as a risk for physical safety at work (22) and the same vulnerability might thus cause issues concerning mental health. Also, young workers may find it more difficult to access organisational resources (e.g. asking for and securing help from colleagues) due to their lack of experience and lack of familiarity with a new workplace, which has been reported as a threat to physical safety at work (22). This contributes to the identified need for procedural support and is also reflected in the young workers' awareness of their responsibility for others internal and external to the organisation.

The second line of reasoning concerns age effects (affecting an individual), period effects (affecting the whole population), and cohort effects (affecting groups of individuals within the population) (23), that are not limited to the work domain but reflect broader individual and/or societal developments. Our study reflects the perspectives of young workers in the current era and these workers generally belong to the same cohort. A recent meta-analysis of "generational differences" showed mixed and limited scientific support for meaningful differences between generations in relation to a variety of outcomes (24). This calls into question the relevance of the idea of "generational differences". The idea of "generational differences", which is frequently proposed as an explanation when considering the mental health of young workers, could be another label for what appear to be very robust cohort effects. However, it is notoriously difficult to disentangle these three different types of effects and our qualitative study does not provide the opportunity to contrast groups within our collected data (i.e. young workers versus older workers, workers of all ages today versus workers of all ages in the past, young workers today versus young workers in the past).

Novel psychosocial work factors for young workers

The novel factor we have labelled "Procedural support" resembles what Taris et al. (1992) (12) called "job clarity". We are thus not the first to suggest or identify this factor. Job clarity has been shown to

be a determinant of work-related outcomes, albeit not in relation to mental health (e.g. [25]). An additional reflection on the novel factor of "Procedural support" as we labelled it is appropriate here. Whereas in the COPSOQ "role clarity" refers to clarity regarding one's goals, responsibilities and expectations, the novel factor of "Procedural support" identified by this study refers to clarity about the way things are done within the organisation. This clarity serves as a support tool for our study population, because it makes the organisation predictable and reliable in the way that it operates when the work becomes difficult or if one encounters problems. We see this as distinct from concepts such as procedural and organisational justice described in occupational science (26), because procedural support is about knowing how things are done and not whether the way things are done feels fair or just. This reasoning is supported by the finding that the young workers' experience of Organisational justice (Domain E - Social Capital) was similar to the general working population.

As for the novel factor of "Responsibility for others" internal or external to the organization, our impression is that this factor has not yet been widely researched in the literature on work-related mental health. However, a review of specific stressors for general practitioner trainees names "the sudden assumption of responsibility for patient care" (p.11 [27]), as a stressor for these young workers. This increase in responsibility at work might generalise to other professions. Conceptually, it is important to note that this factor is not only about the perception or appraisal of the young worker. From the interviews it appeared to be an objective feature of a particular job involving responsibility for others (e.g. providing care, supervising interns, delivering lessons to students). There is some overlap with Emotional demands as a psychosocial work factor in the sense that Responsibility for others is regularly found in jobs characterised by high emotional demands (20), particularly when those for whom the young worker is responsible have the impression that their needs are not met. However, the factor of Emotional demands focuses on being confronted with other people's feelings regardless of the formal responsibility one has for these people (see e.g. COPSOQ items and definition [21]).

Methodological considerations

Some methodological considerations should be taken into account when assessing our results. Firstly, our recruitment strategy relied mainly on Instagram and LinkedIn, limiting access for groups that are possibly less active on these platforms (e.g. blue collar workers [28]). Furthermore, vocational-level educated young workers and men were underrepresented in our study population. This potentially reduces the transferability of our results to individuals from these underrepresented groups. Although we reached data saturation with no new themes appearing in the final interviews, we cannot rule out the possibility that our study may have missed insights regarding the groups that were underrepresented in the final sample. Measures taken to strengthen the methodology of our study included the double-coding procedure for the first round of interviews and consensus meetings after subsequent rounds of coding.

Secondly, the reader should take into account the fact that our study used the COPSOQ as a reference framework. The phrase 'similar to the general working population' implies that the finding is 'similar to the COPSOQ'. Although the COPSOQ is comprehensive and widely used in occupational science, there are other measurement instruments we could have chosen as a point of reference (such as the Job Content Questionnaire [29]). Had we done so, this might have led to a slightly different analysis.

Thirdly, we chose to do just one interview with each participant. This might have limited familiarisation between interviewers and interviewees. A disadvantage of this approach is that it is less conducive to the sharing of sensitive personal experiences and might explain why participants barely mentioned factors in COPSOQ Domain F Conflicts and Offensive behaviour. Hence, we cannot rule out the possibility that our study failed to identify psychosocial work factors and potentially even novel factors in this domain that are perceived in ways that are typical for young workers. A different research design is needed to address this.

Finally, the variation within any study sample based on how old workers are (age), when they live (period), and when they were born (cohort) should not be overlooked. In fact, ignoring within-group heterogeneity is one of the main criticisms of the use of "generational differences" as a scientific

explanation in general (30). In our study population, we accounted for heterogeneity within the group of young workers by applying a purposive sampling strategy. However, in our results we did not see clear distinctions along the lines of the purposive sampling criteria of sex, educational level and type of job.

Implications for research and public health

Our results make it clear that more specialised research on young workers is needed, since our study suggests that, despite a considerable overlap, not all findings for the general working population are applicable to young workers. In line with this, we recommend that instruments used to analyse the impact of the psychosocial work environment are complemented with measurements of Procedural support and Responsibility for others when young workers are among the study population. Above we outline the need for repeated data collection on workers of different age groups to disentangle age, period, and cohort effects. Furthermore, it became apparent that there is a reciprocal relationship between mental health and psychosocial work factors, as illustrated by the statement quoted above: "[when mental health is poor] life just looks less rosy". This altered perspective can also be assumed to affect the appraisal of the psychosocial work environment. This potentially reciprocal relationship poses a well-known challenge for research on work-related mental health and is known as the "triviality trap" (31); research designs that focus more explicitly on identifying causal relationships are proposed to tackle this issue (32).

In terms of public health, our study is relevant because young workers experience work-related psychosocial factors in jobs in an ageing society. In many Western countries there is a correlation between retirement age and life expectancy (33). Young workers will have to work for longer than previous generations and good mental health will be an important enabling resource. Future research could specifically take into account the COPSOQ factors not mentioned by our study population to expand our understanding of these factors and prevent them from potentially undermining mental health.

Implications for practice

We conclude that young workers experience many psychosocial work factors in ways that are similar to the general working population. This implies that young workers do not need to be treated as a separate group with distinct features across all psychosocial work dimensions. At the same time, our results show that creating a good psychosocial work environment for young workers requires specific deliberation by organisations. In particular, employers and supervisors should pay attention to the mental health of young workers whose jobs are characterised by high responsibility for others. The young worker assigned the responsibility should be equipped with resources to do the job well and supported by a supervisor. Lastly, employees need access to interventions that address any associated stress. While the provision of procedural support could play a crucial role in these situations, it should also be considered for jobs other than those that are characterised by high responsibility for others. Organisations should make sure that their onboarding and managerial processes effectively support young workers, so they feel secure about "how things are done". Furthermore, organisations should be cautious in assuming that young workers appreciate a high degree of autonomy. Research showed that within-person increases of job autonomy led to an increase of emotional exhaustion (34), which is in line with our finding that young workers experienced an increase in job autonomy as detrimental to their mental health. Organisations, and supervisors in particular, should actively provide procedural support for young workers while also trusting the existing skills and knowledge that the young worker brings to the job.

When applying our results in the context of a work environment it is important to note that our current study did not try to rank order the impact of individual psychosocial work factors on young workers' mental health. Sense of community at work, for example, was widely mentioned by the study participants but was not perceived in a way that was specific to and typical for young workers. This means that the results of our study are not meant to be interpreted as dictating which factors organisations should prioritise given limited resources. Rather, our results indicate what needs to be taken into account in order to create a psychosocial work environment that supports the mental health of young workers.

Conclusion

Young workers reported a broad set of psychosocial work factors that are also described in the COPSOQ. There is therefore considerable overlap between young workers and the general working population in terms of which psychosocial work factors affect workers' mental health. There are however some dynamics that are more typical for younger workers, particularly in COPSOQ domains A Demands at work and D Work-Individual Interface. In addition, two novel factors, i.e. Procedural support and Responsibility for others, which are not found in the commonly used psychosocial work factor frameworks, might be particularly relevant for young workers. Our results provide organisations with levers that can be used to create a positive psychosocial work environment for young workers. One would be to examine young workers' experience more closely when seeking to maximise their influence on how they carry out their work while at the same time providing an environment characterised by supervisor trust and procedural support.

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Appendix

Appendix A – COREQ checklist

No. Item	Guide questions/description	Reported on Section
Domain 1: Research team and reflexivity		
Personal Characteristics		
1. Inter viewer/facilitator	Which author/s conducted the interview or focus group?	methods - interviewer characteristics
2. Credentials	What were the researcher's credentials? E.g. PhD, MD	methods - interviewer characteristics
3. Occupation	What was their occupation at the time of the study?	methods - interviewer characteristics
4. Gender	Was the researcher male or female?	methods - interviewer characteristics
5. Experience and training	What experience or training did the researcher have?	methods - interviewer characteristics
Relationship with participants		
6. Relationship established	Was a relationship established prior to study commencement?	
7. Participant knowledge of the interviewer	What did the participants know about the researcher? e.g. personal goals, reasons for doing the research	methods – interviewer characteristics
8. Interviewer characteristics	What characteristics were reported about the inter viewer/facilitator? e.g. Bias, assumptions, reasons and interests in the research topic	methods – interviewer characteristics methods – data collection
Domain 2: study design		
Theoretical framework		
9. Methodological orientation and Theory	What methodological orientation was stated to underpin the study? e.g. grounded theory, discourse analysis, ethnography, phenomenology, content analysis	methods - study design
Participant selection		
10. Sampling	How were participants selected? e.g. purposive, convenience, consecutive, snowball	methods - participant selection and recruitment
11. Method of approach	How were participants approached? e.g. face-to-face, telephone, mail, email	methods - participant selection and recruitment

12. Sample size	How many participants were in the study?	methods - data collection
13. Non-participation	How many people refused to participate or dropped out? Reasons?	methods - participant selection and recruitment
Setting		
14. Setting of data collection	Where was the data collected? e.g. home, clinic, workplace	methods - study design
15. Presence of non-participants	Was anyone else present besides the participants and researchers?	methods - data collection
16. Description of sample	What are the important characteristics of the sample? e.g. demographic data, date	methods - study population
Data collection		
17. Interview guide	Were questions, prompts, guides provided by the authors? Was it pilot tested?	methods - data collection
18. Repeat interviews	Were repeat inter views carried out? If yes, how many?	not applicable
19. Audio/visual recording	Did the research use audio or visual recording to collect the data?	methods - data collection
20. Field notes	Were field notes made during and/or after the interview or focus group?	methods - data collection & methods - data analysis
21. Duration	What was the duration of the inter views or focus group?	methods - data collection
22. Data saturation	Was data saturation discussed?	methods - data analysis
23. Transcripts returned	Were transcripts returned to participants for comment and/or correction?	methods - data collection
Domain 3: analysis and findings		
Data analysis		
24. Number of data coders	How many data coders coded the data?	methods - data analysis
25. Description of the coding tree	Did authors provide a description of the coding tree?	methods - data analysis
26. Derivation of themes	Were themes identified in advance or derived from the data?	methods - data analysis
27. Software	What software, if applicable, was used to manage the data?	methods - data analysis
28. Participant checking	Did participants provide feedback on the findings?	methods - data collection
Reporting		

29. Quotations presented	Were participant quotations presented to illustrate the themes/findings? Was each quotation identified? e.g. participant number	Results - psychosocial work environment
30. Data and findings consistent	Was there consistency between the data presented and the findings?	Results - psychosocial work environment
31. Clarity of major themes	Were major themes clearly presented in the findings?	Results - psychosocial work environment
32. Clarity of minor themes	Is there a description of diverse cases or discussion of minor themes?	Results - psychosocial work environment

Appendix B – Interview Protocol

- Check that the informed consent has been signed.

- Check: is the setting suitable for an interview?

- Start the recording.

[Introduction]: This conversation will last a maximum of 60 minutes. If you need a break, let us know and we can stop for a moment. If you have any questions about anything, please ask. And if anything is unclear, please say so.

Are you in a setting where you feel comfortable to have this conversation?

1) What is your age? Do you have an education degree? And if so, what programmes or courses did you follow?

a. Did you complete your degree(s)?

2) How long have you been working? Have you generally worked since completing your education?

3) Can you describe your career so far? [Follow-up: Ask approximately how long the interviewee held a position and when.]

a. Follow up if unclear:

i. Sector in which the interviewee worked?

ii. Career, motivation to change job?

iii. Conditions in each workplace?

4) [If not already clear from the answers to question 3:] Please describe a typical working day in your current job.

5) How important is work in your life compared to other things you do?

a. [If the interviewee finds the question difficult:] Do you mainly work to earn money so you can do things outside of work? Or are there other ways in which your work is meaningful to you?

[Transition:] I now have an idea of what your working life has been like so far, your current work and the importance of work in your life. At this point I would like to switch to mental health.

6) What comes to mind when you think about your own mental health? [Use the wording used by the interviewee throughout the interview.]

a. [If the interviewee finds the question difficult:] What do you notice about your mental health?

7) How has your mental health been over the course of your work life? [Repeat the wording used by the interviewee in answer to question 6.]

8) How would you rate your mental health at the moment on a scale of 1 to 10?

a. [If not already clear:] What makes you give this rating?

[Transition to bring the interviewee's attention back to the interview situation after this question:] Do you need a moment to come back to the here and now? Feel free to get up or have a drink and we'll continue when you're ready.

[When the interviewee is ready:]

We are now going to look at situations at work in which your mental health played a role or that affected your mental health.

9) Can you describe a situation at work that made you feel [Use the interviewee's own words about mental health]?

a. Ask questions using the STAR method and downward arrow technique [identify core beliefs and assumptions]

i. Situation - What factors were at play?

ii. Task/responsibility/role - Formal and felt responsibility in the situation?

iii. Result - What was it about the situation that affected your mental health?

iv. Antecedent - How did you approach the situation? Is there a history/context?

v. Development over time - How has this continued to influence your work?

vi. What would it have taken to get a different result?

vii. How could things have gone differently? How could you have prevented it?

viii. What do you take away from this situation? What did you learn from it?

10) Can you describe another situation, possibly from a previous job, in which your mental health played a role?

a. [If the interviewee does not describe a positive experience:] Can you describe a work situation that had a positive influence on your mental health?

11) Does your home situation play a role in how your work contributes to your mental well-being?

12) What do you need to feel good about yourself at work?

13) Do you have any questions or is there anything else you would like to say on this topic that we haven't covered?

- Explain that the interviewee will receive a follow-up email (including the signed informed consent and information letter) inviting them to evaluate the interview and share information that comes to mind after the interview

- Work Condition & Experience at Work > feeling to junior to address issues
- Work Condition & Experience at Work > role of gender
- Work Condition & Experience at Work > first work experience perceived as/becoming reference "normal"
- Work Condition & Experience at Work > colleagues having mental health issues
- Work Condition & Experience at Work > putting less effort in work because of work dissatisfaction
- Work Condition & Experience at Work > competition with other research institutes
- Work Condition & Experience at Work > overall good experience
- Work Condition & Experience at Work > colleagues suggesting to stick to regular working hours
- Work Condition & Experience at Work > depending on others to do one's work
- Work Condition & Experience at Work > experiences at work shared by colleagues
- Work Condition & Experience at Work > hierarchy in an organization
- Work Condition & Experience at Work > interruptions and distractions
- Work Condition & Experience at Work > group norms
  - Work Condition & Experience at Work > group norms > atmosphere at work
- Work Condition & Experience at Work > having young colleagues to talk to
- Work Condition & Experience at Work > discussing age-based differences at work
- Work Condition & Experience at Work > negative situation is temporary
- Work Condition & Experience at Work > not feeling connected to supervisor
- Work Condition & Experience at Work > overall bad experience at work
- Work Condition & Experience at Work > being challenged in a positive way
  - Work Condition & Experience at Work > being challenged in a positive way > knowing how to fill one's work day
    - Work Condition & Experience at Work > being challenged in a positive way > knowing how to fill one's work day > too little work
  - Work Condition & Experience at Work > being challenged in a positive way > boredom
- Work Condition & Experience at Work > employer facilitating following formal education
- Work Condition & Experience at Work > participation in decision-making processes
- Work Condition & Experience at Work > showing respect among colleagues
- Work Condition & Experience at Work > anticipating reaction of colleagues when communicating at work
- Work Condition & Experience at Work > getting negative feedback
- Work Condition & Experience at Work > reflection on own performance
- Work Condition & Experience at Work > colleagues depending on one's work
- Work Condition & Experience at Work > helping colleagues
- Work Condition & Experience at Work > feeling misunderstood
- Work Condition & Experience at Work > person-job fit
- Work Condition & Experience at Work > enjoyable work
- Work Condition & Experience at Work > physical safety (incl. aggression)
- Work Condition & Experience at Work > poor communication
- Work Condition & Experience at Work > contrasts with colleagues' experiences
- Work Condition & Experience at Work > Expectations from employer
- Work Condition & Experience at Work > expectation from employer concerning development opportunitites
- Work Condition & Experience at Work > social interactions
  - Work Condition & Experience at Work > social interactions > with non-professionals (e.g. patients, students...)
  - Work Condition & Experience at Work > social interactions > with non-colleague professionals (B2B-contacts)
  - Work Condition & Experience at Work > social interactions > with colleagues
  - Work Condition & Experience at Work > social interactions > Teamwork
- Work Condition & Experience at Work > Conflict with Supervisor
- Work Condition & Experience at Work > asking for help/support & sparren
- Work Condition & Experience at Work > (lack of) supervision/guidance
- Work Condition & Experience at Work > (lack of) Decision latitude or -authority & Autonomy
- Work Condition & Experience at Work > Conflicting task demands
- Work Condition & Experience at Work > Employer driven social activities
- Work Condition & Experience at Work > Motivation/justification for excessive workload
- Work Condition & Experience at Work > Open atmosphere to discuss job tasks
- Work Condition & Experience at Work > Pressure from supervisor
- Work Condition & Experience at Work > Working hours
- Work Condition & Experience at Work > Job crafting
- Work Condition & Experience at Work > Expectations about job
- Work Condition & Experience at Work > Development opportunities
- Work Condition & Experience at Work > Responsibilities
- Work Condition & Experience at Work > Contrast with previous job
- Work Condition & Experience at Work > Initial experience
- Work Condition & Experience at Work > Relation between function title and actual work
- Work Condition & Experience at Work > Terms of employment

	Work Condition & Experience at Work > COPSOQ. Possibilities for development (incl skill discretion) > learning new skills at work > lack of learning opportunities
	Work Condition & Experience at Work > COPSOQ. Possibilities for development (incl skill discretion) > insufficient challenge
	Work Condition & Experience at Work > COPSOQ. Possibilities for development (incl skill discretion) > using skills/being able to do what you are good at
Work Condition & Experience at Work > COPSOQ. Variation of Work	
	Work Condition & Experience at Work > COPSOQ. Variation of Work > task variation
Work Condition & Experience at Work > COPSOQ. Control over working time.	
	Work Condition & Experience at Work > COPSOQ. Control over working time. > availability outside of work hours
Work Condition & Experience at Work > COPSOQ. Meaning of work	
	Work Condition & Experience at Work > COPSOQ. Meaning of work > affinity with service or product
	Work Condition & Experience at Work > COPSOQ. Meaning of work > doing societally relevant work
Work Condition & Experience at Work > COPSOQ. Predictability (receiving information to do ones work)	
	Work Condition & Experience at Work > COPSOQ. Predictability (receiving information to do ones work) > procedural clarity
Work Condition & Experience at Work > COPSOQ. Recognition	
	Work Condition & Experience at Work > COPSOQ. Recognition > appreciation/reward
	Work Condition & Experience at Work > COPSOQ. Recognition > not feeling seen/valued
	Work Condition & Experience at Work > COPSOQ. Recognition > getting compliments/feeling valued
	Work Condition & Experience at Work > COPSOQ. Recognition > trusting that one is not exploited
Work Condition & Experience at Work > COPSOQ. Role clarity	
	Work Condition & Experience at Work > COPSOQ. Role clarity > role (un-)clarity
Work Condition & Experience at Work > COPSOQ. Role conflicts	
Work Condition & Experience at Work > COPSOQ. Illegitimate tasks	
	Work Condition & Experience at Work > COPSOQ. Illegitimate tasks > having to do adverse job tasks
Work Condition & Experience at Work > COPSOQ. Quality of Leadership	
	Work Condition & Experience at Work > COPSOQ. Quality of Leadership > attention for personal development
Work Condition & Experience at Work > COPSOQ. Social Support from Colleagues	
	Work Condition & Experience at Work > COPSOQ. Social Support from Colleagues > not feeling connected to colleagues
	Work Condition & Experience at Work > COPSOQ. Social Support from Colleagues > colleagues being approachable
Work Condition & Experience at Work > COPSOQ. Social Support from Supervisor	
Work Condition & Experience at Work > COPSOQ. Sense of community at work	
	Work Condition & Experience at Work > COPSOQ. Sense of community at work > conviviality ("gezelligheid")
	Work Condition & Experience at Work > COPSOQ. Sense of community at work > good colleagues
	Work Condition & Experience at Work > COPSOQ. Sense of community at work > feeling of belonging to a team
	Work Condition & Experience at Work > COPSOQ. Sense of community at work > talking to colleagues about non-work topics
	Work Condition & Experience at Work > COPSOQ. Sense of community at work > colleagues working by themselves ("on an island")
	Work Condition & Experience at Work > COPSOQ. Sense of community at work > caring colleagues
Work Condition & Experience at Work > COPSOQ. Commitment to the workplace	
Work Condition & Experience at Work > COPSOQ. Work Engagement	
Work Condition & Experience at Work > COPSOQ. Job Insecurity	
	Work Condition & Experience at Work > COPSOQ. Job Insecurity > temporary contract
Work Condition & Experience at Work > COPSOQ. Insecurity over working conditions	
Work Condition & Experience at Work > COPSOQ. Quality of Work	
	Work Condition & Experience at Work > COPSOQ. Quality of Work > senior colleagues conserving their ways
	Work Condition & Experience at Work > COPSOQ. Quality of Work > effect of age and tenure
Work Condition & Experience at Work > COPSOQ. Job Satisfaction (incl salary)	
	Work Condition & Experience at Work > COPSOQ. Job Satisfaction (incl salary) > satisfaction with salary
	Work Condition & Experience at Work > COPSOQ. Job Satisfaction (incl salary) > role of salary
Work Condition & Experience at Work > Work Life Conflict	
Work Condition & Experience at Work > COPSOQ. Vertical Trust	
	Work Condition & Experience at Work > COPSOQ. Vertical Trust > perceived mistrust in one's work by supervisor
	Work Condition & Experience at Work > COPSOQ. Vertical Trust > feeling that others trust in one's work
Work Condition & Experience at Work > COPSOQ. Horizontal trust.	
Work Condition & Experience at Work > COPSOQ. Organizational Justice	
	Work Condition & Experience at Work > COPSOQ. Organizational Justice > sharing successes
	Work Condition & Experience at Work > COPSOQ. Organizational Justice > fair distribution of work
Work Condition & Experience at Work > Cognitive demands (different to COPSOQ Cog Dem)	
Work Condition & Experience at Work > role of migration background	
Work Condition & Experience at Work > difficult to say "no" to requests	
Work Condition & Experience at Work > colleagues not following up on what was discussed	
Work Condition & Experience at Work > more self-esteem at work because of more work experience	
Work Condition & Experience at Work > publication pressure	
Work Condition & Experience at Work > expectations coming from colleagues	
Work Condition & Experience at Work > travelling to work	

		Work Condition & Experience at Work > seeing tangible results of own work
Function and Job Task Description		
		Function and Job Task Description > salary
		Function and Job Task Description > Type of company
		Function and Job Task Description > Contract Hours
		Function and Job Task Description > Sector
		Function and Job Task Description > Supervisor/Line-Manager
Career		
		Career > motivation to not follow-up/explore job offer
		Career > differences in work between countries
		Career > doing PhD does not feel like a "real" job
		Career > difference side job and "real job"
		Career > motivation for career change
		Career > multiple job holding
		Career > "real" job/work
		Career > Still studying
		Career > Carreer timeline
		Career > thinking about switching job
		Career > In between job
		Career > Motivation to start a particular job
		Career > Starting Education after having worked
		Career > Relation & Combination Education and Work
		Career > Side Jobs
		Career > Beginning of work life
		Career > First Job
		Career > Current Job
		Career > Second Job
		Career > Transition from side job to first job
		Career > Transition to other job
Personal characteristic		
		Personal characteristic > competitive athlete
		Personal characteristic > romantic relationship
		Personal characteristic > financial situation
		Personal characteristic > Age
		Personal characteristic > Person is currently working
		Personal characteristic > Personal experience
		Personal characteristic > Personality Characteristics
		Personal characteristic > Personality Characteristics > high sense of responsibility
		Personal characteristic > Personality Characteristics > being helpful / wanting to help others
		Personal characteristic > Personality Characteristics > fear of failure
		Personal characteristic > Personality Characteristics > being perfectionist
		Personal characteristic > Personality Characteristics > reflection on sepaerating free time and work time
		Personal characteristic > Personality Characteristics > feeling like not working enough
		Personal characteristic > Personality Characteristics > Expectation about life
Importance of work in life		
		Importance of work in life > work means regular social contact
		Importance of work in life > parents as role model
		Importance of work in life > loyalty for employer
		Importance of work in life > moving for work
		Importance of work in life > works gives structure
		Importance of work in life > Change in importance
Education		
		Education > Location University of Applied Sciences
		Education > University of Applied Sciences

Malte van Veen
Karen M. Oude Hengel
Roosmarijn M. C. Schelvis
Cécile R. L. Boot
Karin Veldman
Iris Arends
Ute Bültmann

Chapter

The association of psychosocial work quality with changes in the mental health of young adults starting career work

4

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The association of psychosocial work quality with changes in the mental health of young adults starting career work

Abstract

Objective: This study investigated if young adults' mental health problems change when starting career work, if potential changes in mental health problems differ by psychosocial work quality, and if mental health problems during adolescence moderate potential changes in mental health by psychosocial work quality.

Methods: We used data from the TRracking Adolescents' Individual Lives Survey (TRAILS) cohort. Follow-up time was two to four years. Mental health was measured with the Youth and Adult Self-Report scales. Longitudinal fixed-effects regression analyses were applied to estimate within-person changes in mental health of young adults entering career work with good, moderate, or poor psychosocial work quality (n=850), and to model adolescent mental health as effect modifier of this change (n=766).

Results. When psychosocial job quality of the first career job was ignored, mental health problems did not significantly change among young adults after having entered career work compared with not having career work. Taking psychosocial job quality into account, mental health problems increased among young adults starting career work in poor psychosocial work quality compared with not being at work [adjusted mean score increase 0.12, 95% confidence interval 0.03-0.21]. No significant changes in mental health problems were found for young adults entering work with moderate or good psychosocial work quality. We found no evidence for adolescent mental health problems as moderator.

Conclusion. Psychosocial work quality potentially plays a role for young workers' mental health. Improving poor psychosocial work quality of young adults might contribute to a mentally healthy and sustainable working life.

Key terms: Longitudinal fixed-effects regression; Young workers; Transition to work

Background

Being in one's 20s is a time in which the lives of most young adults change considerably. After graduation (1) follows a first job that requires a diploma and in which promotional steps take place, i.e. career work, as opposed to working in a side job alongside education. The start of career work constitutes a transition in which work becomes central in the life of a young adult and marks the beginning of a new life phase (2). This transition can be accompanied by other substantial life changes like social and financial independence and leaving the parental home or moving out of a student home (3).

While employment generally contributes to good mental health (4-6), the transition into first career work might also constitute a period of vulnerability in which young adults are particularly susceptible to exposures affecting their mental health (2, 7, 8). One potentially relevant exposure is the quality of the psychosocial work environment that young adults encounter in their first career job. For the general working population, previous studies showed that a work environment characterized by poor psychosocial work quality (e.g. high job demands, low decision latitude, or violence) is associated with poorer mental health (9, 10).

To date, little is known about the role of psychosocial work quality concerning mental health when young adults start career work. Milner et al (11) showed that mental health improved for young adults in Australia who transitioned from not working into work with good psychosocial work quality while mental health deteriorated for young adults who transitioned into work with poor psychosocial work quality. These findings suggest that good psychosocial job quality might be a positive contributor to mental health in young adulthood. However, additional evidence based on different samples is necessary to draw more robust conclusions. Addressing this knowledge gap is practically relevant because poor mental health early in life can lead to lifelong disadvantages (12).

Additionally, a cross-sectional study showed that poor mental health during adolescence exacerbated the association of poor psychosocial work quality with mental health problems for young workers (13). Young adults who experienced poor mental health during adolescence and who start career work in a job with poor psychosocial work quality, might thus have an additional risk of experiencing mental health problems. The role of adolescent mental health however has not yet been studied in the context of transitioning into first career work. By analyzing adolescent mental health problems as potential effect modifier, we might be able to better understand which young adults are more or less affected by good or poor psychosocial work quality when starting first career work. This knowledge can help to prevent aggravation of mental health problems and its consequences like impaired work ability and productivity losses (10) early in the life course.

The aims of the current study are to investigate (1) if young adults' mental health problems change when starting career work, (2) if potential changes in mental health problems differ by psychosocial work quality, and (3) if mental health problems during adolescence moderate potential changes in mental health problems by psychosocial work quality for young adults starting career work.

Methods

Data and study sample

Data were used from the TRracking Adolescents' Individual Lives Survey (TRAILS study), an ongoing prospective population-based cohort study currently consisting of seven waves. In 2000, individuals born between 1989 and 1991 living in three Northern provinces in the Netherlands were invited to TRAILS and 2,229 individuals participated, forming the TRAILS cohort. TRAILS contains data on participants' psychological, social and physical development. The participants' average age of the last included wave was 29. More detailed information about the TRAILS study is published elsewhere (14).

Two observations per young adult – before and after the transition to first career work - were included to address the first two research aims. The period between two waves was minimally two years and

maximally four years. We included only participants who started first career work in either wave five, six, or seven (average age at measurement 22, 26, and 29 years) because psychosocial work quality was measured in these three waves. Career work was defined as working at least twelve hours per week and not being in education, both measured with self-reports. For 212 individuals, it was not clear in which wave they transitioned into first career work due to missing data on work status. By using the event history calendar data for work history (measured in wave seven), we determined the wave of transition to first career work for 111 of these individuals. The remaining 101 individuals with no information on start of career work were excluded. Next, we excluded individuals with missing data on psychosocial work quality (n=75). Moreover, individuals with missing data on mental health problems at either measurement were excluded (n=70). Finally, we excluded those with missing data on time-varying confounders at either measurement wave (n=32), resulting in a final sample of 850 participants with complete data to answer the first and second research question.

To investigate the role of mental health during adolescence as effect modifier (research aim 3), we additionally included each participant's observation from wave three (average age at measurement 16 years). This information was missing for 84 individuals, leading to a sample size of 766 participants for the third research aim (Figure 1) (See Supplementary file 1 for a timeline of the measurements).

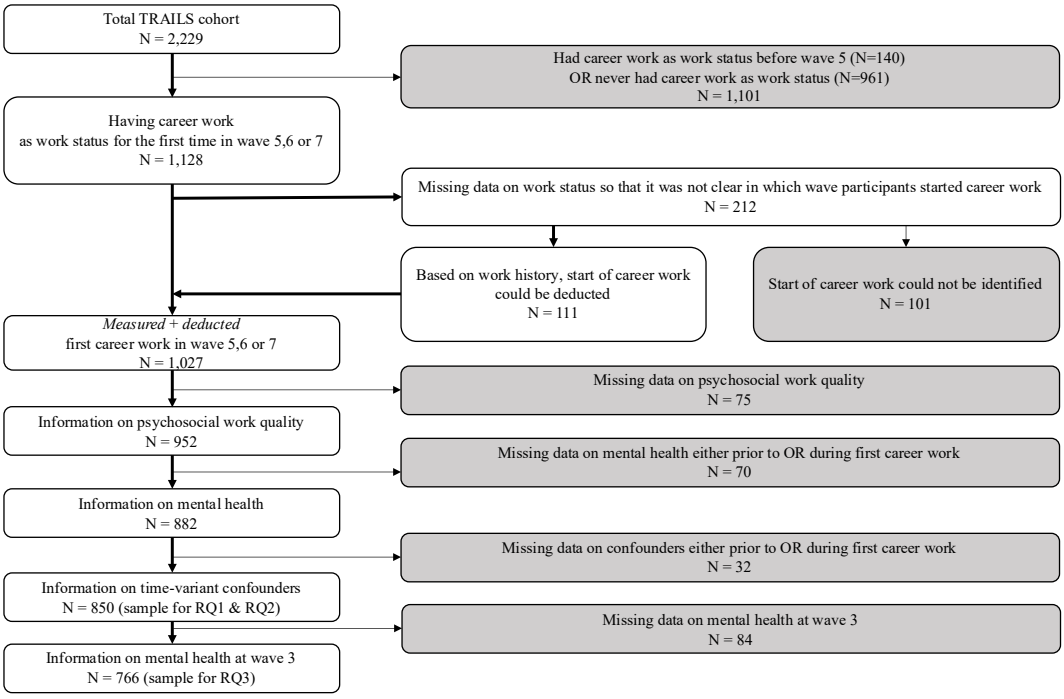

Figure 1. Flow chart of the selection of the study population

Mental health problems

Mental health problems were assessed using the internalizing problems scale from the Adult Self-Report ASR (i.e. anxious/depressed, withdrawn/depressed and somatic problems) (15). For this scale, participants reported internalizing problems over the last six months via 39 items (e.g. "I feel alone" or "Other people don't like me") on a three-point Likert-scale (0 = not true, 1 = somewhat or sometimes true, 2 = very true or often true). The ASR score for internalizing problems is the average response to all items. The total scale ranges from "0" (no problem ever applies) to "2" (all problems apply "very often"), with higher scores indicating more mental health problems.

Psychosocial work quality
Psychosocial work quality was retrieved from the wave in which young workers had their first career work. Psychosocial work quality was based on five psychosocial work factors from the short version of the Copenhagen Psychosocial Questionnaire (COPSOQ II) (16), namely decision authority, development opportunities, meaning of work, work pace, and quantitative demands. All items were coded in a way that higher scores reflected lower psychosocial work quality. Participants had to indicate to what extent statements concerning the five psychosocial work factors apply to them, ranging from 0 ("very low extent") to 4 ("very high extent"). All factors were measured with two items except for decision authority and development opportunities in wave 7, for which the measurement was done with one item each. In line with Milner et al (11), we operationalized psychosocial work quality as the number of psychosocial job adversities. For the current study each psychosocial work factor was firstly dichotomized into no adversity ("very low extent", "low extent", "somewhat" coded "0") or adversity ("high extent", "very high extent" coded "1"). The sum score of these dichotomized indicators formed an ordinal composite scale of psychosocial work quality, ranging from 0 to 5. Because of the low number of participants with three (n=19), four (n=4), or five psychosocial job adversities (n=0), these groups were combined into one group. This resulted in three levels of 0, 1 or 2+ psychosocial job adversities, which we labelled as good, moderate, and poor psychosocial work quality, respectively.

Adolescent mental health problems
For analyzing the moderating effect of adolescent mental health problems, internalizing problem scores were retrieved from wave three. This was measured with the internalizing problem scale of the Youth Self-Report YSR, which is the youth version of the ASR (17).

Time-variant confounders
Age, physical health, and marital status were included as potential time-variant confounders. Age was included as continuous variable (in years), because the incidence of mental health problems has been shown to increase up to an age of 30 (18) and young adults who are older when they start career tend to have an occupation characterized by a better psychosocial work environment (19). Physical health was included, because poor physical health is likely to lead to both poorer mental health and a poorer psychosocial work environment via selection effects (13). Physical health was measured with the single item "how do you rate your physical health during the last 30 days?". Answer options differed across the waves and were harmonized to poor, moderate, and good physical health. Marital status was included, because having a partner has been shown to be beneficial to mental health at least in the short run (20) and it is plausible that having a partner relates to having more financial resources increasing the likelihood of being able to choose a job with a more favorable psychosocial work environment. Marital status is a dichotomous variable with response options "single" and "in a relationship".

Statistical Analyses
Percentages and means with standard deviations (SD) were used to describe demographic characteristics (sex and educational attainment), time-variant confounders, psychosocial work quality and mental health problems. Educational attainment was categorized into low (primary, lower vocational and lower secondary education), medium (intermediate vocational and intermediate secondary education) and high (higher secondary, higher vocational education and university).

Linear fixed effects regression analyses were applied to model within-person changes in mental health problems of the participants. First, the changes in mental health were modelled regardless of psychosocial work quality, hereafter changes in mental health grouped by good, moderate, and poor psychosocial work quality were analyzed. Fixed effects models control for any time-invariant characteristics of a young adult (e.g. sex, cognitive capacity, general tendency to experience unpleasant emotions, early childhood experiences). As such each individual acts as their own control (see equation A for the analysis including groups of different psychosocial work quality, equation for first analysis disregarding work quality not shown for conciseness).

Equation A[1]: $Mental\ Health_{it} = \beta 1 * Psychosocial\ Work\ Quality_{it} + \beta 2 * X_{it} + \mu_i + \varepsilon_{it}$

[1]Mental Health$_{it}$ is the individual mental health score predicted by psychosocial work quality (poor, moderate, or good, compared with not having started first career work) (Psychosocial Work Quality$_{it}$), a person specific error term μ_i controlling for all time-invariant variation (using de-meaning), time-variant confounders X_{it} and a residual error term ε_{it}.

For testing whether the change in mental health problems differed significantly between psychosocial work quality subgroups, we fitted an additional fixed effects regression model with an interaction term defined as the product of a work status indicator and a time-invariant psychosocial work quality indicator) (equation B). The interaction term could not just be added to equation A, because this would result in multicollinearity.

Equation B[1]: $Mental\ Health_{it} = \beta 1 * Psychosocial\ Work\ Quality\ Indicator_i * Work\ Status\ Indicator_t + \beta 2 * X_{it} + \mu_i + \varepsilon_{it}$

[1]Mental Health$_{it}$ is the individual mental health score predicted by the product of a time-invariant indicator for the psychosocial work quality of the first career job (poor, moderate, or good) (Psychosocial Work Quality Indicator$_i$) and work status (at work, not at work) (Work Status Indicator$_t$), a person specific error term μ_i controlling for all time-invariant variation (using de-meaning), time-variant confounders X_{it} and a residual error term ε_{it}.

For modelling the moderating effect of adolescent mental health problems on change in mental health problems due to psychosocial work quality, equation A is expanded with an interaction term, which is the product of adolescent mental health problems and psychosocial work quality (equation C). By adding this term, we assessed whether the change in mental health when starting first career work with different psychosocial job quality depends on mental health during adolescence.

Equation C[1]: $Mental\ Health_{it} = \beta 1 * Psychosocial\ Work\ Quality_{it} + \beta 2 * Psychosocial\ Work\ Quality_{it} * Adolescent\ Mental\ Health_i + \beta 3 * X_{it} + \mu_i + \varepsilon_{it}$

[1]Equation A expanded by interaction term; The main effect of adolescent mental health is not included. This is because this factor is by definition time-invariant and thus receives a coefficient of 0 when estimated using fixed-effects.

We decided to conduct additional between-group analyses to provide context to our focal results after having obtained results from the fixed effects regression analyses. We plotted the average mental health scores from the waves preceding and succeeding the transition to first career work respectively, grouped by psychosocial work quality based on estimated marginal means from the adjusted model. We also tested the between group differences for each work status using two separate ANOVA's with Tukey's HSD post-hoc tests.

Results

Description of participants

Participants were predominantly female (60.8%), and more than half of the participants (56.9%) had high educational attainment when they first started career work (table 1). The average age in the wave preceding first career work was 21.2 years (SD = 2.3) and it was 24.6 years (SD 2.4) in the wave in which participants had first started career work. After the transition to first career work, 55.3% of the young workers reported good psychosocial work quality, 32.6% of the young workers reported

moderate psychosocial work quality, and 12.1% of the young workers reported poor psychosocial work quality.

Table 1. Descriptive table of sociodemographic variables, internalizing problems, and time-variant confounders by work status (N=850). [SD=standard deviation]

Sex female (%, n)[1]		60.8% (517)	
Educational attainment after transition to first career work (%, n)[1]			
Low		4.8% (41)	
Medium		37.8% (321)	
High		56.9% (484)	
Missing		0.5% (4)	
		Prior to first career work	**After transition to first career work**
Age in years			
Mean (SD)		21.2 (2.3)	24.6 (2.4)
Physical health (%, n)			
Good		88.5% (752)	86.0% (731)
Moderate		9.5% (81)	12.2% (104)
Poor		2.0% (17)	1.8% (15)
Marital status (%, n)			
In relationship		40.7% (346)	61.1% (519)
Single		59.3% (504)	38.8% (330)
Psychosocial Work Quality (%, n)			
Good	(0 adversities)	not having career work	55.3% (470)
Moderate	(1 adversity)	not having career work	32.6% (277)
Poor	(2+ adversities)	not having career work	12.1% (103)
Internalizing problems (range 0-2)			
Whole sample			
Mean (SD)		0.25 (0.24)	0.28 (0.24)
Internalizing problems grouped by psychosocial work quality Mean (SD)			
Good:	0 adversities	0.24 (0.2)	0.25 (0.2)
Moderate:	1 adversity	0.26 (0.2)	0.29 (0.3)
Poor:	2+ adversities	0.28 (0.2)	0.38 (0.3)
Internalizing problems at wave 3[2] (range 0-2)			
Mean (SD)		0.32 (0.24)	

[1]Sex and educational attainment are not included in fixed-effects regression models
[2]Age at wave 3: 16 years, n=766

Change in mental health problems when transitioning into first career work

The increase in internalizing problems scores in young adults starting career work was not statistically significant after controlling for confounders (0.06; 95%CI -0.02:0.15; table 2).

For young adults transitioning into career work with poor or moderate psychosocial work quality, internalizing problems increased significantly in the crude model, while no statistically significant change was found for the group of young adults transitioning to career work with good psychosocial work quality (table 2). The adjusted model showed the same pattern as the crude model, but internalizing problems only increased significantly for young adults who transitioned into career work with poor psychosocial quality (0.12; 95%CI 0.03-0.21; table 2).

The increase in internalizing problems (i.e. the difference in slopes) was significantly larger for young adults starting career work in poor compared with good psychosocial work quality and for young adults starting career work in poor compared with moderate psychosocial work quality (Supplementary file 2).

Additional between-person analyses showed that internalizing problem scores before starting first career work did not significantly differ between groups entering career work with poor, moderate or psychosocial work quality (supplementary file 3). After having started career work, young workers who started career work in poor psychosocial work quality had significantly higher internalizing problems scores compared with young workers who started career work in moderate and good psychosocial work quality (both $p<0.01$; Figure 2), while no differences were found between the groups with good versus moderate psychosocial work quality ($p=0.08$; Supplementary file 3).

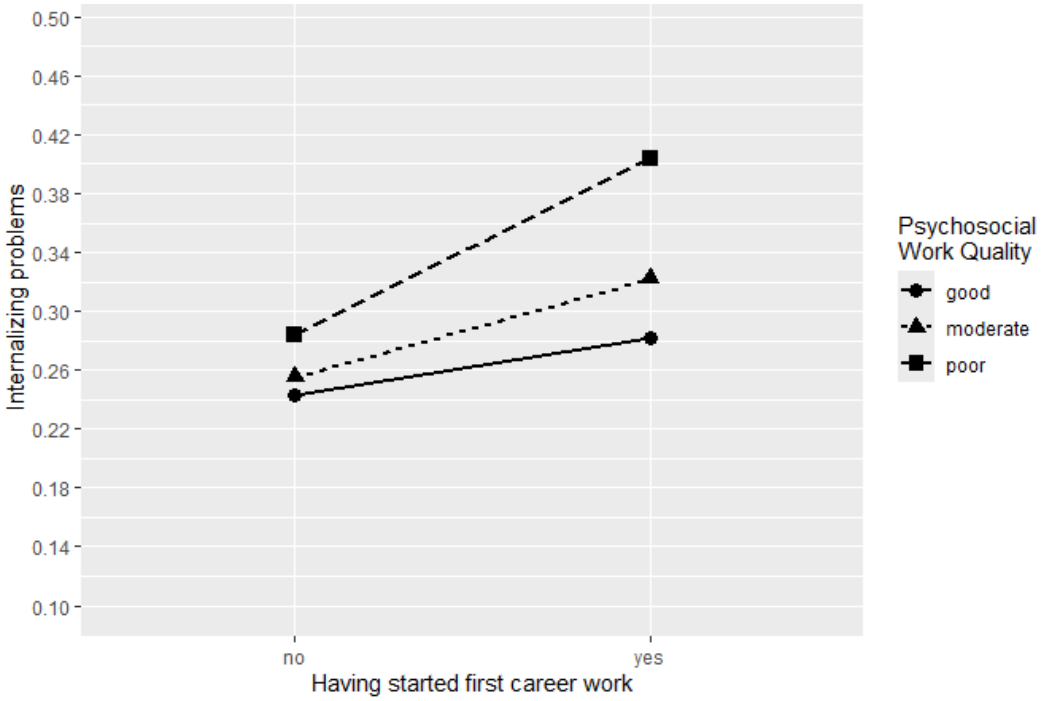

Figure 2. Marginalized means of mental health problems before and during first career work grouped by psychosocial work quality, controlling for time-variant confounders age, physical health, and marital status (n=850).

Mental health problems during adolescence as effect modifier

The increase in internalizing problems was higher for young adults starting career work with moderate psychosocial work quality when they experienced more internalizing problems during adolescence in the crude model (0.12 95%CI 0.01;0.23; table 3) but was no longer significant in the adjusted model (0.11 95%CI -0.01;0.22). No interaction effects in the crude or adjusted models were found for workers entering career work with poor or good psychosocial work quality.

Table 2. Changes in internalizing problems of 850 young adults transitioning into first career work for the whole sample and per psychosocial work quality group (crude and adjusted model) based on linear fixed effects regression analysis; reference status: "not having career work". Statistically significant change in bold. [95% CI=95% confidence interval]

	Crude Model			**Adjusted model**[1]		
	n	Average within-person change in internalizing problems	95% CI	n	Average within-person change in internalizing problems	95% CI
Whole sample	**850**	**0.02**	**[0.01:0.04]**	850	0.06	[-0.02:0.15]
Per Psychosocial Work Quality						
Good (0 adversities)	470	0.01	[-0.01:0.02]	470	0.04	[-0.05:0.13]
Moderate (1 adversity)	**277**	**0.03**	**[0.01:0.06]**	277	0.07	[-0.02:0.16]
Poor (2+ adversities)	**103**	**0.09**	**[0.05:0.13]**	**103**	**0.12**	**[0.03:0.21]**

[1]Included time-variant confounders were age, physical health, and marital status

Table 3. Effect moderation by mental health problems prior to starting first career work by psychosocial work quality group (crude and adjusted model) based on linear fixed effects regression analysis. Statistically significant change in bold (n=766). [95% CI=95% confidence interval]

		Crude Model		**Adjusted model**[1]	
	n	Coefficient for effect moderation	95% CI	Coefficient for effect moderation	95% CI
Good psychosocial work quality × Adolescent mental health problems	434	-0.03	[-0.11:0.05]	-0.04	[-0.13:0.04]
Moderate psychosocial work quality × Adolescent mental health problems	**240**	**0.12**	**[0.01:0.23]**	0.11	[-0.01:0.22]
Poor psychosocial work quality × Adolescent mental health problems	92	-0.09	[-0.26:0.07]	-0.11	[-0.27:0.05]

[1]Included time-variant confounders were age, physical health, and marital status

Discussion

Our study showed that young adults in general did not experience a change in mental health problems when starting first career work compared with not being at work. When differentiating by psychosocial work quality, however, mental health problems increased for those young adults starting career work in jobs with poor psychosocial work quality. Mental health problems during adolescence did not moderate the effect of psychosocial work quality on changes in mental health when starting career work.

In line with Milner et al (11), our study showed that mental health problems increase for young workers who experience poor psychosocial work quality at the beginning of career work and suggest that the increase of mental health problems in young workers is greater when the psychosocial work quality is poorer albeit that the increases we observed have a very small magnitude. In contrast to the results by Milner et al (11), we did not find that mental health problems decreased when starting career work in good psychosocial working conditions. A possible explanation for this difference may be that our study concentrates on the short-term effects of entering first career work while Milner et al (11) included more waves of data after the transition to first career work. Future research could aim at disentangling possible differences between the short-lived versus more permanent changes in mental health and the role of the psychosocial work quality therein.

When looking at young workers transitioning into first career work with poor psychosocial work quality, the mental health problems increased slightly (with 0.12 points on the ASR-scale). Although the increase is rather small, mental health problems among young adults starting career work in jobs with poor psychosocial quality deserve attention. In the present study, we modelled only the start of career work life. It can be speculated that, particularly among young workers remaining in jobs with poor psychosocial job quality, the increase of mental health problems might persist. More research is needed as mental health problems might also attenuate once young workers get used to their psychosocial work environment.

Our additional between-person analyses comparing young workers based on the psychosocial work quality of their first career jobs suggest that psychosocial work quality might play a role in widening the differences in mental health problems between groups of workers over time. These analyses further carefully hint at selection effects in the sense that mental health problems just before entering career work make it more likely to end up in work with poor psychosocial work quality. Those young adults starting and continuing to work in jobs with poor psychosocial work quality might thus find themselves in a downward spiral of increasing mental health problems (21).

In contrast with LaMontagne et al (13), we did not find that mental health during adolescence moderates the impact of psychosocial work quality on the mental health of young workers entering paid employment. As research is still scarce in this field, this calls for further research adopting a life course approach in which an individual's mental health history and non-work related life-events are taken into account already before the transition into career work. A life course approach may help to better understand young adults' situation at the start of career work and how psychosocial work quality affects mental health (7, 22, 23).

Our study contributes to a better understanding of mental health changes at the beginning of career work life, as it is one of the few studies to date analyzing within-person effects as well as the role of adolescent mental health problems. A strength of our study is using a composite score to operationalize the psychosocial work exposure, because research has shown that no one "toxic psychosocial work factor" exists that by itself determines mental health problems (24). By using a composite score, we can account for that different factors might determine the association of psychosocial work quality with mental health problems for different young workers. However, we need to acknowledge that our operationalization of psychosocial work quality also has some limitations in the current study as influential aspects of the psychosocial work environment (e.g. sense of community at work or being responsible for others (25)) were not measured in the TRAILS study and are subsequently not incorporated in our composite score. Previous research suggested that good and poor psychosocial work factors respectively are tightly clustered, i.e. not having incorporated a

factor, even if it is influential, might not bias our results (26). The second strength is the focus on within-person effects by using fixed effects regression analysis, which controls for all potential time-invariant confounders. The distinction of within- and between person effects is important, because the two effects are not necessarily congruent (27, 28). A previous study showed, for example, that higher job autonomy was associated with lower emotional exhaustion between workers, but an increase in job autonomy led to an increase in emotional exhaustion within workers (29).

A limitation of our study is that we cannot rule out that our results are subjected to common method bias and potential reverse causality as both, mental health problems during first career work, and psychosocial work quality, were measured during the same wave. Measures of psychosocial work quality might be affected by contemporaneous mental health problems. This is also labelled the gloomy perception effect, which implies that a young worker with poor mental health will perceive and report the psychosocial work environment as more negative than someone with better mental health even when they work in the same psychosocial work environment (21). In general, it is however assumed that subjective measures of the psychosocial work environment are not merely individual appraisals, but reflect objective features of the psychosocial work environment (13). A final limitation is that the TRAILS study is subject to attrition bias. Male participants and participants whose parents had lower educational level are less likely to participate over time (30). Our sample comprised only few young workers with low educational attainment. Furthermore, compared to participants starting career work with moderate or good psychosocial work quality, relatively few participants were in the poor psychosocial work quality group. We have no reason to expect that this attrition led to a systematic bias of our results, but it potentially limits generalizability of our findings concerning these groups.

In conclusion, our study provides suggestive evidence that mental health problems increase in young workers who experience poor psychosocial work quality in their first career work. Improving poor psychosocial work quality of young adults might eventually contribute to young adults being able to lead a mentally healthy and sustainable working life.

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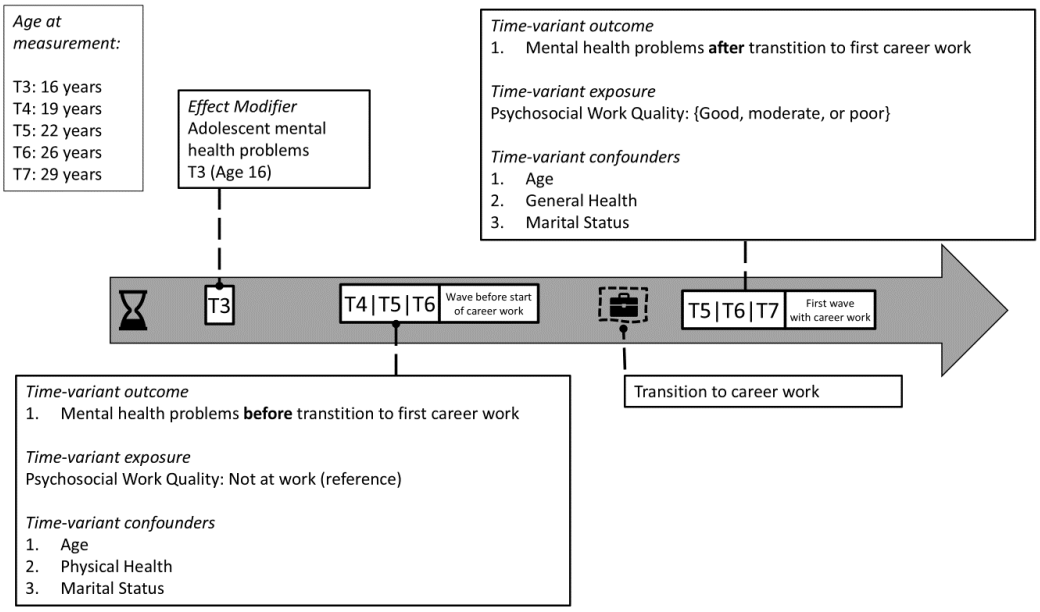
Appendix

Supplementary file 1 – Timeline with variables at different measurement moments



Supplementary file 1 Figure. Timeline

Supplementary table 2. Differences in slopes

Supplementary table 2. Between-group differences of within-person changes of internalizing problem scores (i.e. differences in slopes). Statistically significant differences in bold.

		Crude Model			**Adjusted Model**[1]		
Comparison of within-person change between subgroups		Interaction coefficient	95% CI	p-value	Interaction coefficient	95% CI	p-value
Good psychosocial work quality (reference)							
vs	Moderate psychosocial work quality	0.03	[-0.01:0.06]	0.09	0.03	[-0.01:0.06]	0.08
vs	**Poor psychosocial work quality**	**0.09**	**[0.04:0.13]**	**<0.01**	**0.08**	**[0.04:0.13]**	**<0.01**
Moderate psychosocial work quality (reference)							
vs	**Poor psychosocial work quality**	**0.06**	**[0.01:0.11]**	**0.01**	**0.05**	**[0.01:0.10]**	**0.03**

[1]Included time-variant confounders were age, physical health, and marital status

Supplementary table 3 – Between group differences in internalizing problem scores

Supplementary table 3. Between group differences in internalizing problem scores before and after the transition to first career work. Statistically significant differences in bold.

Before starting first career work				
Subgroup comparison		Mean Diff.	95% CI	p-value
Good psychosocial work quality (reference)				
vs	Moderate psychosocial work quality	0.01	[-0.03:0.05]	0.78
vs	Poor psychosocial work quality	0.04	[-0.02:0.10]	0.25
Moderate psychosocial work quality (reference)				
vs	Poor psychosocial work quality	0.03	[-0.04:0.09]	0.54
After transition to first career work				
Subgroup comparison		Mean Diff.	95% CI	
Good psychosocial work quality (reference)				
vs	Moderate psychosocial work quality	0.04	[-0.01:0.08]	0.08
vs	**Poor psychosocial work quality**	**0.12**	**[0.07:0.19]**	**<0.01**
Moderate psychosocial work quality (reference)				
vs	**Poor**	**0.09**	**[0.02:0.15]**	**<0.01**

Supplementary table 4 – Sensitivity Analysis of RQ 1 on sample from RQ 2 (n=766)

Supplementary table 4. Changes in mental health problems of 766 young adults transitioning into first career work by psychosocial work quality group (crude and adjusted model) based on linear fixed effects regression analysis. Statistically significant change in bold. [95% CI=95% confidence interval]

	Crude Model			**Adjusted model**[1]		
Psychosocial Work Quality	n	Average within-person change in mental health problems	95% CI	n	Average within-person change in mental health problems	95% CI
Good (0 adversities)	434	0.01	[-0.01:0.03]	434	0.04	[-0.06:0.13]
Moderate (1 adversity)	**240**	**0.03**	**[0.00:0.06]**	240	0.06	[-0.04:0.15]
Poor (2+ adversities)	**92**	**0.08**	**[0.03:0.12]**	**92**	**0.10**	**[0.00:0.20]**

[1]Included time-variant confounders were age, physical health, and marital status

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Malte van Veen
Roosmarijn M. C. Schelvis
Trynke Hoekstra
Paulien M. Bongers
Cécile R. L. Boot
Karen M. Oude Hengel

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Chapter

Work characteristics and emotional exhaustion among young workers:

a latent class analysis

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Work characteristics and emotional exhaustion among young workers: a latent class analysis

Abstract

Objectives: This study aims to assess the heterogeneity of psychosocial working conditions of young workers by identifying subgroups of work characteristic configurations within young workers and to assess these subgroups' associations with emotional exhaustion.

Design: Latent class analysis. Groups were formed based on 12 work characteristics (8 job demands and 4 job resources), educational level and sex. Differences in emotional exhaustion between subgroups were analysed using analysis of variance and post hoc comparisons.

Setting: Data from the 2019 wave of the Netherlands Working Conditions Survey.

Participants: 7,301 individuals between the age of 18 and 30 years, who worked more than 16 hours per week.

Main outcome measure: Emotional exhaustion.

Results: Five subgroups of work characteristics could be identified and were labelled as: (1) 'low-complexity work' (24.4%), (2) 'office work' (32.3%), (3) 'manual and non-interpersonal work' (12.4%), (4) 'non-manual and interpersonal work' (21.0%), and (5) 'manual and interpersonal work' (9.9%). Mean scores for emotional exhaustion in the two interpersonal work groups (M=3.11, SD=1.4; M=3.45, SD=1.6) were significantly higher than in the first three groups (M=2.05, SD=1.1; M=1.98, SD=1.0; M=2.05, SD=1.1) (all 95% CIs excluding 0). Further, mean scores for emotional exhaustion were significantly higher in the 'manual and interpersonal work' group than in the 'non-manual and interpersonal work' group (95% CI 0.24, 0.45). All results could be replicated in the 2017 and 2021 waves of the Netherlands Working Conditions Survey.

Conclusions: Young workers reported heterogeneous work characteristic configurations with substantial differences in degrees of emotional exhaustion between the identified subgroups. Preventing emotional exhaustion should focus on the two interpersonal work subgroups, which showed a high degree of emotional exhaustion. In prevention efforts, these groups' configurations of work characteristics should be taken into account.

Background

Mental health complaints, including diagnosed mental disorders, are a leading contributor to disability worldwide (1) Young adults have a 30–80% higher symptom prevalence of anxiety and depression than their older counterparts (2). Evidence indicates a local peak in the onset distribution of mental health disorders around the age of 30 years (3) Mental health complaints can have a devastating and lasting impact on a young adult's life(4), which includes a reduced work participation (5). This can be particularly problematic at an early career stage, because a young worker is at risk of entering a vicious circle in which mental health problems and work-related stress increase each other (6).

Mental health complaints do not only have work-related consequences, but work can also play a role in the development of these complaints. Even though entering working life is not associated with worsened mental health for most young adults (7), starting one's working life in poor working conditions can negatively impact mental health (8). The damaging potential of poor working conditions for one's mental health is well established for the general working population (9, 10). Consensus exists that good working conditions can have a beneficial effect on workers' mental health and should play a role in preventing mental health complaints (11, 12).

For the prevention of mental health complaints among young workers, examining the intragroup differences, also termed heterogeneity, of their working conditions is required to find an appropriate balance between one-size-fits-all measures and more tailored approaches. Rudolph et al (13) cautioned not to overlook heterogeneity concerning a seemingly consistent group of individuals who are given the same label (e.g., young workers). Neglecting heterogeneity might lead to overly simplified, consequently invalid inferences concerning attitudes, values and behaviours. Another benefit of assessing heterogeneity is the possibility of identifying subgroups of work characteristic configurations among young workers which are associated with higher degrees of mental health complaints. Earlier research suggests for example that workers in social service occupations experience more mental health complaints than workers in other occupations (14, 15). Ng et al studied workers born between 1982 and 1999 and stated that a lack of research on heterogeneity of this birth cohort exists (16). Combining this with a general lack of research on young workers (17, 18), it can be concluded that little is known about the heterogeneity of working conditions of young workers.

A regularly applied method to study heterogeneity is latent class analysis (LCA), which aims to identify subgroups within a given sample. LCA is a data-driven clustering method in which observations are grouped based on predefined indicator variables (19). Shahidi et al (20) applied LCA in a recent study and identified four psychosocial work characteristic subgroups within the general working population in Canada. These four subgroups showed the same rank order on all work characteristics so that there was a group ranking highest on all variables with a higher score reflecting more adverse psychosocial working conditions. They concluded that 'work stressors are tightly clustered' and that mental health complaints were highest in the subgroups with the most adverse psychosocial work characteristics (20).

The aims of our study are to identify subgroups of young workers' work characteristics and to examine the association between these subgroups and emotional exhaustion.

Methods

Study population

We used data from the 2019 wave of the Netherlands Working Conditions Survey (NWCS), which is an annual cross-sectional survey to monitor the health and working conditions of workers in the Netherlands aged 15–74 years (N=58,316). An extensive methodological report on the NWCS can be found elsewhere (21).

We selected young workers from the NWCS. Even though no general consensus exists on which age defines a young worker, common cut-offs are around 25, 30 and 35 years of age (2,22,23). To include young workers with non-academic education who generally enter the labour market around the age

of 20 years as well as academically trained professionals who mostly enter the labour market in their mid-20s, we included workers aged between 18 and 30 years (n=11,472). Further, we only included workers who worked more than 16 hours weekly in a paid job, resulting in a final sample of 7,301 young workers. We followed the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) reporting guidelines for cross-sectional studies (24) (see online supplemental file A for the STROBE checklist).

Patient and public involvement

The content of the NWCS is developed and evaluated in collaboration between TNO, Statistics Netherlands and the Dutch Ministry of Social Affairs.

Indicator variables

Applying LCA begins with the selection of indicator variables. This was done in three steps. First, a long list of work characteristics was prepared, starting with all factors from the Copenhagen Psychosocial Questionnaire (25). We then added variables concerning employment characteristics and sociodemographic factors that are related to mental health complaints: occupational skill level, contract type, working hours, shift work, irregular working hours, multi-jobbing, dangerous work, physical demands, sector, company size, age, educational level, sex, ethnicity and household composition. The long list consisted of 34 variables.

Second, five experts in occupational epidemiology or work-related mental health (including authors CB and KOH) independently rated whether a variable from the long list should (a) be included, (b) potentially be included or (c) not be included. The ratings were integrated following a point system in which a variable that should be included received 3 points, a potential inclusion 1 point and a non-inclusion 0 points. The expert ratings were summed up per variable.

Third, during a meeting with all five experts, the 16 highest scoring indicator variables were selected. From this list of 16 variables, 2 more variables were excluded after discussion, namely contract type and occupational skill level. Contract type was excluded, because objective job insecurity is not related to mental health complaints (26), whereas subjective work insecurity might be related.9 Occupational skill level was excluded because of its close association with other included work characteristics and educational level. All experts agreed that sex and educational level should be included as indicator variables due to their known associations with work characteristics and mental health complaints (17,27). By including sex and educational level as LCA indicators, we prevent that the LCA might result in groups, which can be explained by differences in sex or educational level that are strongly connected to these psychosocial work factors. The 14 final indicator variables to which all experts consented and their operationalisation in the NWCS are presented in table 1. Since there is an ongoing methodological discussion concerning whether sociodemographic characteristics should be included as indicators in LCA, we conducted a sensitivity analysis in which we repeated our analysis excluding sex and educational level as indicator variables.

Table 1. Description, background information and operationalisation of LCA indicator variables

***Variable name*: Description**[a]	**Scale or item background**	**Operationalization and response options**
Demographics		
Sex	Statistics Netherlands	"Male", "Female"
Educational Level[b]: The highest obtained degree	Statistics Netherlands use the terms, "Low", "Intermediate", "High"	Categories (own label): (a) elementary, (b) vocational, (c) academic
Job Resources		
Lack of Autonomy: A worker's control over how and when work is executed	Based on JCQ (47) and POLS, complemented by one NWCS-specific item on autonomy on working hours	6 items, 3-point-scale ("Yes, regularly", "Yes, sometimes", "No"); example item: "Can you make your own decisions on how to execute your work?"
Low Colleague Support: Social support received from colleagues	Subset of JCQ	2 items, 4-point-scale (Completely disagree to completely agree); example item: "My co-workers are friendly"
Low Manager Support: Social support received from direct manager	Subset of JCQ	2 items, 4-point-scale (Completely disagree to completely agree); example item: "My supervisor pays attention to what I am saying"
Lack of Development Opportunities: The extent to which professional development is stimulated by the supervisor	NWCS, self-constructed	1 item, 3-point-scale ("No", "Yes, to a limited degree", "Yes, to a large degree"); "Does your supervisor stimulate your knowledge and skill development?"
Job Demands		
Quantitative Demands: The amount of work faced by the worker	Based on JCQ	3 items, 4-point-scale ("Never" to "Always"); Example item: "Do you have to work extra hard?"
Emotional Demands: The extent to which work is emotionally demanding	Subset of COPSOQ (48)	3 items, 4-point-scale ("Never" to "Always"); Example item: "Does your work lead to emotionally difficult situations?"
Cognitive Demands: The extent of complexity of the work	Based on JCQ	3 items, 4-point-scale ("Never" to "Always"); Example item: "Does your work require intense thinking?"
Physical Demands: The extent to which work is physically demanding	Based on LFS (49)	4 items, 3-point-scale ("Yes, regularly", "Yes, sometimes", "No"); Example item: "Are you working in an uncomfortable posture?"
Job Insecurity: Satisfaction with the job security that the current job is offering	NWCS, self-constructed	1 item, 3-point-scale ("Not satisfied", "Satisfied" "Very satisfied"); "How satisfied are you in your current job concerning the aspect of proper job security?"
Working Hours: The number of hours a worker is working per week on average	NWCS, self-constructed	Continuous, coded so that >60 = 60; "How many hours are you working on average?"[c]
Shift Work: The extent to which a worker is doing shift work	NWCS, self-constructed	1 item, 3-point-scale ("Yes, regularly", "Yes, sometimes", "No"); "Are you working in shifts?"
Work-Life Conflict: The extent to which a worker's work and non-work life interfere	NWCS, self-constructed	2 items, 4-point-scale ("No, never" to "Yes, very often"); example item: "Do you miss or neglect family activities due to work?"

[a] Elaborate descriptions of each variable in Dutch can be found in (21); the original Dutch wording of all items for the indicator variables and for emotional exhaustion can be found in (50)

[b] Elementary education represents maximal one year of completed vocational education; vocational education represents more than one year of completed vocational education without completed academic education; academic education represents a bachelor's degree from a university or university of applied sciences

[c] Respondents can choose if they want to indicate average working hours per week, month, or year. For the NWCS this is recalculated to weekly hours. The question is asked in an open format and some workers indicate working hours that are considered unrealistic (i.e. close or equal to 95 per week) and therefore we transformed every value higher than 60 to a value of 60.

JCQ: Job Content Questionnaire; POLS: Permanent Onderzoek Leef Situatie (Statistics Netherlands (CBS)); COPSOQ: Copenhagen Psychosocial Questionnaire; LFS: Labour Force Survey.

Variables were labelled so that a higher value indicates more adversity. Nine indicators (ie, lack of autonomy, low colleague support, low manager support, quantitative demands, emotional demands, cognitive demands, physical demands, working hours, work–life conflict) were treated as continuous variables. For each continuous variable, we calculated a z-standardised mean score based on all items for ease of interpretation. Sex was treated as dichotomous variable; educational level, lack of development opportunities, subjective job insecurity and shift work were treated as ordinal variables (see online supplemental file B for bivariate correlations of all continuous variables).

Emotional exhaustion

Emotional exhaustion is used as measurement for mental health complaints. It is measured using an adjusted version of the emotional exhaustion subscale from the Utrecht Burnout Scale (28), which is an adjusted Dutch version of the Maslach Burnout Inventory-General Survey (29). Using a 7-point scale ranging from 'never' (1) to 'every day' (7), respondents were asked to report the applicability of five statements, which refer to emotional exhaustion (e.g., 'I feel emotionally exhausted by my work'). The emotional exhaustion score was calculated as the mean of the items. The distribution is left-skewed (skewness=1.28). Internal consistency of the scale is good with Cronbach's α=0.88.

Statistical analyses

We applied LCA for analysing the heterogeneity of working conditions among young workers. In LCA, the latent classes are latent variables for which each young worker receives a probability of belonging to each class. Subsequently, each worker is allocated to the class with the best fit. This allocation based on best fit ignores membership uncertainty, which might lead to flawed results when using class membership as predictor for distal outcomes. In order to assess the robustness of our results when membership uncertainty is taken into account, we did a sensitivity analysis using the three-step method with emotional exhaustion as distal outcome as implemented in Mplus.

We fitted models from 1 up to and including 10 classes. A combination of statistical fit indices (the log likelihood, the Akaike Information Criterion (AIC), the Bayesian Information Criterion (BIC), the adjusted BIC (aBIC), entropy, the bootstrapped likelihood ratio test and the average latent class posterior probability matrix) and content-related criteria (class size and interpretability) was used to select the most appropriate number of classes (30). In general, a lower AIC, BIC and aBIC indicate a better model data fit (31). We looked for the point of inflection when plotting these fit indices, indicating that adding another class does not substantially improve the fit. The entropy value and the average latent class posterior probability matrix indicate how well the young workers fit into each latent class (32, 33). We further assessed if classes were big enough to include a substantial number of workers and if we could interpret and label the classes in a comprehensive way. It was also checked if a class is a split-off from another class in a model with k+1 latent classes.

For deeper interpreting and labelling the classes, we used descriptive statistics and visualisations of all indicator variables. Additionally, each class was assigned a rank on each indicator variable, with the highest score '5' reflecting relatively unfavourable conditions and the lowest score '1' reflecting relatively favourable conditions. Work characteristics were classified as being 'job resources' or 'job demands'. The most common jobs for each class according to the ISCO-08 (International Standard Classification of Occupations) 2-digit codes (34) were also assessed.

An analysis of variance (ANOVA) with Tukey-HSD post hoc tests was conducted for comparing identified subgroups on emotional exhaustion. No other factor than class membership was included in these analyses, because potentially relevant confounders (ie, sex and educational level) had already been included as indicator variables.

To check for robustness of the results, sensitivity analyses were conducted using two other waves of the NWCS (2017, [35] and 2021, [36]) on which all analyses were repeated. All data preparation and analyses were executed using R V.4.0.2 in RStudio V.1.3.959. The latent class models were fitted using finite mixture modelling and MLR estimators as implemented in Mplus V.8.7, which was also used for computing the statistical fit indices. Missing data were handled using the default of using all available data, using full information maximum likelihood and assuming missing at random.

Results

Selection of the number of latent classes

Statistical fit indices, as well as the proportion of the smallest class for models with 1–10 classes, are presented in table 2. For aBIC, AIC and BIC, the incremental decrease in value was getting lower from the five-class solution on. The bootstrapped likelihood ratio test for comparing nested models indicated a significant improvement in model fit for all models. The entropy value increased until adding an eighth class. Two authors (MvV and TH) preselected the five, six and seven-class models based on the criteria outlined above. The preselected classes were then in detail discussed with all authors for the final selection on number of classes. The six-class solution consisted of a small class, only containing 3.4% of all observations. Comparing the classes between the models on the indicator variables, the sixth class was considered to be insufficiently distinct from the classes in the five-class solution to justify adding the sixth class. For the five-class model, the average latent posterior probabilities for all five classes were above 0.82, which is considered acceptable. The entropy value of 0.78 was slightly below the generally suggested threshold of 0.80 (30). Because the six-class solution did not add sufficiently distinct classes, the seven-class solution is not described in more detail. The five-class solution was selected as the final model.

Table 2. Statistical model fit indices for models from 1 to 10 latent classes

Number of classes	LL	AIC	BIC	aBIC	BLRT	Entropy	Proportion smallest class
1	-123194.7	246443.4	246629.6	246543.8	< 0.001	NA	100%
2	-120676.8	241445.6	241762.8	241616.6	< 0.001	0.73	29.5%
3	-118823.3	237776.5	238224.7	238018.2	< 0.001	0.71	25.2%
4	-117379.0	234926.0	235505.2	235238.3	< 0.001	0.77	13.4%
5 (chosen)	**-116493.1**	**233192.2**	**233902.5**	**233575.2**	**< 0.001**	**0.78**	**9.9%**
6	-115959.7	232163.5	233004.8	232617.1	< 0.001	0.79	3.4%
7	-115613.4	231508.7	232481.0	232033.0	< 0.001	0.81	1.2%
8	-115274.2	230868.4	231971.7	231463.2	< 0.001	0.76	3%
9	-114934.5	230226.9	231461.3	230892.4	< 0.001	0.78	1.1%
10	-114515.3	229426.6	230792.0	230162.8	< 0.001	0.79	1%

LL: Log Likelihood; AIC: Akaike Information Criterion; BIC: Bayesian Information Criterion; aBIC: adjusted Bayesian information criterion; BLRT: p-value based on bootstrapped likelihood ratio test

Description of the sample and the five subgroups

The mean age in the study sample was 24.8 years, and a slight majority (55.3%) were female. Ten per cent of the young workers had elementary, 41.3% vocational and 47.8% academic education (table 3). The five subgroups were labelled as: (1) 'low-complexity work' (n=1784, 24.4%), (2) 'office work' (n=2357, 32.3%), (3) 'manual and non-interpersonal work' (n=905, 12.4%), (4) 'non-manual and interpersonal work' (n=1536, 21.0%), and (5) 'manual and interpersonal work' (n=719, 9.9%). Some ISCO functions could mostly be found in one group (e.g., building workers of which 84% belonged to 'manual and non-interpersonal work'), whereas other occupations were spread across groups (e.g., personal care workers of which 52% belonged to 'low-complexity work', 29% to 'manual and interpersonal work', and 11% to 'non-manual and interpersonal work'). Online supplemental file C shows the most common jobs per subgroup and their distributions between the subgroups.

Table 3. Descriptives of all indicator variables for entire study sample and for each subgroup

Subgroup	Total	Low complex work	Office Work	Manual & non-interper-sonal work	Non-manual & interpersonal work	(Manual & interper-sonal work
	N=7,301	N=1,784	N=2,357	N=905	N=1,536	N=719
	100%	24.4%	32.3%	12.4%	21%	9.9%
Age						
Mean (SD)	24.8 (3.1)	23.5 (3.4)	25.5 (2.7)	23.7 (3.4)	26.0 (2.4)	24.7 (3.0)
Missing	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
Education						
Low	753 (10.3%)	314 (17.6%)	89 (3.8%)	266 (29.4%)	16 (1.0%)	68 (9.5%)
Intermediate	3014 (41.3%)	1165 (65.3%)	568 (24.1%)	560 (61.9%)	267 (17.4%)	454 (63.1%)
High	3488 (47.8%)	284 (15.9%)	1691 (71.7%)	71 (7.8%)	1250 (81.4%)	192 (26.7%)
Missing	46 (0.6%)	21 (1.2%)	9 (0.4%)	8 (0.9%)	3 (0.2%)	5 (0.7%)
Sex						
Female	4041 (55.3%)	1192 (66.8%)	1108 (47.0%)	62 (6.9%)	1154 (75.1%)	525 (73.0%)
Male	3260 (44.7%)	592 (33.2%)	1249 (53.0%)	843 (93.1%)	382 (24.9%)	194 (27.0%)
Missing	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
Shift Work						
Never	5682 (77.8%)	1103 (61.8%)	2288 (97.1%)	668 (73.8%)	1338 (87.1%)	285 (39.6%)
Sometimes	389 (5.3%)	170 (9.5%)	27 (1.1%)	76 (8.4%)	50 (3.3%)	66 (9.2%)
Regularly	1124 (15.4%)	449 (25.2%)	32 (1.4%)	148 (16.4%)	139 (9.0%)	356 (49.5%)
Missing	106 (1.5%)	62 (3.5%)	10 (0.4%)	13 (1.4%)	9 (0.6%)	12 (1.7%)
Job Insecurity						
Low	2486 (34.1%)	299 (16.8%)	1152 (48.9%)	302 (33.4%)	552 (35.9%)	181 (25.2%)
Medium	4031 (55.2%)	1245 (69.8%)	1055 (44.8%)	549 (60.7%)	790 (51.4%)	392 (54.5%)
High	770 (10.5%)	236 (13.2%)	147 (6.2%)	52 (5.7%)	194 (12.6%)	141 (19.6%)
Missing	14 (0.2%)	4 (0.2%)	3 (0.1%)	2 (0.2%)	0 (0%)	5 (0.7%)
Lack Of Development Opportunities						
Low	2598 (35.6%)	363 (20.3%)	1223 (51.9%)	301 (33.3%)	535 (34.8%)	176 (24.5%)
Medium	3574 (49.0%)	964 (54.0%)	1001 (42.5%)	463 (51.2%)	808 (52.6%)	338 (47.0%)
High	1100 (15.1%)	443 (24.8%)	128 (5.4%)	134 (14.8%)	193 (12.6%)	202 (28.1%)
Missing	29 (0.4%)	14 (0.8%)	5 (0.2%)	7 (0.8%)	0 (0%)	3 (0.4%)

Table 3 (continued). Descriptives of all indicator variables for entire study sample and for each subgroup

Lack Of Autonomy (scale: 1-3)						
Mean (SD)	1.76 (0.5)	1.97 (0.4)	1.41 (0.4)	1.76 (0.4)	1.88 (0.4)	2.14 (0.4)
Median [Min, Max]	1.67 [1.00, 3.00]	2.00 [1.00, 3.00]	1.33 [1.00, 2.67]	1.67 [1.00, 3.00]	1.83 [1.00, 3.00]	2.17 [1.00, 3.00]
Missing	22 (0.3%)	4 (0.2%)	5 (0.2%)	8 (0.9%)	4 (0.3%)	1 (0.1%)
Low Manager Support (scale: 1-4)						
Mean (SD)	1.89 (0.7)	1.98 (0.6)	1.58 (0.6)	1.90 (0.7)	2.03 (0.6)	2.33 (0.8)
Median [Min, Max]	2.00 [1.00, 4.00]	2.00 [1.00, 4.00]	1.50 [1.00, 4.00]	2.00 [1.00, 4.00]	2.00 [1.00, 4.00]	2.00 [1.00, 4.00]
Missing	215 (2.9%)	72 (4.0%)	47 (2.0%)	21 (2.3%)	40 (2.6%)	35 (4.9%)
Low Colleague Support (scale: 1-4)						
Mean (SD)	1.56 (0.6)	1.70 (0.6)	1.42 (0.5)	1.66 (0.6)	1.49 (0.5)	1.70 (0.6)
Median [Min, Max]	1.50 [1.00, 4.00]	2.00 [1.00, 4.00]	1.00 [1.00, 4.00]	1.50 [1.00, 4.00]	1.50 [1.00, 4.00]	2.00 [1.00, 4.00]
Missing	143 (2.0%)	20 (2.8%)	28 (1.2%)	31 (3.4%)	8 (0.5%)	56 (3.1%)
Working Hours						
Mean (SD)	34.2 (7.1)	29.3 (7.3)	36.9 (5.3)	38.4 (5.7)	34.2 (6.37)	31.7 (7.1)
Median [Min, Max]	36.0 [17.0, 60.0]	30.0 [17.0, 50.0]	40.0 [17.0, 60.0]	40.0 [18.0, 60.0]	36.0 [17.0, 60.0]	32.0 [17.0, 60.0]
Missing	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
Work Life Conflict (scale: 1-4)						
Mean (SD)	1.41 (0.520)	1.29 (0.4)	1.26 (0.4)	1.31 (0.5)	1.58 (0.5)	1.91 (0.7)
Median [Min, Max]	1.00 [1.00, 4.00]	1.00 [1.00, 3.50]	1.00 [1.00, 3.00]	1.00 [1.00, 3.00]	1.50 [1.00, 4.00]	2.00 [1.00, 4.00]
Missing	26 (0.4%)	9 (0.5%)	4 (0.2%)	7 (0.8%)	1 (0.1%)	5 (0.7%)
Quantitative Demands (scale: 1-4)						
Mean (SD)	2.40 (0.7)	2.12 (0.5)	2.14 (0.5)	2.30 (0.5)	2.87 (0.6)	3.10 (0.6)
Median [Min, Max]	2.33 [1.00, 4.00]	2.00 [1.00, 4.00]	2.00 [1.00, 4.00]	2.00 [1.00, 4.00]	3.00 [1.00, 4.00]	3.00 [1.67, 4.00]
Missing	9 (0.1%)	4 (0.2%)	1 (0.1%)	1 (0.1%)	1 (0.1%)	2 (0.3%)
Emotional Demands (scale: 1-4)						
Mean (SD)	1.79 (0.7)	1.50 (0.5)	1.50 (0.5)	1.37 (0.4)	2.48 (0.5)	2.47 (0.6)
Median [Min, Max]	1.67 [1.00, 4.00]	1.33 [1.00, 3.00]	1.33 [1.00, 3.33]	1.33 [1.00, 3.00]	2.33 [1.00, 4.00]	2.33 [1.00, 4.00]
Missing	7 (0.1%)	3 (0.2%)	2 (0.1%)	1 (0.1%)	1 (0.1%)	2 (0.3%)
Cognitive Demands (scale: 1-4)						
Mean (SD)	3.02 (0.7)	2.49 (0.6)	3.06 (0.6)	2.89 (0.6)	3.50 (0.4)	3.36 (0.6)
Median [Min, Max]	3.00 [1.00, 4.00]	2.67 [1.00, 4.00]	3.00 [1.00, 4.00]	3.00 [1.00, 4.00]	3.67 [2.00, 4.00]	3.33 [1.33, 4.00]
Missing	7 (0.1%)	4 (0.2%)	2 (0.1%)	1 (0.1%)	0 (0%)	0 (0%)

Table 3 (continued). Descriptives of all indicator variables for entire study sample and for each subgroup

Physical Demands (scale: 1-3)						
Mean (SD)	1.45 (0.57)	1.39 (0.3)	1.09 (0.2)	2.35 (0.4)	1.23 (0.3)	2.06 (0.3)
Median [Min, Max]	1.25 [1.00, 3.00]	1.25 [1.00, 2.25]	1.00 [1.00, 2.00]	2.25 [1.50, 3.00]	1.25 [1.00, 2.25]	2.00 [1.25, 3.00]
Missing	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)

The first group, 'low-complexity work', was characterised by having the fewest cognitive demands and the lowest weekly working hours (Figure 1). Workers in this group perceived relatively high job insecurity, only comparable with the 'manual and interpersonal work' group. These two groups also shared a relatively high amount of workers regularly working in shifts compared with the other three groups (25% in this first group). Altogether, this first group had medium job demands across all indicator variables, while also having relatively few job resources (Figure 1). Sales workers, personal service workers, for example, waiters and hairdressers, and personal care workers together made up 40% of this group.

	Job Demands								Job Resources			
Subgroup	Shift Work	Job Insecurity	Work Hours	Work-Life Conflict	Quantitative Demand	Emotional Demands	Cognitive Demands	Physical Demands	Lack of Devel. Opportunity	Lack of Autonomy	Low manager support	Low colleague support
(i) Low complex work	4	4	1	1	1	2	1	3	5	3	3	5
(ii) Office work	1	1	4	1	1	2	3	1	1	1	1	1
(iii) Manual & non-interpersonal work	4	1	5	1	2	1	2	5	3	3	3	5
(iv) Non-manual & interpersonal work	2	3	3	3	4	5	5	2	3	3	3	3
(v) Manual & interpersonal work	5	5	2	5	5	5	4	4	5	5	5	5

Figure 1. Overview of contrasts of work characteristics between the five subgroups, categorised as job demands and job resources. If values were close to each other on visual inspection, they were assigned the same rank so that the ranks reflect the descriptives and not inflate contrasts.

The second group, 'office work', was characterised by having the most job resources of all groups, that is, most development opportunities, highest autonomy, as well as highest support by colleagues and managers (Figure 1). This group also had the least physical demands and virtually no young worker in this group did shift work. Together with the 'manual and non-interpersonal work' group, this second group, had the highest weekly working hours. Except for the high working hours and medium cognitive demands, this 'office work' group scored low on job demands (Figure 1). This group had a high share of academically educated workers (almost 75%). It consisted of 19% business and administration professionals and analysts. Together with business and administration associate professionals and information and communications technology professionals, they made up about 43% of this group.

The third group, ‘manual and non-interpersonal work’, was male dominated (93% males) and characterised by the highest physical demands and a high amount of shift work. This group had relatively little psychosocial job demands, while also having relatively little job resources (Figure 1). Compared with the other groups, this group had a relatively high share of elementarily educated workers (29%). The largest share of a single job type that could be found in this group were building and related trade workers, who made up 14% of this group, followed by metal, machinery and related trade workers, who made up another 14% of this group. Skilled agricultural, forestry and fishery workers made up 6% of this third group. Together with drivers and mobile plant operators who constituted 8% of this group and science and engineering associate professionals who constituted almost 7% of this group, the aforementioned job types accounted for almost 50% of this group.

The fourth group, ‘non-manual and interpersonal work’, had the highest share of academically educated young workers (81%). This group shared some features with the fifth group, ‘manual and interpersonal work’, namely higher cognitive, quantitative and emotional demands than the first three groups (Figure 1). Both groups consisted for about 75% of female workers. While having high job demands in general, physical demands were rather low in this fourth group. Further, this fourth group, ‘non-manual and interpersonal work’, had more job resources (ie, higher autonomy and higher manager support) than the fifth group, ‘manual and interpersonal work’ (Figure 1). Teaching professionals, health professionals, and social and cultural professionals together made up more than 52% of this group.

The fifth group, ‘manual and interpersonal work’, was characterised by the highest amount of workers regularly working in shifts (49.5%) as well as high cognitive, emotional and quantitative demands (Figure 1). While emotional and cognitive demands were comparable with the fourth group, ‘non-manual and interpersonal work’, quantitative demands in this fifth group were even higher. This fifth group reported higher physical demands than the fourth group, which were only topped by the ‘manual and non-interpersonal work’ group. This fifth group further experienced the highest lack of autonomy, lowest manager support and lowest colleague support. Almost 20% of workers in this group experienced high job insecurity, which was the highest score. Altogether, this group can be characterised by having the highest job demands, combined with the least job resources (Figure 1). Fifteen per cent of the workers in this group were health associate professionals, 12% were health professionals, 12% were personal care workers and another 12% were personal services workers. Together, these four functions made up more than half of this group.

Association with emotional exhaustion

An ANOVA indicated significant differences in emotional exhaustion between the five subgroups, $F(4, 7294)=402.3$, $p<0.001$. Emotional exhaustion in the fourth group, ‘non-manual and interpersonal work’ (M=3.11, SD=1.4), and the fifth group, ‘manual and interpersonal work’ (M=3.45, SD=1.6), was significantly higher than in the three other groups (table 4). Emotional exhaustion in group five, ‘manual and interpersonal work’, was also significantly higher than in group four, ‘non-manual and interpersonal work’ group. The first group, ‘low-complexity work’ (M=2.05, SD=1.1), the second group, ‘office work’ (M=1.98, SD=1.0), and the third group, ‘manual and non-interpersonal work’ (M=2.05, SD=1.1), showed comparable levels of emotional exhaustion. Running a sensitivity analysis comparing emotional exhaustion between the classes taking membership uncertainty into account using the three-step procedure with emotional exhaustion as distal outcome as implemented in Mplus led to comparable results.

Table 4. Simple comparisons of emotional exhaustion between the five subgroups

		Emotional Exhaustion	
Subgroup comparison		*Mean Diff.*	*95% CI*
Low complexity work (reference)[a]			
vs	Office work	-0.07	[-0.19, 0.60]
vs	Manual & non-interpersonal work	0.01	[-0.13, 0.14]
vs	**Non-manual & interpersonal work**	**1.06**	**[0.93, 1.20]**
vs	**Manual & interpersonal work**	**1.41**	**[1.24, 1.57]**
Office work (reference)			
vs	Manual & non-interpersonal work	0.07	[-0.03,0.18]
vs	**Non-manual & interpersonal work**	**1.13**	**[1.02, 1.24]**
vs	**Manual & interpersonal work**	**1.47**	**[1.33, 1.61]**
Manual & non-interpersonal work (reference)			
vs	**Non-manual & interpersonal work**	**1.06**	**[0.94, 1.17]**
vs	**Manual & interpersonal work**	**1.40**	**[1.26, 1.54]**
Non-manual & interpersonal work (reference)			
vs	**Manual & interpersonal work**	**0.34**	**[0.24, 0.45]**

[a] Bold font indicates 95% CI's not containing 0

Sensitivity analysis: validation in 2017 and 2021 NWCS waves

The identification of the five subgroups and the differences in emotional exhaustion could be replicated among young workers retrieved from the NWCS waves of 2017 (n=5,496) and 2021 (n=6,115) with two exceptions: first, the difference in emotional exhaustion between both interpersonal work groups was not significant in the 2021 wave. Second, the difference in emotional exhaustion between 'manual and non-interpersonal work' and 'low-complexity work' was significant in the 2017 wave, with a mean difference of 0.2 (see online supplemental files D and E).

Discussion

Five subgroups of work characteristics of young workers were identified and labelled (1) 'low-complexity work', (2) 'office work', (3) 'manual and non-interpersonal work', (4) 'non-manual and interpersonal work', and (5) 'manual and interpersonal work'. Therewith, the current study showed heterogeneity of work characteristics within the group of young workers. Young workers in the two interpersonal work subgroups reported higher emotional exhaustion than their peers in the other three subgroups.

The contrast between the two groups with higher emotional exhaustion levels on one side and the three groups with lower emotional exhaustion levels on the other side is also useful for contrasting the subgroups' work characteristic profiles. Workers in the interpersonal work groups reported high emotional and quantitative demands and had a higher woman-to-man ratio compared with the three other groups. Additionally, the interpersonal work groups had the highest work–life conflict. The difference between the two interpersonal work subgroups was that high physical demands and low job resources were reported in the 'manual and interpersonal work' group, but not in the 'non-manual and interpersonal work' group. In contrast to Shahidi et al (20), we did not find that adverse work characteristics are necessarily 'tightly clustered' for young workers, with the exception that the 'manual and interpersonal work' subgroup was characterised by an accumulation of adverse work characteristics on all variables. In the current study, a nuanced picture appeared in which groups were characterised by more favourable working conditions on some variables, while scoring worse on others. The 'non-manual and interpersonal work' group for example reported the highest cognitive demands of all groups, while scoring centremost of all subgroups concerning lack of autonomy. The differences between the study of Shahidi et al (20) and the current study can be explained by different study populations (all ages vs young workers) and the included indicator variables (exclusively psychosocial variables vs a broader scope of work characteristics).

Our results are in line with previous research, showing a higher risk of mental health complaints for interpersonal work and also showing that within this group doing physical work constitutes an additional risk of mental health complaints (14). Linking the work characteristic profiles to the differences in emotional exhaustion, our current study might indicate that some job demand configurations, which were present in both interpersonal work subgroups, are associated with emotional exhaustion (ie, high emotional and quantitative demands). Earlier research showed that these factors potentially play a role in the development of emotional exhaustion (9, 10, 37–39). The fact that the young workers from the fourth group, 'non-manual and interpersonal work', reported lower emotional exhaustion than the fifth group, 'manual and interpersonal work', might be explained by the buffering hypothesis of having relatively higher job resources (ie, more manager support and autonomy) at one's disposal. This buffering hypothesis is postulated in the job demands resources model (40), but the evidence is mixed (41, 42).

The magnitude of the differences in emotional exhaustion between the subgroups can be considered practically relevant. A value of 2, as was on average found in the three non-interpersonal work groups, corresponds with being emotionally exhausted a few times per year, whereas a value of 3, which the interpersonal work groups on average exceeded, indicated monthly emotional exhaustion. Currently, no consensus exists about a cut-off value that would distinguish a healthy from an unhealthy individual in terms of emotional exhaustion. Nevertheless, a systematic review (43) reports that being exhausted a 'few times per month', which corresponds to a value of 4 in the NWCS, is commonly used as a cut-off point for classifying a worker as being emotionally exhausted. A substantial share of workers in the two interpersonal work subgroups, but not in the three non-interpersonal work subgroups in our current study, is exceeding this value of 4 and would thus commonly be qualified as emotionally exhausted.

Strengths and limitations

The major strengths of the study are the large sample size using an established dataset (the NWCS), the careful selection of the indicator variables using a systematic process and the replication of the results. Therefore, the identified subgroups are considered robust for describing heterogeneity of

working conditions within the group of young workers. However, this study also has limitations. First, causal conclusions concerning the association between work characteristic configurations and emotional exhaustion cannot be drawn from this cross-sectional study and subgroup differences in emotional exhaustion could be caused by confounding factors that were not included. Particularly, prior mental health complaints might be a confounding factor, because they are explaining both, current emotional exhaustion and self-selection into particular working conditions (6). Nevertheless, evidence is accumulating that working conditions affect mental health complaints after controlling for selection effects (14, 44). Second, concerning the interpretation and labelling of the subgroups, there is a risk on overemphasising the most common ISCO functions, which can be found in a subgroup, because work characteristics can be heterogeneous for workers sharing one function (45). Against this background, the added value of applying data-driven LCA was that it did not make a priori assumptions on how to categorise work characteristics and thus constitutes a valuable complement to expert consensus-based classifications (e.g., ISCO) or the regularly applied, but ambiguous descriptions of jobs as 'blue collar' or 'white collar' (e.g., Lips-Wiersma et al [46]).

Practical implications

Work that is characterised by the configurations of work characteristics which can be found in the two interpersonal work subgroups should be prioritised when developing and applying occupational mental health interventions. Since the highest degrees of emotional exhaustion were reported by young workers doing this work, the potential positive effect of these interventions can be largest. Depending on the actual configurations of work characteristics that are experienced by a young worker, different prevention strategies, assessing and targeting both job demands and job resources (42), should be considered.

Conclusion

This study showed that young workers reported heterogeneous work characteristic configurations with substantial differences in degrees of emotional exhaustion between the identified subgroups. The two interpersonal work subgroups showed a higher degree of emotional exhaustion. Preventing emotional exhaustion should focus on these groups. In prevention efforts, these groups' configurations of work characteristics should be taken into account.

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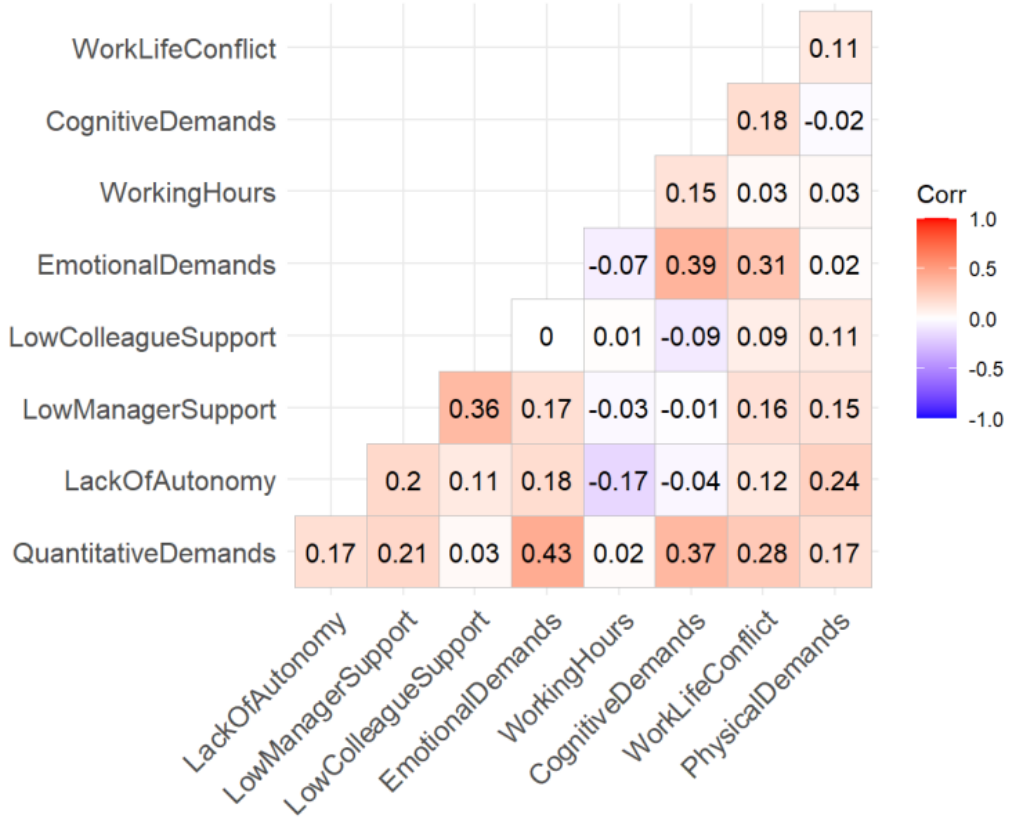
Appendix

Supplementary File A – Completed STROBE – Statement

	Item No	Recommendation	Page No
Title and abstract	1	(*a*) Indicate the study's design with a commonly used term in the title or the abstract	1
		(*b*) Provide in the abstract an informative and balanced summary of what was done and what was found	2
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	4
Objectives	3	State specific objectives, including any prespecified hypotheses	5
Methods			
Study design	4	Present key elements of study design early in the paper	5,6
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	5
Participants	6	(*a*) Give the eligibility criteria, and the sources and methods of selection of participants	5
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	6,8
Data sources/ measurement	8	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	7,8
Bias	9	Describe any efforts to address potential sources of bias	10
Study size	10	Explain how the study size was arrived at	5
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	8
Statistical methods	12	(*a*) Describe all statistical methods, including those used to control for confounding	9,10
		(*b*) Describe any methods used to examine subgroups and interactions	n.a.
		(*c*) Explain how missing data were addressed	n.a.
		(*d*) If applicable, describe analytical methods taking account of sampling strategy	n.a.
		(*e*) Describe any sensitivity analyses	10
Results			
Participants	13	(a) Report numbers of individuals at each stage of study—e.g. numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	5
		(b) Give reasons for non-participation at each stage	n.a.

		(c) Consider use of a flow diagram	n.a.
Descriptive data	14	(a) Give characteristics of study participants (e.g. demographic, clinical, social) and information on exposures and potential confounders	11
		(b) Indicate number of participants with missing data for each variable of interest	Table 3
Outcome data	15	Report numbers of outcome events or summary measures	15,16
Main results	16	(*a*) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (e.g., 95% confidence interval). Make clear which confounders were adjusted for and why they were included	Table 5
		(*b*) Report category boundaries when continuous variables were categorized	n.a.
		(*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	n.a.
Other analyses	17	Report other analyses done—e.g. analyses of subgroups and interactions, and sensitivity analyses	16,17
Discussion			
Key results	18	Summarise key results with reference to study objectives	17
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	18,19
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	17
Generalisability	21	Discuss the generalisability (external validity) of the study results	18
Other information			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	20

Supplementary File B – Bivariate correlations



Supplementary File C – Top 20 ISCO codes per class

ISCO08 submajor group	Frequency	Proportion (%)	Cumulative proportion (%)	Proportion of code in this sub-group (%)
Subgroup (i): Low complex work				
52 Sales Workers	316	17.7	17.7	60.5
51 Personal Services Workers	231	12.9	30.7	53.7
53 Personal Care Workers	161	9.0	39.7	51.9
32 Health Associate Professionals	114	6.4	46.1	35.5
34 Legal, Social, Cultural and Related Associate Professionals	93	5.2	51.3	29.9
42 Customer Services Clerks	80	4.5	55.8	42.6
93 Labourers in Mining, Construction, Manufacturing and Transport	80	4.5	60.3	48.8
23 Teaching Professionals	73	4.1	64.3	8.9
33 Business and Administration Associate Professionals	57	3.2	67.5	12.4
43 Numerical and Material Recording Clerks	54	3.0	70.6	23.4

24 Business and Administration Professionals	50	2.8	73.4	7.8
83 Drivers and Mobile Plant Operators	40	2.2	75.6	28
31 Science and Engineering Associate Professionals	38	2.1	77.7	19.4
94 Food Preparation Assistants	38	2.1	79.9	64.4
54 Protective Services Workers	37	2.1	82.0	42.5
91 Cleaners and Helpers	32	1.8	83.7	57.1
22 Health Professionals	28	1.6	85.3	8.3
41 General and Keyboard Clerks	23	1.3	86.6	25.8
26 Legal, Social and Cultural Professionals	21	1.2	87.8	8.2
75 Food Processing, Woodworking, Garment and Other Craft and Related Trades Workers	20	1.1	88.9	33.9
Subgroup (ii): Office work				
24 Business and Administration Professionals	453	19.2	19.2	70.9
33 Business and Administration Associate Professionals	302	12.8	32.0	65.8
25 Information and Communications Technology Professionals	248	10.5	42.6	82.7
21 Science and Engineering Professionals	186	7.9	50.4	69.1
23 Teaching Professionals	172	7.3	57.7	20.9
26 Legal, Social and Cultural Professionals	114	4.8	62.6	44.4
43 Numerical and Material Recording Clerks	106	4.5	67.1	45.9
52 Sales Workers	89	3.8	70.9	17
31 Science and Engineering Associate Professionals	75	3.2	74.0	38.3
42 Customer Services Clerks	56	2.4	76.4	29.8
34 Legal, Social, Cultural and Related Associate Professionals	55	2.3	78.7	17.7
22 Health Professionals	54	2.3	81.0	16
51 Personal Services Workers	54	2.3	83.3	12.6
41 General and Keyboard Clerks	53	2.2	85.6	59.6
12 Administrative and Commercial Managers	40	1.7	87.3	70.2
32 Health Associate Professionals	34	1.4	88.7	10.6
44 Other Clerical Support Workers	32	1.4	90.1	47.1
53 Personal Care Workers	21	0.9	91.0	6.8
35 Information and Communications Technicians	20	0.8	91.8	41.7
13 Production and Specialized Services Managers	18	0.8	92.6	43.9
Subgroup (iii): Manual, non-interpersonal work				
72 Metal, Machinery and Related Trades Workers	131	14.5	14.5	75.3

71 Building and Related Trades Workers (excluding Electricians)	129	14.3	28.7	83.8
83 Drivers and Mobile Plant Operators	70	7.7	36.5	49
31 Science and Engineering Associate Professionals	60	6.6	43.1	30.6
61 Market-oriented Skilled Agricultural Workers	55	6.1	49.2	64.7
93 Labourers in Mining, Construction, Manufacturing and Transport	51	5.6	54.8	31.1
74 Electrical and Electronic Trades Workers	48	5.3	60.1	62.3
43 Numerical and Material Recording Clerks	36	4.0	64.1	15.6
51 Personal Services Workers	33	3.6	67.7	7.7
21 Science and Engineering Professionals	28	3.1	70.8	10.4
75 Food Processing, Woodworking, Garment and Other Craft and Related Trades Workers	28	3.1	73.9	47.5
81 Stationary Plant and Machine Operators	27	3.0	76.9	49.1
52 Sales Workers	25	2.8	79.7	4.8
7 Craft and Related Trades Workers without further specification	17	1.9	81.5	50
82 Assemblers	14	1.5	83.1	48.3
13 Production and Specialized Services Managers	13	1.4	84.5	31.7
03 Armed Forces Occupations, Other Ranks	12	1.3	85.9	57.1
34 Legal, Social, Cultural and Related Associate Professionals	12	1.3	87.2	3.9
91 Cleaners and Helpers	12	1.3	88.5	21.4
96 Refuse Workers and Other Elementary Workers	11	1.2	89.7	28.9
Subgroup (iv): Non-manual interpersonal work				
23 Teaching Professionals	531	34.6	34.6	64.5
22 Health Professionals	165	10.7	45.3	49
24 Business and Administration Professionals	127	8.3	53.6	19.9
26 Legal, Social and Cultural Professionals	115	7.5	61.1	44.7
33 Business and Administration Associate Professionals	89	5.8	66.9	19.4
34 Legal, Social, Cultural and Related Associate Professionals	87	5.7	72.5	28
32 Health Associate Professionals	58	3.8	76.3	18.1
42 Customer Services Clerks	42	2.7	79.0	22.3
52 Sales Workers	39	2.5	81.6	7.5
25 Information and Communications Technology Professionals	38	2.5	84.0	12.7
21 Science and Engineering Professionals	36	2.3	86.4	13.4
53 Personal Care Workers	33	2.1	88.5	10.6
51 Personal Services Workers	26	1.7	90.2	6

43 Numerical and Material Recording Clerks	25	1.6	91.9	10.8
14 Hospitality, Retail and Other Services Managers	13	0.8	92.7	27.7
54 Protective Services Workers	13	0.8	93.6	14.9
12 Administrative and Commercial Managers	11	0.7	94.3	19.3
31 Science and Engineering Associate Professionals	11	0.7	95.0	5.6
44 Other Clerical Support Workers	10	0.7	95.6	14.7
13 Production and Specialized Services Managers	7	0.5	96.1	17.1
Subgroup (v): Manual, interpersonal work				
32 Health Associate Professionals	106	14.7	14.7	33
22 Health Professionals	89	12.4	27.1	26.4
53 Personal Care Workers	89	12.4	39.5	28.7
51 Personal Services Workers	86	12.0	51.5	20
34 Legal, Social, Cultural and Related Associate Professionals	64	8.9	60.4	20.6
52 Sales Workers	53	7.4	67.7	10.2
23 Teaching Professionals	42	5.8	73.6	5.1
54 Protective Services Workers	18	2.5	76.1	20.7
93 Labourers in Mining, Construction, Manufacturing and Transport	18	2.5	78.6	11
83 Drivers and Mobile Plant Operators	17	2.4	80.9	11.9
31 Science and Engineering Associate Professionals	12	1.7	82.6	6.1
43 Numerical and Material Recording Clerks	10	1.4	84.0	4.3
42 Customer Services Clerks	9	1.3	85.3	4.8
94 Food Preparation Assistants	9	1.3	86.5	15.3
81 Stationary Plant and Machine Operators	8	1.1	87.6	14.5
61 Market-oriented Skilled Agricultural Workers	7	1.0	88.6	8.2
72 Metal, Machinery and Related Trades Workers	7	1.0	89.6	4
71 Building and Related Trades Workers (excluding Electricians)	6	0.8	90.4	3.9
82 Assemblers	6	0.8	91.2	20.7
03 Armed Forces Occupations, Other Ranks	5	0.7	91.9	23.8

Supplementary File D – 2017 Data

Table 2_2017. Statistical model fit indices for models from 1 to 10 latent classes. [LL: Log Likelihood; AIC: Akaike Information Criterion; BIC: Bayesian Information Criterion; aBIC: adjusted Bayesian information criterion]

Number of classes	LL	AIC	BIC	aBIC	Entropy	Proportion smallest class
1	-93088.8	186231.7	186410.2	186324.4	NA	100%
2	-91210.3	182512.5	182816.7	182670.5	0.65	43%
3	-89832.1	179794.3	180224.1	180017.5	0.72	21.8%
4	-88799	177766.1	178321.5	178054.6	0.79	13.3%
5	-88235.9	176677.9	177358.9	177031.6	0.77	11.7%
6	-87749.7	175743.3	176550	176162.3	0.79	5.2%
7	-87299.4	174880.9	175813.1	175365.1	0.81	2.2%
8	-87013	174345.9	175403.8	174895.4	0.80	2.0%
9	-86742.6	173843.2	175026.7	174457.9	0.80	1.9%
10	-86546.8	173489.6	174798.7	174169.5	0.80	1.5%

Table 3_2017. Descriptives of all indicator variables for entire study sample and for each subgroup

Subgroup	Total	(i) Low complex work	(ii) Office Work	(iii) Manual & non-interper-sonal work	(iv) Non-manual & interpersonal work	(v) Manual & interper-sonal work
	N=5496	N=1354	N=2027	N=658	N=812	N=645
	100%	25%	37%	12%	15%	12%
Age						
Mean (SD)	24.9 (3.0)	23.6 (3.2)	25.5 (2.6)	24.1 (3.3)	26.1 (2.3)	24.8 (3.0)
Median [Min, Max]	25.0 [18.0, 29.0]	24.0 [18.0, 29.0]	26.0 [18.0, 29.0]	24.0 [18.0, 29.0]	26.0 [18.0, 29.0]	25.0 [18.0, 29.0]
Missing	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
Education						
Low	512 (9.3%)	241 (17.8%)	55 (2.7%)	145 (22.0%)	5 (0.6%)	66 (10.2%)
Intermediate	2375 (43.2%)	855 (63.1%)	545 (26.9%)	441 (67.0%)	140 (17.2%)	394 (61.1%)
High	2568 (46.7%)	240 (17.7%)	1418 (70.0%)	66 (10.0%)	664 (81.8%)	180 (27.9%)
Missing	41 (0.7%)	18 (1.3%)	9 (0.4%)	6 (0.9%)	3 (0.4%)	5 (0.8%)

Sex						
Female	2948 (53.6%)	882 (65.1%)	949 (46.8%)	44 (6.7%)	577 (71.1%)	496 (76.9%)
Male	2548 (46.4%)	472 (34.9%)	1078 (53.2%)	614 (93.3%)	235 (28.9%)	149 (23.1%)
Missing	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
Shift Work						
Never	4161 (75.7%)	855 (63.1%)	1908 (94.1%)	486 (73.9%)	676 (83.3%)	236 (36.6%)
Sometimes	320 (5.8%)	125 (9.2%)	44 (2.2%)	48 (7.3%)	21 (2.6%)	82 (12.7%)
Regularly	946 (17.2%)	341 (25.2%)	60 (3.0%)	117 (17.8%)	108 (13.3%)	320 (49.6%)
Missing	69 (1.3%)	33 (2.4%)	15 (0.7%)	7 (1.1%)	7 (0.9%)	7 (1.1%)
Job Insecurity						
Low	1510 (27.5%)	194 (14.3%)	812 (40.1%)	203 (30.9%)	185 (22.8%)	116 (18.0%)
Medium	3200 (58.2%)	946 (69.9%)	1044 (51.5%)	383 (58.2%)	452 (55.7%)	375 (58.1%)
High	765 (13.9%)	209 (15.4%)	160 (7.9%)	71 (10.8%)	174 (21.4%)	151 (23.4%)
Missing	21 (0.4%)	5 (0.4%)	11 (0.5%)	1 (0.2%)	1 (0.1%)	3 (0.5%)
Lack Of Development Opportunities						
Low	1854 (33.7%)	254 (18.8%)	1030 (50.8%)	196 (29.8%)	250 (30.8%)	124 (19.2%)
Medium	2589 (47.1%)	680 (50.2%)	860 (42.4%)	325 (49.4%)	432 (53.2%)	292 (45.3%)
High	1006 (18.3%)	405 (29.9%)	122 (6.0%)	130 (19.8%)	122 (15.0%)	227 (35.2%)
Missing	47 (0.9%)	15 (1.1%)	15 (0.7%)	7 (1.1%)	8 (1.0%)	2 (0.3%)
Lack Of Autonomy (scale: 1-3)						
Mean (SD)	1.75 (0.5)	1.98 (0.4)	1.43 (0.4)	1.77 (0.4)	1.84 (0.5)	2.14 (0.4)
Median [Min, Max]	1.67 [1.00, 3.00]	2.00 [1.00, 3.00]	1.33 [1.00, 2.83]	1.67 [1.00, 2.83]	1.83 [1.00, 3.00]	2.17 [1.00, 3.00]
Missing	4 (0.1%)	2 (0.1%)	0 (0%)	1 (0.2%)	0 (0%)	1 (0.2%)
Low Manager Support (scale: 1-4)						
Mean (SD)	1.91 (0.7)	1.97 (0.7)	1.60 (0.6)	1.96 (0.7)	2.18 (0.7)	2.40 (0.8)
Median [Min, Max]	2.00 [1.00, 4.00]	2.00 [1.00, 4.00]	1.50 [1.00, 4.00]	2.00 [1.00, 4.00]	2.00 [1.00, 4.00]	2.00 [1.00, 4.00]
Missing	167 (3.0%)	49 (3.6%)	60 (3.0%)	13 (2.0%)	17 (2.1%)	28 (4.3%)
Low Colleague Support (scale: 1-4)						
Mean (SD)	1.58 (0.6)	1.68 (0.6)	1.42 (0.5)	1.67 (0.6)	1.63 (0.6)	1.69 (0.6)
Median [Min, Max]	1.50 [1.00, 4.00]	2.00 [1.00, 4.00]	1.00 [1.00, 4.00]	2.00 [1.00, 4.00]	1.50 [1.00, 4.00]	2.00 [1.00, 4.00]
Missing	107 (1.9%)	41 (3.0%)	30 (1.5%)	18 (2.7%)	5 (0.6%)	13 (2.0%)
Working Hours						
Mean (SD)	34.2 (7.1)	29.2 (7.4)	37.1 (5.1)	38.5 (5.6)	34.9 (5.9)	30.8 (6.7)

Median [Min, Max]	36.0 [17.0, 60.0]	30.0 [17.0, 50.0]	40.0 [18.0, 60.0]	40.0 [17.0, 60.0]	36.0 [17.0, 60.0]	32.0 [17.0, 55.0]
Missing	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
Work Life Conflict (scale: 1-4)						
Mean (SD)	1.41 (0.5)	1.25 (0.4)	1.31 (0.4)	1.42 (0.5)	1.60 (0.5)	1.81 (0.7)
Median [Min, Max]	1.00 [1.00, 4.00]	1.00 [1.00, 3.00]	1.00 [1.00, 4.00]	1.00 [1.00, 4.00]	1.50 [1.00, 4.00]	2.00 [1.00, 4.00]
Missing	29 (0.5%)	10 (0.7%)	8 (0.4%)	5 (0.8%)	6 (0.7%)	0 (0%)
Quantitative Demands (scale: 1-4)						
Mean (SD)	2.41 (0.7)	2.08 (0.6)	2.22 (0.5)	2.41 (0.6)	2.91 (0.6)	3.05 (0.6)
Median [Min, Max]	2.33 [1.00, 4.00]	2.00 [1.00, 4.00]	2.00 [1.00, 4.00]	2.33 [1.00, 4.00]	3.00 [1.33, 4.00]	3.00 [1.33, 4.00]
Missing	10 (0.2%)	1 (0.1%)	4 (0.2%)	1 (0.2%)	1 (0.1%)	3 (0.5%)
Emotional Demands (scale: 1-4)						
Mean (SD)	1.72 (0.7)	1.42 (0.5)	1.51 (0.5)	1.40 (0.5)	2.48 (0.5)	2.39 (0.6)
Median [Min, Max]	1.67 [1.00, 4.00]	1.33 [1.00, 3.00]	1.33 [1.00, 3.33]	1.33 [1.00, 3.00]	2.33 [1.00, 4.00]	2.33 [1.00, 4.00]
Missing	7 (0.1%)	1 (0.1%)	1 (0.1%)	1 (0.2%)	2 (0.2%)	2 (0.3%)
Cognitive Demands (scale: 1-4)						
Mean (SD)	3.00 (0.7)	2.42 (0.6)	3.15 (0.6)	2.92 (0.6)	3.48 (0.5)	3.24 (0.6)
Median [Min, Max]	3.00 [1.00, 4.00]	2.33 [1.00, 4.00]	3.00 [1.00, 4.00]	3.00 [1.00, 4.00]	3.67 [1.67, 4.00]	3.33 [1.00, 4.00]
Missing	2 (0.1%)	2 (0.1%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
Physical Demands (scale: 1-3)						
Mean (SD)	1.45 (0.5)	1.39 (0.3)	1.11 (0.2)	2.37 (0.5)	1.18 (0.2)	2.01 (0.4)
Median [Min, Max]	1.25 [1.00, 3.00]	1.33 [1.00, 2.50]	1.00 [1.00, 2.00]	2.25 [1.50, 3.00]	1.00 [1.00, 2.00]	2.00 [1.25, 3.00]
Missing	3 (0.1%)	2 (0.1%)	1 (0.1%)	0 (0%)	0 (0%)	0 (0%)

Figure 1_2017. Overview of contrasts of work characteristics between the five subgroups, categorized as job demands and job resources[a]

	Job Demands								Job Resources			
Subgroup_2017	Shift Work	Job Insecurity	Work Hours	Work-Life Conflict	Quantitative Demand	Emotional Demands	Cognitive Demands	Physical Demands	Lack of Devel. Opportunity	Lack of Autonomy	Low manager support	Low colleague support
(i) Low complex work_2017	4	3	1	1	1	1	1	3	5	3	3	3
(ii) Office work_2017	1	1	4	1	1	2	3	1	1	1	1	1
(iii) Manual & non-interpersonal work_2017	3	2	5	2	2	1	2	5	3	3	3	3
(iv) Non-manual & interpersonal work_2017	2	4	3	3	4	5	5	2	3	3	3	3
(v) Manual & interpersonal work_2017	5	5	2	5	5	5	4	4	5	5	5	3

[a]If values were close to each other on visual inspection, they were assigned the same rank so that the ranks reflect the descriptives and not inflate contrasts.

Table 4_2017. Simple comparisons of emotional exhaustion between the five subgroups. [CI=confidence interval.]

		Emotional Exhaustion	
Subgroup comparison		*Mean Diff.*	*95% CI*
Low complex work (reference)[a]			
vs	Office work	0.09	[-0.02, 0.20]
vs	**Manual & non-interpersonal work**	**0.2**	**[0.05, 0.35]**
vs	**Non-manual & interpersonal work**	**1.15**	**[1.01, 1.30]**
vs	**Manual & interpersonal work**	**1.34**	**[1.19, 1.50]**
Office work (reference)			
vs	Manual & non-interpersonal work	0.11	[-0.03,0.25]
vs	**Non-manual & interpersonal work**	**1.06**	**[0.93, 1.20]**
vs	**Manual & interpersonal work**	**1.25**	**[1.11, 1.4]**
Manual & non-interpersonal work (reference)			
vs	**Non-manual & interpersonal work**	**0.95**	**[0.79, 1.12]**
vs	**Manual & interpersonal work**	**1.14**	**[0.97, 1.32]**
Non-manual & interpersonal work (reference)			
vs	**Manual & interpersonal work**	**0.19**	**[0.02, 0.36]**

[a]Bold font indicates 95% CI's not containing 0.

Supplementary File E – 2021 Data

Table 2_2021. Statistical model fit indices for models from 1 to 10 latent classes. [LL: Log Likelihood; AIC: Akaike Information Criterion; BIC: Bayesian Information Criterion; aBIC: adjusted Bayesian information criterion]

Number of classes	LL	AIC	BIC	aBIC	Entropy	Proportion smallest class
1	-102342.7	204739.4	204920.8	204835.0	NA	100%
2	-100075.2	200242.3	200551.4	200405.2	0.765	26.1%
3	-98607.52	197345	197781.7	197575.2	0.716	23.3%
4	-97401.09	194970.2	195534.5	195267.6	0.777	12.1%
5	-96730.05	193666.1	194358.1	194030.8	0.781	10.0%
6	-96252.8	192749.6	193569.3	193181.6	0.799	2.2%
7	-95861.23	192004.5	192951.8	192503.7	0.807	2.2%

8	-95526.83	191373.7	192448.6	191940.2	0.769	2.1%
9	-95172.84	190703.7	191906.3	191337.5	0.802	2.2%
10	-94914.86	190225.7	191556	190926.8	0.79	1.5%

Table 3_2021. Descriptives of all indicator variables for entire study sample and for each subgroup

Subgroup	**Total**	**(i) Low complex work**	**(ii) Office Work**	**(iii) Manual & non-interper-sonal work**	**(iv) Non-manual & interpersonal work**	**(v) Manual & interper-sonal work**
	N=6115	N=1451	N=2249	N=630	N=1174	N=611
	100%	23.7%	36.8%	10.3%	19.2%	10.0%
Age						
Mean (SD)	24.8 (3.1)	23.5 (3.3)	25.6 (2.7)	23.5 (3.3)	25.9 (2.5)	24.7 (3.0)
Median [Min, Max]	25.0 [18.0, 29.0]	23.0 [18.0, 29.0]	26.0 [18.0, 29.0]	23.0 [18.0, 29.0]	26.0 [18.0, 29.0]	25.0 [18.0, 29.0]
Missing	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
Education						
Low	536 (8.8%)	238 (16.4%)	70 (3.1%)	155 (24.6%)	19 (1.6%)	54 (8.8%)
Intermediate	2381 (38.9%)	898 (61.9%)	479 (21.3%)	414 (65.7%)	217 (18.5%)	373 (61.0%)
High	3154 (51.6%)	297 (20.5%)	1690 (75.1%)	56 (8.9%)	934 (79.6%)	177 (29.0%)
Missing	44 (0.7%)	18 (1.2%)	10 (0.4%)	5 (0.8%)	4 (0.3%)	7 (1.1%)
Sex						
Female	3454 (56.5%)	948 (65.3%)	1113 (49.5%)	48 (7.6%)	884 (75.3%)	461 (75.5%)
Male	2661 (43.5%)	503 (34.7%)	1136 (50.5%)	582 (92.4%)	290 (24.7%)	150 (24.6%)
Missing	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
Shift Work						
Never	4889 (80.0%)	932 (64.2%)	2202 (97.9%)	486 (77.1%)	1022 (87.1%)	247 (40.4%)
Sometimes	306 (5.0%)	146 (10.1%)	16 (0.7%)	52 (8.3%)	30 (2.6%)	62 (10.1%)
Regularly	834 (13.6%)	326 (22.5%)	17 (0.8%)	85 (13.5%)	114 (9.7%)	292 (47.8%)
Missing	86 (1.4%)	47 (3.2%)	14 (0.6%)	7 (1.1%)	8 (0.7%)	10 (1.6%)
Job Insecurity						
Low	2611 (42.7%)	363 (25.0%)	1254 (55.8%)	255 (40.5%)	513 (43.7%)	226 (37.0%)
Medium	3028 (49.5%)	974 (67.1%)	886 (39.4%)	345 (54.8%)	502 (42.8%)	321 (52.5%)
High	468 (7.7%)	113 (7.8%)	106 (4.7%)	26 (4.1%)	159 (13.5%)	64 (10.5%)
Missing	8 (0.1%)	1 (0.1%)	3 (0.1%)	4 (0.6%)	0 (0%)	0 (0%)

Lack Of Development Opportunities						
Low	2323 (38.0%)	376 (25.9%)	1186 (52.7%)	204 (32.4%)	391 (33.3%)	166 (27.2%)
Medium	2916 (47.7%)	737 (50.8%)	953 (42.4%)	348 (55.2%)	599 (51.0%)	279 (45.7%)
High	842 (13.8%)	325 (22.4%)	105 (4.7%)	71 (11.3%)	177 (15.1%)	164 (26.8%)
Missing	34 (0.6%)	13 (0.9%)	5 (0.2%)	7 (1.1%)	7 (0.6%)	2 (0.3%)
Lack Of Autonomy (scale: 1-3)						
Mean (SD)	1.75 (0.5)	1.98 (0.4)	1.44 (0.4)	1.74 (0.4)	1.89 (0.5)	2.14 (0.4)
Median [Min, Max]	1.67 [1.00, 3.00]	2.00 [1.00, 3.00]	1.33 [1.00, 2.83]	1.67 [1.00, 3.00]	1.83 [1.00, 3.00]	2.17 [1.00, 3.00]
Missing	39 (0.6%)	8 (0.6%)	10 (0.4%)	5 (0.8%)	9 (0.8%)	7 (1.1%)
Low Manager Support (scale: 1-4)						
Mean (SD)	1.85 (0.7)	1.88 (0.6)	1.58 (0.6)	1.85 (0.6)	2.09 (0.7)	2.32 (0.8)
Median [Min, Max]	2.00 [1.00, 4.00]	2.00 [1.00, 4.00]	1.50 [1.00, 4.00]	2.00 [1.00, 4.00]	2.00 [1.00, 4.00]	2.00 [1.00, 4.00]
Missing	148 (2.4%)	44 (3.0%)	38 (1.7%)	16 (2.5%)	25 (2.1%)	25 (4.1%)
Low Colleague Support (scale: 1-4)						
Mean (SD)	1.55 (0.6)	1.64 (0.6)	1.41 (0.5)	1.66 (0.5)	1.55 (0.6)	1.71 (0.7)
Median [Min, Max]	1.50 [1.00, 4.00]	1.50 [1.00, 4.00]	1.00 [1.00, 4.00]	1.50 [1.00, 4.00]	1.50 [1.00, 4.00]	2.00 [1.00, 4.00]
Missing	144 (2.4%)	57 (3.9%)	28 (1.2%)	20 (3.2%)	20 (1.7%)	19 (3.1%)
Working Hours						
Mean (SD)	34.3 (6.9)	29.2 (7.3)	36.8 (5.0)	38.2 (5.8)	34.6 (6.3)	32.7 (6.6)
Median [Min, Max]	36.0 [17.0, 60.0]	30.0 [17.0, 55.0]	40.0 [17.0, 60.0]	40.0 [18.0, 60.0]	36.0 [17.0, 60.0]	32.0 [17.0, 60.0]
Missing	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
Work Life Conflict (scale: 1-4)						
Mean (SD)	1.37 (0.5)	1.25 (0.4)	1.25 (0.4)	1.34 (0.5)	1.59 (0.5)	1.73 (0.
Median [Min, Max]	1.00 [1.00, 4.00]	1.00 [1.00, 3.00]	1.00 [1.00, 3.50]	1.00 [1.00, 4.00]	1.50 [1.00, 4.00]	1.50 [1.00, 4.00]
Missing	26 (0.4%)	12 (0.8%)	3 (0.1%)	8 (1.3%)	2 (0.2%)	1 (0.2%)
Quantitative Demands (scale: 1-4)						
Mean (SD)	2.37 (0.6)	2.08 (0.5)	2.10 (0.5)	2.33 (0.5)	2.92 (0.6)	3.02 (0.6)
Median [Min, Max]	2.33 [1.00, 4.00]	2.00 [1.00, 4.00]	2.00 [1.00, 4.00]	2.33 [1.00, 4.00]	3.00 [1.33, 4.00]	3.00 [1.33, 4.00]
Missing	38 (0.6%)	9 (0.6%)	9 (0.4%)	3 (0.5%)	10 (0.9%)	7 (1.1%)
Emotional Demands (scale: 1-4)						
Mean (SD)	1.81 (0.7)	1.51 (0.5)	1.55 (0.5)	1.42 (0.5)	2.53 (0.6)	2.46 (0.6)
Median [Min, Max]	1.67 [1.00, 4.00]	1.33 [1.00, 4.00]	1.33 [1.00, 3.50]	1.33 [1.00, 3.33]	2.33 [1.00, 4.00]	2.33 [1.00, 4.00]
Missing	35 (0.6%)	9 (0.6%)	8 (0.4%)	3 (0.5%)	8 (0.7%)	7 (1.1%)
Cognitive Demands (scale: 1-4)						
Mean (SD)	2.98 (0.7)	2.41 (0.6)	3.04 (0.6)	2.89 (0.6)	3.48 (0.5)	3.29 (0.6)

Median [Min, Max]	3.00 [1.00, 4.00]	2.33 [1.00, 4.00]	3.00 [1.00, 4.00]	3.00 [1.00, 4.00]	3.67 [1.67, 4.00]	3.33 [1.00, 4.00]
Missing	32 (0.5%)	8 (0.6%)	7 (0.3%)	3 (0.5%)	7 (0.6%)	7 (1.1%)
Physical Demands (scale: 1-3)						
Mean (SD)	1.40 (0.5)	1.36 (0.3)	1.09 (0.2)	2.37 (0.4)	1.20 (0.2)	2.04 (0.4)
Median [Min, Max]	1.25 [1.00, 3.00]	1.25 [1.00, 2.25]	1.00 [1.00, 2.00]	2.25 [1.75, 3.00]	1.00 [1.00, 2.00]	2.00 [1.25, 3.00]
Missing	32 (0.5%)	9 (0.6%)	6 (0.3%)	3 (0.5%)	7 (0.6%)	7 (1.1%)

Figure 1_2021. Overview of contrasts of work characteristics between the five subgroups, categorized as job demands and job resources[a]

	Job Demands								Job Resources			
Subgroup_2021	Shift Work	Job Insecurity	Work Hours	Work-Life Conflict	Quantitative Demand	Emotional Demands	Cognitive Demands	Physical Demands	Lack of Devel. Opportunity	Lack of Autonomy	Low manager support	Low colleague support
(i) Low complex work_2021	4	4	1	1	1	2	1	3	5	3	3	3
(ii) Office work_2021	1	1	4	1	1	2	3	1	1	1	1	1
(iii) Manual & non-interpersonal work_2021	4	1	5	2	2	1	2	5	3	3	3	3
(iv) Non-manual & interpersonal work_2021	2	3	3	3	4	5	5	2	3	3	3	3
(v) Manual & interpersonal work_2021	5	5	2	5	5	5	4	4	5	5	5	4

[a]If values were close to each other on visual inspection, they were assigned the same rank so that the ranks reflect the descriptives and not inflate contrasts.

Table 4_2021. Simple comparisons of emotional exhaustion between the five subgroups. [CI=confidence interval.]

		Emotional Exhaustion	
Subgroup comparison		*Mean Diff.*	*95% CI*
Low complex work (reference)[a]			
vs	Office work	-0.03	[-0.14, 0.08]
vs	Manual & non-interpersonal work	0.00	[-0.16, 0.16]
vs	**Non-manual & interpersonal work**	**1.37**	**[1.24, 1.50]**
vs	**Manual & interpersonal work**	**1.42**	**[1.26, 1.58]**
Office work (reference)			
vs	Manual & non-interpersonal work	-0.03	[-0.12, 0.18]
vs	**Non-manual & interpersonal work**	**1.34**	**[1.22, 1.46]**
vs	**Manual & interpersonal work**	**1.39**	**[1.24, 1.46]**
Manual & non-interpersonal work (reference)			
vs	**Non-manual & interpersonal work**	**1.37**	**[1.21, 1.53]**
vs	**Manual & interpersonal work**	**1.42**	**[1.23, 1.61]**
Non-manual & interpersonal work (reference)			
vs	Manual & interpersonal work	0.05	[-0.11, 0.22]

[a]Bold font indicates 95% CI's not containing 0.

Supplementary File F – Excluding educational level and sex as indicator variables

Table 2_excl_gen_edu. Statistical model fit indices for models from 1 to 10 latent classes. [LL: Log Likelihood; AIC: Akaike Information Criterion; BIC: Bayesian Information Criterion; aBIC: adjusted Bayesian information criterion]

Number of classes	LL	AIC	BIC	aBIC	Entropy	Proportion smallest class
1	-111268.01	222584.03	222749.53	222673.27	NA	100%
2	-108900.43	217880.87	218156.7	218029.59	0.732	27.2%
3	-107509.41	215130.82	215516.99	215339.03	0.669	25.6%
4	-106773.95	213691.89	214188.39	213959.59	0.733	12.0%
5	-106005.56	212187.13	212793.96	212514.31	0.746	7.1%
6	-105563.18	211334.36	212051.52	211721.03	0.762	4.2%
7	-105203.39	210646.78	211474.27	211092.94	0.778	1.2%
8	-104858.47	209988.93	210926.76	210494.58	0.766	2.9%
9	-104586.95	209477.91	210526.06	210043.04	0.756	1.0%
10	-104326.02	208988.04	210146.53	209612.66	0.76	1.0%

Table 3__excl_gen_edu. Descriptives of all indicator variables for entire study sample and for each subgroup

Subgroup	Total	(i) Low complex work	(ii) Office Work	(iii) Manual & non-interper-sonal work	(iv) Non-manual & interpersonal work	(v) Manual & interper-sonal work
	N=7301	N=1707	N=2431	N=916	N=1728	N=519
	100%	23.4%	33.3%	12.5%	23.7%	7.1%
Age						
Mean (SD)	24.8 (3.1)	23.9 (3.34)	25.3 (2.88)	23.7 (3.33)	25.7 (2.64)	24.8 (3.06)
Median [Min, Max]	25.0 [18.0, 29.0]	24.0 [18.0, 29.0]	26.0 [18.0, 29.0]	24.0 [18.0, 29.0]	26.0 [18.0, 29.0]	25.0 [18.0, 29.0]
Missing	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
Education						
Low	753 (10.3%)	272 (15.9%)	130 (5.3%)	227 (24.8%)	49 (2.8%)	75 (14.5%)
Intermediate	3014 (41.3%)	903 (52.9%)	746 (30.7%)	560 (61.1%)	514 (29.7%)	291 (56.1%)
High	3488 (47.8%)	512 (30.0%)	1545 (63.6%)	122 (13.3%)	1161 (67.2%)	148 (28.5%)
Missing	46 (0.6%)	20 (1.2%)	10 (0.4%)	7 (0.8%)	4 (0.2%)	5 (1.0%)
Sex						
Female	1070 (62.7%)	1233 (50.7%)	192 (21.0%)	1210 (70.0%)	336 (64.7%)	1070 (62.7%)
Male	637 (37.3%)	1198 (49.3%)	724 (79.0%)	518 (30.0%)	183 (35.3%)	637 (37.3%)
Missing	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
Shift Work						
Never	5682 (77.8%)	1137 (66.6%)	2309 (95.0%)	633 (69.1%)	1376 (79.6%)	227 (43.7%)
Sometimes	389 (5.3%)	161 (9.4%)	33 (1.4%)	81 (8.8%)	63 (3.6%)	51 (9.8%)
Regularly	1124 (15.4%)	354 (20.7%)	74 (3.0%)	188 (20.5%)	275 (15.9%)	233 (44.9%)
Missing	106 (1.5%)	55 (3.2%)	15 (0.6%)	14 (1.5%)	14 (0.8%)	8 (1.5%)
Job Insecurity						
Low	2486 (34.1%)	198 (11.6%)	1249 (51.4%)	310 (33.8%)	647 (37.4%)	82 (15.8%)
Medium	4031 (55.2%)	1232 (72.2%)	1055 (43.4%)	550 (60.0%)	892 (51.6%)	302 (58.2%)
High	770 (10.5%)	272 (15.9%)	125 (5.1%)	52 (5.7%)	189 (10.9%)	132 (25.4%)
Missing	14 (0.2%)	5 (0.3%)	2 (0.1%)	4 (0.4%)	0 (0%)	3 (0.6%)
Lack Of Development Opportunities						
Low	2598 (35.6%)	204 (12.0%)	1362 (56.0%)	336 (36.7%)	613 (35.5%)	83 (16.0%)
Medium	3574 (49.0%)	982 (57.5%)	987 (40.6%)	448 (48.9%)	922 (53.4%)	235 (45.3%)

High	1100 (15.1%)	506 (29.6%)	78 (3.2%)	124 (13.5%)	193 (11.2%)	199 (38.3%)
Missing	29 (0.4%)	15 (0.9%)	4 (0.2%)	8 (0.9%)	0 (0%)	2 (0.4%)
Lack Of Autonomy (scale: 1-3)						
Mean (SD)	1.76 (0.5)	1.94 (0.4)	1.45 (0.4)	1.78 (0.4)	1.88 (0.5)	2.19 (0.4)
Median [Min, Max]	1.67 [1.00, 3.00]	2.00 [1.00, 3.00]	1.33 [1.00, 3.00]	1.67 [1.00, 3.00]	1.83 [1.00, 3.00]	2.17 [1.00, 3.00]
Missing	22 (0.3%)	6 (0.4%)	3 (0.1%)	9 (1.0%)	4 (0.2%)	0 (0%)
Low Manager Support (scale: 1-4)						
Mean (SD)	1.89 (0.7)	2.11 (0.6)	1.52 (0.5)	1.86 (0.6)	2.00 (0.6)	2.55 (0.7)
Median [Min, Max]	2.00 [1.00, 4.00]	2.00 [1.00, 4.00]	1.50 [1.00, 3.50]	2.00 [1.00, 4.00]	2.00 [1.00, 4.00]	2.50 [1.00, 4.00]
Missing	215 (2.9%)	73 (4.3%)	51 (2.1%)	24 (2.6%)	41 (2.4%)	26 (5.0%)
Low Colleague Support (scale: 1-4)						
Mean (SD)	1.56 (0.6)	1.79 (0.6)	1.37 (0.5)	1.61 (0.5)	1.51 (0.5)	1.82 (0.7)
Median [Min, Max]	1.50 [1.00, 4.00]	2.00 [1.00, 4.00]	1.00 [1.00, 4.00]	1.50 [1.00, 4.00]	1.50 [1.00, 4.00]	2.00 [1.00, 4.00]
Missing	143 (2.0%)	57 (3.3%)	30 (1.2%)	27 (2.9%)	11 (0.6%)	18 (3.5%)
Working Hours						
Mean (SD)	34.2 (7.1)	30.0 (7.5)	36.3 (5.8)	37.3 (6.4)	34.1 (6.4)	32.2 (7.6)
Median [Min, Max]	36.0 [17.0, 60.0]	30.0 [17.0, 60.0]	40.0 [17.0, 60.0]	40.0 [17.0, 60.0]	36.0 [17.0, 60.0]	32.0 [17.0, 60.0]
Missing	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
Work Life Conflict (scale: 1-4)						
Mean (SD)	1.41 (0.5)	1.30 (0.4)	1.25 (0.4)	1.32 (0.5)	1.59 (0.5)	2.03 (0.7)
Median [Min, Max]	1.00 [1.00, 4.00]	1.00 [1.00, 3.50]	1.00 [1.00, 3.00]	1.00 [1.00, 3.00]	1.50 [1.00, 4.00]	2.00 [1.00, 4.00]
Missing	26 (0.4%)	13 (0.8%)	2 (0.1%)	7 (0.8%)	1 (0.1%)	3 (0.6%)
Quantitative Demands (scale: 1-4)						
Mean (SD)	2.40 (0.7)	2.10 (0.5)	2.12 (0.5)	2.31 (0.5)	2.90 (0.6)	3.25 (0.6)
Median [Min, Max]	2.33 [1.00, 4.00]	2.00 [1.00, 4.00]	2.00 [1.00, 4.00]	2.33 [1.00, 4.00]	3.00 [1.00, 4.00]	3.17 [1.67, 4.00]
Missing	9 (0.1%)	5 (0.3%)	1 (0.0%)	1 (0.1%)	1 (0.1%)	1 (0.2%)
Emotional Demands (scale: 1-4)						
Mean (SD)	1.79 (0.7)	1.49 (0.5)	1.51 (0.5)	1.42 (0.5)	2.45 (0.6)	2.52 (0.7)
Median [Min, Max]	1.67 [1.00, 4.00]	1.33 [1.00, 3.33]	1.33 [1.00, 3.67]	1.33 [1.00, 3.00]	2.33 [1.00, 4.00]	2.33 [1.00, 4.00]
Missing	7 (0.1%)	4 (0.2%)	0 (0%)	1 (0.1%)	1 (0.1%)	1 (0.2%)
Cognitive Demands (scale: 1-4)						
Mean (SD)	3.02 (0.7)	2.43 (0.6)	3.05 (0.6)	2.93 (0.6)	3.51 (0.4)	3.34 (0.6)
Median [Min, Max]	3.00 [1.00, 4.00]	2.33 [1.00, 4.00]	3.00 [1.00, 4.00]	3.00 [1.00, 4.00]	3.67 [1.67, 4.00]	3.33 [1.33, 4.00]
Missing	7 (0.1%)	4 (0.2%)	2 (0.1%)	1 (0.1%)	0 (0%)	0 (0%)
Physical Demands (scale: 1-3)						

Mean (SD)	1.45 (0.5)	1.35 (0.3)	1.12 (0.2)	2.37 (0.3)	1.30 (0.3)	2.14 (0.4)
Median [Min, Max]	1.25 [1.00, 3.00]	1.25 [1.00, 2.25]	1.00 [1.00, 2.00]	2.25 [1.75, 3.00]	1.25 [1.00, 2.25]	2.00 [1.25, 3.00]
Missing	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)

Table 4__excl_gen_edu. Simple comparisons of emotional exhaustion between the five subgroups. [CI=confidence interval.]

		Emotional Exhaustion	
Subgroup comparison		*Mean Diff.*	*95% CI*
Low complex work (reference)[a]			
vs	**Office work**	**0.20**	**[0.1, 0.3]**
vs	Manual & non-interpersonal work	0.07	[-0.07, 0.2]
vs	**Non-manual & interpersonal work**	**0.93**	**[0.82, 1.05]**
vs	**Manual & interpersonal work**	**1.60**	**[1.43, 1.76]**
Office work (reference)			
vs	**Manual & non-interpersonal work**	**0.13**	**[0, 0.26]**
vs	**Non-manual & interpersonal work**	**1.13**	**[1.03, 1.23]**
vs	**Manual & interpersonal work**	**1.79**	**[1.64, 1.95]**
Manual & non-interpersonal work (reference)			
vs	**Non-manual & interpersonal work**	**1.00**	**[0.87, 1.13]**
vs	**Manual & interpersonal work**	**1.66**	**[1.48, 1.84]**
Non-manual & interpersonal work (reference)			
vs	**Manual & interpersonal work**	**0.66**	**[0.5, 0.82]**

[a]Bold font indicates 95% CI's not containing 0.

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Roosmarijn M. C. Schelvis
Malte van Veen
Sietske J. Tamminga
Karen M. Oude Hengel
Karen Nieuwenhuijsen
Cécile R. L. Boot
Jan Dul

Chapter

Psychosocial work adversities as necessity for work-related emotional exhaustion in young workers:

evidence from a cross-sectional necessary condition analysis

six

6

Psychosocial work adversities as necessity for work-related emotional exhaustion in young workers: evidence from a cross-sectional necessary condition analysis

Abstract

Objectives: Being exposed to adverse psychosocial working conditions contributes to poor mental health in young workers. This study aims to explore whether psychosocial work adversities are a necessary condition for work-related emotional exhaustion in young workers.

Design, outcomes and methods: Data from the Netherlands Working Condition Survey 2021 was used for this cross sectional study. The sample included 5,791 young workers (aged < 30 years). Using a novel method called Necessary Condition Analysis, we tested two psychosocial work adversities as necessary conditions for high work-related emotional exhaustion: 1) a composite score of high job demands and low job resources, and 2) a composite score of high job demands. Additionally, we tested whether the threshold for job demands as necessary condition for high work-related emotional exhaustion differed for young workers with low versus high resources.

Results: Both psychosocial work adversities were a necessary condition for high work-related emotional exhaustion in young workers. The necessity threshold for job demands, which guarantees the absence of a particularly high level of work-related emotional exhaustion, was higher for the group of young workers with high job resources compared to the group of young workers with low job resources.

Conclusions: Without psychosocial work adversities, high work-related emotional exhaustion was not observed in young workers. This might indicate a necessity role of psychosocial work adversities for young workers' mental health.

Key words: enabler, deterministic causality, work stress, mental health

Introduction

Being exposed to adverse psychosocial working conditions contributes to adverse mental health in employees (1, 2) and it is argued that this is especially true for young workers aged ≤30 years (3). However, exposure to adverse psychosocial working conditions has been studied mainly from the perspective of probabilistic causality, which seems inherent to the most commonly applied statistical models in the fields of occupational health and epidemiology. The matter has since long been subject of debate, with strong advocates of the probabilistic view (4, 5). In the dominant probabilistic causal perspective, the cause (psychosocial working conditions) is assumed to have an effect on the outcome (mental health) *on average*. Although knowledge about average effects is important, it implies that a large part of the population will not experience the positive effects or might even experience a negative effect. The large number of studies that applied this reasoning has brought us a long list of possible determinants that could all likely, on average, positively or negatively contribute to adverse mental health.

Recently, a different perspective on studying the relationship between two variables has entered a variety of disciplines in the social, medical and technical sciences (e.g. [6-8] respectively): necessity logic and accompanying Necessary Condition Analysis (NCA [9]). Necessity logic takes a deterministic necessity perspective (if not X then not Y) in contrast to the common probabilistic sufficiency perspective (if X then probably Y). Necessary conditions are 'critical' factors that can be observed in every single case in which an outcome is present. Without the factor, the outcome does not occur and another factor cannot compensate for the absence of the necessary factor. NCA allows for 'in degree statements': there must be a certain level of X to have a certain level of Y. In this article we introduce this perspective to occupational health research by examining the relationship between adverse psychosocial working conditions and adverse mental health in young workers from a necessity logic point of view.

Our research is inspired by the Job Demands Resources (JDR-)model which distinguishes between work characteristics as either job demands or job resources (10). According to the JDR-model, job resources can fulfill psychological needs and can therefore buffer the negative impact of job demands on work-related mental health (11). As no consensus is at hand for the operationalization of adverse work-related mental health, we have chosen work-related 'emotional exhaustion' as operationalization (12). Since earlier research suggests that there is not one toxic factor explaining mental health outcomes (2), we consider emotional exhaustion to be an equifinal phenomenon (i.e. a different combination of job demands and job resources per individual worker can lead to the same degree of emotional exhaustion). Against this background, we hypothesize that:

H1. A high level on the composite score of job demands and job resources is necessary for a high level of work-related emotional exhaustion in young workers;

H2. A high level of job demands is necessary for a high level of work-related emotional exhaustion in young workers.

We additionally test whether the hypothesized necessity differs for young workers with high versus low job resources.

Methods

Study population & ethics approval

Data from the 2021 wave of the Netherlands Working Condition Survey (NWCS) was used, which is an annual cross-sectional survey to monitor the health and working conditions of Dutch workers aged 15-74 (N= 49,659). The methodological report on this survey can be found elsewhere (12). According to the Netherlands Organisation for Applied Scientific Research TNO's Internal Review Board, the NWCS was not subject to the requirements of the Dutch Medical Research Involving Human Subjects Act (case 2018-066) and the study was approved.

For the current study, young workers aged 18 until and including 29 (N=9,191) were eligible and they needed to work at least 16 hours in a paid job (N=6,115). They further had to have data for emotional exhaustion and psychosocial work variables resulting in a final sample of 5,791 young workers.

Outcome variable: work-related emotional exhaustion

Work-related emotional exhaustion was measured with the emotional exhaustion scale of the validated Utrecht Burnout Scale (13) which is an adjusted Dutch version of the Maslach Burnout Inventory-General Survey (MBI-GS) (14). The subscale consisted of five items (e.g. "I feel emotionally exhausted by my work") and the seven-point response scale ranged from (1) "never" to (7) "every day" (see Table 1). The work-related emotional exhaustion score was calculated as the mean score of the items (range 1 to 7), with higher scores indicating more emotional exhaustion.

Table 1. Overview of all variables, origin, sample items, response categories and internal reliability

Outcome variable				
Adverse mental health	**Origin (see note)**	**Example item**	**Response category**	**Internal reliability (Cronbach's alpha)**
Emotional Exhaustion (5 items)	UBOS[a]	"At the end of a working day I feel empty"	(1) Never (2) Several times a year (3) Monthly (4) Several times a month (5) Every week (6) Several times a week (7) Every day	0.89
Exposure variables				
Composite Psychosocial work adversities (28 items)				
The combination of high job demands and low job resources				
Composite Job demands (17 items)	**Origin (see note)**	**Example item**	**Response category**	
Quantitative demands (3 items)	JCQ[b]	"Do you have to work extra hard?"	(1) Never (2) Sometimes (3) Often (4) Always	0.84
Emotional demands (3 items)	COPSOQ[c]	"Does your work lead to emotionally difficult situations?"	(1) Never (2) Sometimes (3) Often (4) Always	0.84

Cognitive demands (3 items)	JCQ[b]	"Does your work require intense thinking?"	(1) Never (2) Sometimes (3) Often (4) Always	0.77
Internal inappropriate conduct (4 items; sexual harassment, intimidation, bullying, physical violence)	European Survey[d]	"Can you indicate the extent to which you have personally experienced harassment by managers or colleagues in the past 12 months?"	(1) No, never (2) Yes, sometimes (3) Yes, often (4) Yes, very often	Not applicable (see methods)
External inappropriate conduct (4 items; sexual harassment, intimidation, bullying, physical violence)	European Survey[d]	"Can you indicate the extent to which you have personally experienced inappropriate sexual attention from clients (or patients, students or passengers, etc.) in the past 12 months?"	(1) No, never (2) Yes, sometimes (3) Yes, often (4) Yes, very often	Not applicable (see methods)
Composite Job resources (11 items)	**Origin (see note)**	**Example item**	**Response category**	
Autonomy/ decision latitude (6 items)	JCQ[b] POLS[e], NWCS[f]	"Can you make your own decisions on how to execute your work?"	(1) Yes, regularly (2) Yes, sometimes (3) No	0.75
Colleague support (2 items)	JCQ[b]	"My co-workers are friendly"	(1) Completely disagree (2) Disagree (3) Agree (4) Completely agree	0.80
Manager support (2 items)	JCQ[b]	"My supervisor pays attention to what I say"	(1) Completely disagree (2) Disagree (3) Agree (4) Completely agree	0.85
Development opportunities (1 item)	NWCS[f]	"Does your supervisor encourage the development of your knowledge and skills?"	(1) No (2) Yes, to a limited extent (3) Yes, to a large extent	Not applicable

[a] Subscale of Utrecht Burnout Scale (UBOS [13]); which is an adjusted Dutch version of the Maslach Burnout Inventory-General Survey (MBI-GS [14]);
[b] Job Content Questionnaire (JCQ [15]);
[c] Copenhagen Psychosocial Questionnaire (COPSOQ [16]);
[d] Based on European Survey of the European Foundation for the Improvement of Working and Living conditions [17];
[e]Permanent Onderzoek Leef Situatie (POLS, Statistics Netherlands (CBS)) as described in NWCS [12];
[f] One item on 'time autonomy' within the autonomy scale was constructed specifically for the NWCS [12]; one item on development opportunities was constructed specifically for the NWCS (ibid.).

Exposure variables
Job demands and job resources variables - The variables were selected based on discussions within the project team and their availability in the dataset (see Table 1 for item origin, sample item and answer categories). Five job demand variables were included: quantitative demands (3 items), emotional demands (3 items), cognitive demands (3 items), internal (4 items) and external inappropriate conduct (4 items). Four job resource variables were included: autonomy (6 items), colleague support (2 items), manager support (2 items), and development opportunities (1 item).

Constructing composite scores for hypothesis testing - Three composite scores were calculated for psychosocial work adversities: job demands, job resources and a combination of high job demands and low job resources. First, all variables were coded in the same direction with a higher score reflecting more adversity. Next, all variables were rescaled so that the minimum score was 0 (=no adversity) and the maximum score was 1 (highest adversity), preserving the individual distribution per variable. For the demands 'internal and external inappropriate conduct', every experience was considered as adverse, so all 'Yes'-answer categories (2, 3 and 4) received a score of 1. Subsequently the mean of all variables was calculated per composite, meaning that scoring the maximum level on all factors would result in a composite score of 1 and scoring the minimum score on all factors would result in a composite score of 0. The composite score on job demands included the five job demand variables, the composite score on job resources included the four job resources variables, the composite score on high demands and low resources included all nine variables. The composites are treated as continuous variables, except in the test of hypothesis two for which job resources were dichotomized into low and high job resources based on a median-split.

Data analysis
We applied Necessary Condition Analyses 9 to hypotheses H1 and H2 on psychosocial work adversity as necessity for work-related emotional exhaustion first for the whole sample of young workers and then for young workers with high versus low job resources separately. We not only test the composite as necessary conditions (e.g. job demands), but also the scales (e.g., cognitive demands), and also all individual items within the scales (e.g. "does your work require intense thinking?"). This is done in order to assess if one of the underlying scales or items is driving the necessity association.

NCA is a multiple bivariate analysis that identifies empty spaces in scatterplots that are compatible with the hypothesis (in the current case upper left corner) by drawing a ceiling line on top of the data, which acts as the border between the empty and the full area. Visual inspection of scatter-plots were used to identify a potential necessary condition and to select the ceiling line. We selected the stepwise CE-FDH ceiling line because the border was not linear. Effect sizes were calculated as is suggested for NCA by dividing the ceiling zone, which is the size of the empty space by the empirical scope, which is the area of the scatter plot bounded by the minimum and maximum values of the variables. As a rule of thumb effect sizes can be small ($0 < d < 0.1$), medium ($.1 \leq d < 0.3$), large ($0.3 \leq d < 0.5$) or very large ($d \geq 0.5$) (18). We considered an effect size as of $d = 0.05$ as relevant given the practical importance our outcome. Using a permutation test 18, a p-value is estimated, which is the probability that the effect size is compatible with effect sizes produced by unrelated variables. Necessary conditions operate in isolation from the rest of the causal structure, such that control variables and confounders are not relevant for the analysis. Bottleneck tables were used to quantify which level of the composite psychosocial work adversities is necessary for a particular level of work-related emotional exhaustion.

We tested the robustness of findings with seven earlier waves of the same survey (2014 till 2020), thereby including 49,454 young workers in total. All analyses were conducted using the NCA package version 3.3.3 in R 4.0.2 in RStudio Version 1.3.959.

Outlier analysis
Outlier identification is important in a large dataset as in the current study (n = 5,791). The effect size is susceptible to single data points that determine the ceiling line or the scope area. We used the NCA R-package for outlier detection, and we considered cases which affected the effect size by 30% or

more as anomalies. We followed a pragmatic necessity logic and thus allowed for the exclusion of a number of cases in further reporting, to come to a statement relevant for virtually all young workers. No outliers were identified for psychosocial work adversities , while one outlier was identified for job demands as necessary condition was identified. All effect sizes and p-values are reported after exclusion of the identified outlier.

Results

Participant characteristics

The sample consisted of slightly more females (57%) than males and the mean age was 25 years (Table 2). About half of the sample had higher secondary educational training (52%) and the large majority had a permanent employment contract with fixed working hours (70%). The position in the household differed between the young workers: almost 39% lived with (one or more) parents or caregivers, 19% lived on their own and 40% lived with a partner, of which a minority also cared for children (Table 2).

Table 2. Characteristics of study population (N=5,791)

Characteristics (range)	Count (frequency)	Mean (sd)
Gender		
Female	2503 (56.8%)	
Male	3288 (43.2%)	
Age (18.0, 29.0)		24.9 (3.07)
Working hours per week (17.0, 95.0)		34.3 (6.91)
Educational level		
Low	488 (8.4%)	
Intermediate	2225 (38.4%)	
High	3043 (52.5%)	
Type of employment		
Permanent employment, fixed hours	4057 (70.1%)	
Prospect of permanent employment, fixed hours	512 (8.8%)	
Temporary employment, fixed hours	215 (3.7%)	
Temporary or on call employee	420 (7.9%)	
Permanent or temporary employment without fixed hours	351 (6.1%)	
Household composition		
Child living with parent(s) or caregiver(s)	2233 (38.6%)	
Single person	1114 (19.2%)	
Partner in (un)married couple without children	1942 (33.5%)	
Partner in (un)married couple with children	387 (6.7%)	
Parent in single-parent household or other household	115 (2%)	

[a] Missings in educational level N=44 (0.7%).

H1: composite of high demands and low resources is necessary for work-related emotional exhaustion

A high level of the composite on job demands and job resources is necessary for a high level of work-related emotional exhaustion in young workers (empty upper left corner in Figure 1; effect size = 0.11, p-value < .001). This means that a high level of psychosocial work adversities must be present in a young worker in order to also have a high level of work-related emotional exhaustion, regardless of other factors, supporting our hypothesis. The bottleneck table shows that for experiencing a work-related emotional exhaustion level of 4 (i.e. 'several times per month'), a young workers' score on the demands and resources composite is necessarily 0.12, whereas a composite score of 0.15 is necessary for an exhaustion score of 6 (i.e. 'several times a week') and 0.34 for an exhaustion score of 7 (i.e. 'every day'; Table 3).

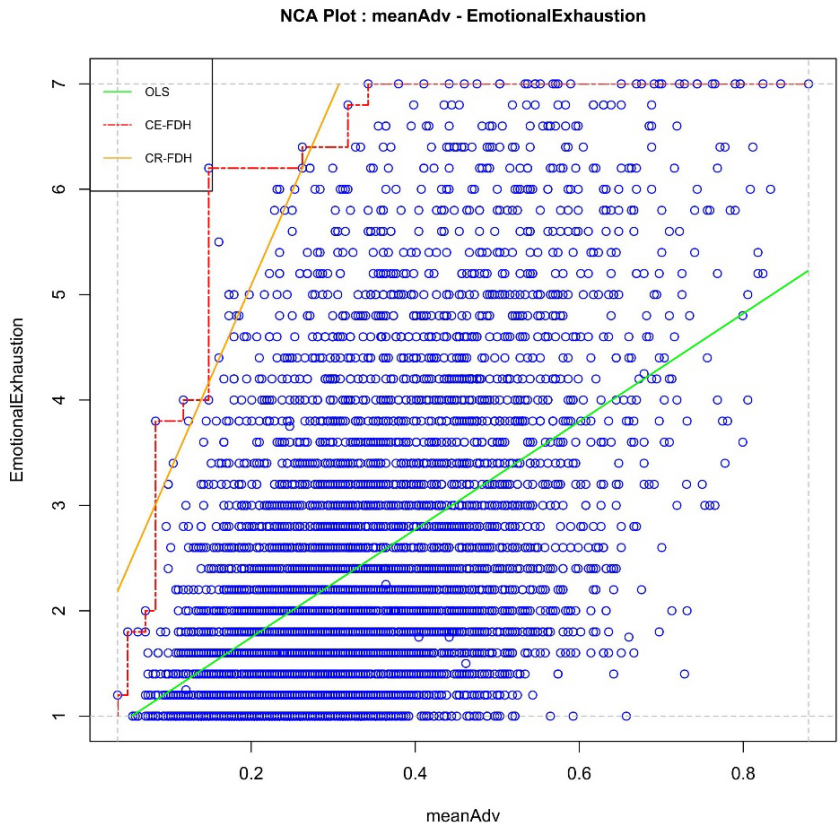

Figure 1. Scatterplot for composite high job demands and low job resources (x) and work-related emotional exhaustion (y) without outliers. CE-FDH is the stepwise ceiling envelopment line (red, dashed line); CR-FDH is the ceiling regression line (yellow, upper solid line); OLS is the regression line (green, lower solid line).

Table 3. Bottleneck tables, based on CE-FDH line, after outlier exclusion

Composite job demands and job resources without outliers		Job demands with low job resources without outliers, based on CE-FDH line		Job demands with high job resources without outliers, based on CE-FDH line	
Work-related Emotional Exhaustion	Composite job demands and job resources	Work-related Emotional Exhaustion	Job demands in low job resource group	Work-related Emotional Exhaustion	Job demands in high job resource group
1	NN	1.0	NN	1.0	NN
1,2	NN	1.2	0.022	1.2	0.022
1,4	0.049	1.4	0.022	1.4	0.044
1,6	0.049	1.6	0.022	1.6	0.044
1,8	0.049	1.8	0.022	1.8	0.044
2	0.071	2.0	0.022	2.0	0.044
2,2	0.083	2.2	0.022	2.2	0.067
2,4	0.083	2.4	0.022	2.4	0.067
2,6	0.083	2.6	0.022	2.6	0.067
2,8	0.083	2.8	0.022	2.8	0.067
3	0.083	3.0	0.022	3.0	0.067
3,2	0.083	3.2	0.022	3.2	0.067
3,4	0.083	3.4	0.044	3.4	0.067
3,6	0.083	3.6	0.044	3.6	0.067
3,8	0.083	3.8	0.044	3.8	0.067
4	0.117	4.0	0.089	4.0	0.111
4,2	0.148	4.2	0.089	4.2	0.111
4,4	0.148	4.4	0.089	4.4	0.111
4,6	0.148	4.6	0.089	4.6	0.111
4,8	0.148	4.8	0.089	4.8	0.156
5	0.148	5.0	0.089	5.0	0.156
5,2	0.148	5.2	0.111	5.2	0.200
5,4	0.148	5.4	0.111	5.4	0.200
5,6	0.148	5.6	0.111	5.6	0.200
5,8	0.148	5.8	0.111	5.8	0.200

6	0.148	6.0	0.111	6.0	0.200
6,2	0.148	6.2	0.200	6.2	0.267
6,4	0.262	6.4	0.200	6.4	0.356
6,6	0.318	6.6	0.222	6.6	0.356
6,8	0.318	6.8	0.378	6.8	0.356
7	0.343	7.0	0.378	7.0	0.400

On further analysis, none of the job demand scales or job resource scales in the composite were necessary conditions (all effect sizes ≤ .01) nor were items within these scales necessary conditions (all effect sizes ≤ .02). This indicates that none of the scales or items alone are responsible for the necessity we found in the composite.

H2: composite job demands is necessary for work-related emotional exhaustion and the level of job resources matters

In line with our second hypothesis, we found that a high level of the composite job demands is necessary for a high level of work-related emotional exhaustion in young workers (empty upper left corner in Figure 2; effect size = 0.10, $p < .001$), regardless of the level of job resources (Figure 2). In the group of young workers with low resources, a high level of job demands was necessary for a high level of emotional exhaustion (effect size = 0.10, $p < .001$). Whereas in the group with high resources a higher level of job demands was necessary for a high level of emotional exhaustion, as indicated by a lower ceiling line (effect size = 0.15, $p < .001$). More specifically, the bottleneck table demonstrates that for reaching an emotional exhaustion level of 4 (i.e. 'several times a month'), the high resource group needs a composite job demands score of 0.11, whereas a score of 0.02 is necessary for reaching that same level in the group with low resources (Table 3). In conclusion, the necessity threshold for job demands differed for young workers with low versus high resources.

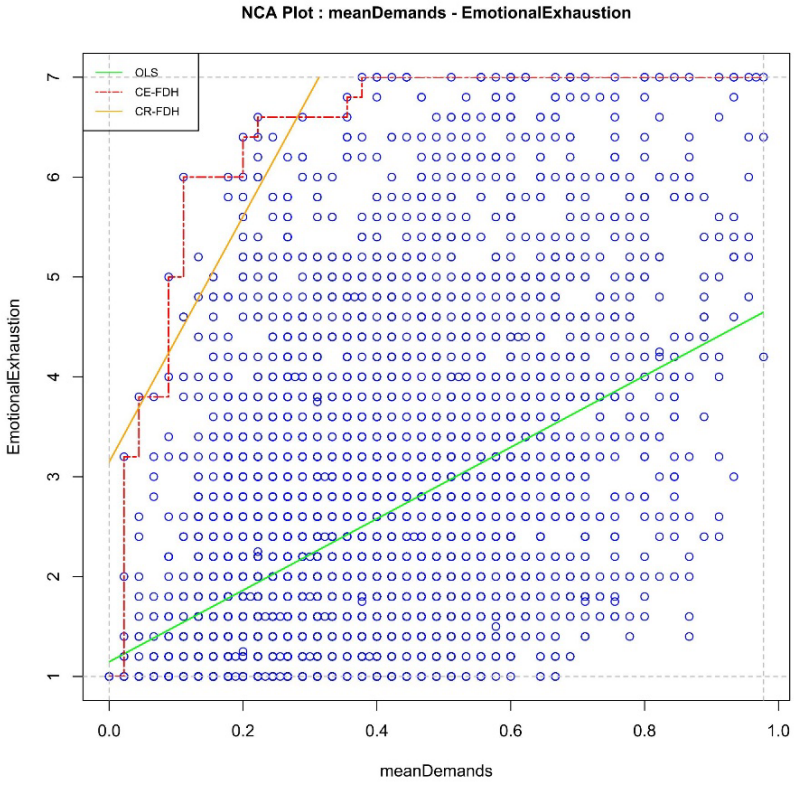

Figure 2. Scatterplot for composite job demands (x) and work-related emotional exhaustion (y) without outliers. CE-FDH is the stepwise ceiling envelopment line (red, dashed line); CR-FDH is the ceiling regression line (yellow, upper solid line); OLS is the regression line (green, lower solid line).

Robustness of findings

The findings for hypothesis 1 were replicated in the 2014 to 2020 waves of the NWCS. All effect sizes were at least 0.08, with p-values <.001 (see Supplementary Information, Table 1). The same holds for hypothesis 2, the findings could be replicated as well in the 2014 to 2020 waves of the NWCS. All effect sizes for the low resource group were at least 0.05 with p-values <.001, and all effect size for the high resource group were at least 0.10 with p-values <.01 for all but one year (Supplementary Information, Table 2).

Discussion

Using necessity logic and the Necessary Condition Analysis (9), we hypothesized that psychosocial work adversities are necessary for high work-related emotional exhaustion in young workers. Firstly, we tested a composite score of high job demands and low job resources (psychosocial work adversities), and secondly a composite score of high job demands as necessities. Both composites were necessary conditions for work-related emotional exhaustion. Additionally, we tested whether the necessity threshold for job demands differed for young workers with low versus high resources. For young workers with high job resources, the amount of job demands could be higher before they became necessary for a high level of work-related emotional exhaustion, compared to young workers with low job resources.

Reflection on findings

Probability-based research can only capture effects that are averaged over (often) heterogeneous populations. Necessity logic provides a different lens for understanding how psychosocial work exposures affect work-related emotional exhaustion. In NCA the results apply to virtually all participants and enable the identification of necessary conditions that must to be present for enabling a desired outcome (e.g. good mental health) or must be absent for blocking an undesired outcome (e.g. mental health problems). The necessity of psychosocial work adversities for work-related emotional exhaustion suggests that removing high levels of psychosocial work adversities will avoid high levels of emotional exhaustion in nearly all cases. Moreover, the levels of x and y are shown in the bottleneck table, but the interpretation of what level of exposure and outcome is (too) high needs discussion among scholars and practitioners as well as between managers and employees within organizations: is it acceptable to experience work-related emotional exhaustion several times a year, monthly or every week, and under what conditions?

Our study is among the first to study psychosocial exposures and a mental health outcome in the workplace from a necessity perspective. One recent study by Manchiraju and colleagues (19) on entrepreneurial role stress and burnout demonstrated the necessity of a role stress composite score (i.e. role conflict, role ambiguity and role overload) for the presence of burnout in entrepreneurs. Our study differs from this study in the domain (young workers in organizations versus self-reported entrepreneurs), the theoretical mental health concept (JDR-model [10] versus the 'tri-component conceptualization of role stress' [20]) and the measurements of the outcome (Utrecht Burnout Scale [13] versus the burnout scale by Malach-Pines [21]).

Methodological considerations

Our study is based on cross-sectional data. The occurrence of reverse and reciprocal causality between mental health outcomes and psychosocial adversities is still a matter of debate (22, 23) and work-related emotional exhaustion has also been shown to change perceptions of job demands and resources (24). Consequently, we cannot rule out that high emotional exhaustion itself contributes to higher (experienced) psychosocial work adversities. In general, necessary conditions that are identified in a cross-sectional study may be causally interpreted only if there is theoretical support for it and if reverse causality is considered implausible. The credibility of a causal necessity relationship increases with a time-lagged, longitudinal or experimental study design (25). Further research of this type is needed to rule out reciprocal or reversed causality.

We developed composite scales for testing psychosocial work adversities. Even though information from individual items might be lost and measurement error cannot be accounted for, this approach makes sense theoretically because there is not one toxic factor for work-related emotional exhaustion. Empirically this is confirmed by the finding that none of the demand or resource scales, nor any of the items within these scales were necessary conditions, which gives us confidence in the appropriateness of our procedure to create composite scales. As a test for robustness, we replicated the findings in seven earlier waves of the same survey. All results were statistically significant, effect size were small to medium (see Supplementary Information).

Implications for research and practice

Not all young workers with high psychosocial work adversities report high work-related emotional exhaustion. Future research could look into other contributing factors that determine high emotional exhaustion when high work adversities are present (e.g. coping style, personal characteristics, a history of poor mental health, or organizational factors).

Our study showed that work-related emotional exhaustion was observed in young workers with high job demands. However, in workers with a high level of resources, the threshold for job demands being a necessary condition for exhaustion was higher. This is in line with the "buffering hypothesis" of the JDR-model model (26) and future research could clarify the mechanisms behind the shift in the NCA ceiling line that we observed.

We drafted our hypotheses in line with necessity logic's enabling formulation (one must have (level of) X to have (level of) Y). The logical equivalent of these hypotheses is the constraining formulation (the absence of X is sufficient for the absence of Y). Lowering the level of adversities guarantees a reduction of the maximum level of emotional exhaustion. Comparable to the 'safe dose' of exposure to potentially harmful agents, our results might inform specific targets or maximum levels of adversities in work organizations.

Concluding remarks

In our experience, necessity logic and NCA, are an enrichment to occupational health research. We conclude that without psychosocial work adversities, high work-related emotional exhaustion is absent in young workers. This might indicate a necessity role of psychosocial work adversities for young workers' mental health. We illustrated how NCA logic and method requires different theorizing before the start of the study than what we are used to in our field.

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Appendix

Table 1. Robustness checks for composite high job demands and low job resources as necessary condition

Year	N	Outliers	Effect size	p-value	Outlier Count
2014	4,071	included	0.15	<.001	NA
2014	4,070	excluded	0.10	<.001	1
2015	5,390	included	0.12	<.001	NA
2015	5,390	excluded	0.12	<.001	0
2016	5,281	included	0.09	<.001	NA
2016	5,281	excluded	0.09	<.001	0
2017	5,199	included	0.15	<.001	NA
2017	5,199	excluded	0.15	<.001	0
2018	7,354	included	0.14	<.001	NA
2018	7,354	excluded	0.14	<.001	0
2019	6,944	included	0.08	<.001	NA
2019	6,944	excluded	0.08	<.001	0
2020	6,782	included	0.10	<.001	NA
2020	6,782	excluded	0.10	<.001	0
2021	5,791	included	0.11	<.001	NA
2021	5,791	excluded	0.11	<.001	0

Table 2. Robustness checks for composite job demands as necessary condition contrasted for high versus low job resources

Year	N[1]	Outliers	High or low job resource	Effect size	p-value	Outlier count
2014	4,264	Included	All	0.05	.216	NA
	1,939		Low job resource	0.06	.039	NA
	2,132		High job resource	0.12	.089	NA
	4,263	Excluded	All	0.06	.029	1
	1,938		Low job resource	0.08	.002	1
	2,132		High job resource	0.12	.089	0
2015	5,627	Included	All	0.07	<.001	NA
	2,612		Low job resource	0.08	.001	NA
	2,778		High job resource	0.19	<.001	NA
	5,626	Excluded	All	0.10	<.001	1
	2,611		Low job resource	0.11	<.001	1
	2,778		High job resource	0.19	<.001	0
2016	5,536	Included	All	0.05	0.018	NA
	2,632		Low job resource	0.07	.001	NA
	2,649		High job resource	0.12	.005	NA
	5,535	Excluded	All	0.07	<.001	1
	2,631		Low job resource	0.08	<.001	1
	2,649		High job resource	0.12	.005	0
2017	5,465	Included	All	0.10	<.001	NA
	2,495		Low job resource	0.10	<.001	NA
	2,704		High job resource	0.17	<.001	NA
	5,465	Excluded	All	0.10	<.001	0
	2,495		Low job resource	0.10	<.001	0
	2,704		High job resource	0.17	<.001	0
2018	7,744	Included	All	0.01	.658	NA
	3,675		Low job resource	0.01	.749	NA
	3,679		High job resource	0.12	<.001	NA
	7,742	Excluded	All	0.06	<.001	2
	3,673		Low job resource	0.06	<.001	2
	3,679		High job resource	0.12	<.001	0
2019	7,281	Included	All	0.06	<.001	NA
	3,394		Low job resource	0.06	<.001	NA
	3,550		High job resource	0.11	<.001	NA
	7,281	Excluded	All	0.06	<.001	0
	3,394		Low job resource	0.06	<.001	0
	3,550		High job resource	0.11	<.001	0
2020	7,050	Included	All	0.10	<.001	NA

	3,349		Low job resource	0.11	<.001	NA
	3,433		High job resource	0.15	<.001	NA
	7,050	Excluded	All	0.10	<.001	0
	3,349		Low job resource	0.11	<.001	0
	3,433		High job resource	0.15	<.001	0
2021	6,074	Included	All	0.07	<.001	NA
	2,885		Low job resource	0.07	<.001	NA
	2,906		High job resource	0.15	<.001	NA
	6,073	Excluded	All	0.10	<.001	1
	2,884		Low job resource	0.10	<.001	1
	2,906		High job resource	0.15	<.001	0

Note[1]: N's from "low" and "high" job resources rows do not add up to N from "all" row due to missing data on job resources.

Malte van Veen

Chapter

General Discussion

seven 7

General Discussion

Young adulthood appears to be a vulnerable life phase for the development of mental health complaints (1, 2). The psychosocial work environment of a young worker's job is potentially contributing to such mental health complaints (3, 4). To date mental health of young workers received little attention in occupational health research. At the time of writing, only a few research groups worldwide have been focusing on the topic, e.g. in the Netherlands (5, 6), Australia (7, 8), and Denmark (9, 10). Research on mental health of young workers is still in its infancy and only few studies exist to which we can compare our results. The studies in this doctorate thesis aim to better understand the relationship between the psychosocial work environment and mental health of young workers.

In this thesis, I provide answers to the following three research questions:

1. Which aspects of the psychosocial work environment are associated with the mental health of young workers? (Chapters 2 and 3)

2. How do groups of young workers who are experiencing a variety of psychosocial work environments differ regarding their mental health? (Chapter 4 and 5)

3. Is a high level of psychosocial work adversities a necessity for work-related emotional exhaustion in young workers? (Chapter 6)

In this general discussion, I present an overview of the findings from the five studies and elaborate on methodological aspects of the studies followed by directions for future research. Next, I offer practical recommendations before ending with an overall conclusion.

Main Findings

Research question 1: Which aspects of the psychosocial work environment are associated with the mental health of young workers? (Chapters 2 and 3)
With our systematic review (**chapter 2**), we provide an overview of studies reporting the association between psychosocial work factors and mental health complaints of young workers with a maximum age of 35 years. We used a broad search strategy, including a wide range of psychosocial work factors (e.g. cognitive demands, emotional demands, job control) and mental health outcomes (e.g. emotional exhaustion, depression symptoms, anxiety symptoms, stress complaints). Seventeen studies met our inclusion criteria, reporting many combinations of exposure-outcome associations. Even after merging some exposures and outcomes respectively, only nine combinations were reported sufficiently often to allow for a synthesis of the evidence. These were burnout as outcome in combination with job demands, cognitive demands, colleague support, emotional demands, job control, and interpersonal conflict, and mental health as outcome in combination with psychosocial job quality and job insecurity. To assess the certainty of the evidence base we did used the GRADE method (11). Due to the heterogeneity of the studies and the substantial risk of bias, we concluded that the evidence regarding the association between psychosocial work factors and mental health in young workers is highly uncertain. We further noticed that the included psychosocial work factors are largely based on the dominant occupational health models meaning that aspects of the psychosocial work environment that might be especially relevant for young workers are potentially missing, as these models were not developed for young workers in particular.

Due to the scarce evidence observed in **chapter 2**, we conducted a primarily inductive qualitative study to explore which psychosocial work factors are associated with the mental health of young workers (**chapter 3**). We interviewed 36 young workers with a maximum age of 30 and asked them how their experiences at work affected their mental health. We interviewed young men and women, covering vocationally as well as academically educated young workers in different types of jobs (i.e.

interpersonal and non-interpersonal jobs). We then compared young workers' descriptions to the existing psychosocial work factor framework COPSOQ (12). This resulted in three main findings.

The first main finding is that most factors described by the young workers were also described for the general working population. The second main finding is that certain factors appeared to come about in a way that is typical for young workers (i.e. *Quantitative Demands*, *Influence at Work*, *Commitment to the Workplace*, *Job Insecurity*, *Quality of work*, *Job satisfaction*, *Vertical Trust*). The third main finding is that two novel psychosocial work factors were identified that are not listed by the COPSOQ, namely feeling too much *responsibility for others* (e.g. students or interns), and *need for procedural support*, which entails that young workers have a need to find clear procedures at their workplace concerning processes and responsibilities.

Furthermore, two psychosocial work factors appeared to be particularly relevant for young workers: a high *sense of community at work* and appropriate *influence at work*. Sense of community at work (i.e. feeling part of a group and having good relations with colleagues in general) stood out, because it was mentioned by virtually all young workers we interviewed. Even though sense of community at work does not come about in a way that is typical for young workers it seems to play a prominent role for them. Influence at work stood out, because young workers expressed a need for influence at work concerning tasks at which they feel capable, but not for tasks that they feel are too novel for them. Based on these findings we conclude that young workers are not an entirely distinct group within the general working population, but that some psychosocial work factors appear to be particularly relevant for their mental health.

Answer to research question 1 (chapter 2 and 3):
We conclude that the little existing research on mental health of young workers suffers from a high risk of bias. On the other hand, we observed a substantial overlap between the general working population and young workers. This implies that much of the existing knowledge on the general working population is applicable to young workers. However, some factors appear to play a role in way that is more typical for young workers (i.e. Quantitative Demands, Influence at Work, Commitment to the Workplace, Job Insecurity, Quality of work, Job satisfaction, Vertical Trust). Additionally, we observed two novel factors regarding how work appears to affect mental health of young adults (i.e. responsibility for others and need for procedural support) and found a potentially important role for sense of community at work. Regarding influence at work we found a potentially important nuance, namely that this factor can result in mental health complaints when not matched with sufficient experience to conduct a task.

Research question 2: How do groups of young workers who are experiencing a variety of psychosocial work environments differ regarding their mental health? (Chapters 4 and 5)
In the study presented in **chapter 4** we applied fixed effects regression analysis to model within-person changes of mental health complaints. We compared how mental health complaints changed after having started career work compared with not being at work, and whether mental health complaints during adolescence play a role as effect modifier. The analysis was conducted on a sample of 850 young adults entering their first career job. The measurement moments for not being at work and having entered work were minimally two years and maximally four years apart. While we did not find statistically significant changes in mental health complaints when analyzing the young workers as one group, we found statistically significant differences when taking the psychosocial work quality of the first career job into account. Young adults who started career work in poor psychosocial work quality experienced a statistically significant increase of mental health complaints compared with not being at work. Those starting career work in moderate and good psychosocial work quality did not experience a statistically significant change in mental health complaints. We did not find evidence concerning adolescent mental health as effect modifier.

For **Chapter 5** we assessed the heterogeneity of the psychosocial work environment of young workers in a data-driven way using latent class analysis. The aim was to identify groups of young workers based on work characteristic configurations. The groups were modelled based on nine psychosocial

work factors (comprising five job demands and four job resources), physical job demands, and two working time related job demands (i.e. contract hours, shift work). After modelling the groups, we analyzed whether the groups differed regarding emotional exhaustion. We identified five distinct groups of work characteristic configurations of young workers and labelled them (1) *low-complexity work*, (2) *office work*, (3) *manual and non-interpersonal work*, (4) *non-manual and interpersonal work*, and (5) *manual and interpersonal work*. Interpersonal work in this context means that, based on ISCO job codes (13), interpersonal jobs entail frequent encounters with 'third parties', i.e. individuals who are not colleagues such as patients, students, or clients. Emotional exhaustion of these groups differed significantly: young workers from the two groups doing interpersonal work (groups 4 and 5) reported significantly more emotional exhaustion than young workers from the other three groups. Levels of emotional exhaustion were the highest for young workers doing interpersonal work that is physically demanding (group 5). We observed that high job demands (e.g. emotional demands, quantitative demands) were associated with a high level of emotional exhaustion while job resources (e.g. autonomy, manager support) potentially buffered the impact of high work demands. This observation is in line with the job demand resource model (14). The observation that young workers doing interpersonal work on average score higher on emotional exhaustion than young workers doing other type of work is reminiscent of early conceptualizations of burnout, which were emphasizing emotional and interpersonal stressors (15).

Answer to Research Question 2 (chapters 4 and 5):
We found that young workers' mental health differs depending on the psychosocial work quality they experience. This implies an association between the psychosocial work environment and mental health of young workers. Mental health complaints increased for young workers who started first career work in jobs with poor psychosocial work quality (**chapter 4**). The two groups identified in **chapter 5** that were characterized by young workers reporting high job demands showed significantly higher levels of emotional exhaustion than young workers in groups characterized by fewer job demands.

Research Question 3: Is a high level of psychosocial work adversities a necessity for work-related emotional exhaustion in young workers?
For the study reported in **chapter 6** we assessed whether a high level of psychosocial work adversities is necessary for a high level of work-related emotional exhaustion in young workers. We did this by applying necessary condition analysis (NCA). NCA provides a theoretical view on causality as well as an accompanying a method, not yet widely used in occupational health research. The aim of NCA is to identify conditions that need to be in place for an outcome to occur, but that are not sufficient for the outcome to occur (e.g. having obtained a particular test score as a necessary but not sufficient condition for admission to an educational program [16]). Logically, this implies that removing the necessary condition will prevent the outcome from occurring. In our study we analyzed whether psychosocial work adversities were a necessary condition for work-related emotional exhaustion to occur. This is equivalent to analyzing whether the absence of psychosocial work adversities guarantees the absence of work-related mental health complaints. Psychosocial work adversities were analyzed as necessary conditions in two different ways (1) a composite score reflecting high job demands and low resources and (2) a composite score reflecting high job demands. For both operationalizations we found that psychosocial work adversity was a necessary condition for work-related emotional exhaustion. Specifically, a high level of psychosocial job adversity among young workers was necessary for very high levels of emotional exhaustion. However, even at a minimal level of psychosocial work adversity we observed cases of young workers reporting levels of mental health complaints that were high enough to be considered problematic (i.e. feeling exhausted more than once per month) (17).

Additionally, we tested whether the threshold for high job demands as a necessary condition for high work-related emotional exhaustion differed for young workers with low versus high resources. The necessity threshold in this study is the value that describes the maximum observed level of work-related emotional exhaustion for a given level of psychosocial work adversities. We found that the necessity threshold for high job demands was higher for the group of young workers with high job

resources compared to the group of young workers with low job resources. This suggests that young workers with more job resources face a higher level of job demands without experiencing the same level of emotional exhaustion compared to young workers with lower job resources.

Answer to Research Question 3 (chapter 6):
A high level of psychosocial work adversities is a necessity for very high levels of work-related emotional exhaustion. Nevertheless, very low levels of psychosocial work adversities did not limit work-related emotional exhaustion to a level that would commonly be considered "good mental health". This implies that a low level of psychosocial work adversity is not a guarantee good work-related mental health in young workers.

Methodological Considerations

Below I will discuss methodological considerations that have to be taken into account when evaluating the answers to the three research questions above. I discuss three methodological aspects related to the studies in this thesis: (1) the definition of young workers as a group, (2) measuring the psychosocial work environment of young workers, and (3) a causal interpretation of our results.

Defining the group of young workers
With the exception of **chapter 4** we defined young workers by chronological age, i.e. not older than 35 years for **chapter 2** and not older than 30 years for **chapters 3**, **5** and **6**. Despite the lack of consensus regarding the age cut-off that defines a young worker (see general introduction), the operationalization of young workers based on chronological age is intuitive and common in research on young workers (18). As information on a worker's age is available in most data sets (e.g. [19, 20]) this filtering variable can be used in a straightforward manner making it a widely applicable method to define the group of young workers. Operationalizing young workers by age however results in a group of young workers whose work experience might vary by up to ten years when a maximum age of 30 years is chosen. This group namely comprises young adults with vocational education who regularly start career work in their late teens as well as young adults with academic education who start career work in their mid-to-late 20s (21). This is potentially problematic, because indications exist that it is not young age, but the transition to first career work that might distinguish young workers from the general working population in terms of how the psychosocial work environment affects their mental health (see [22-25])

A focus on transitions, including the one to first career work, is central in the so called "life course approach", which has been advocated by occupational health scholars (26, 27). According to this approach transitions are "sensitive or critical periods" in which young workers might be particularly susceptible to the psychosocial work environment affecting their mental health (26). This is in line with reports from the young workers that we interviewed for **chapter 3**. They reported that they exceeded their own boundaries at the expense of their mental health, because they did not know better due to a lack of work experience. This characteristic of starting with career work cannot be captured by defining young workers by age.

When operationalizing young workers as those who transition to work, it is important to focus on the first career job of a young worker and not on a side job that is often followed while still being in education, is temporary and often does not require a diploma. Based on the interviews with young workers (**chapter 3**) the impact of psychosocial work quality of a side job on mental health is likely to be considerably smaller compared to the psychosocial work quality of a career job. Notable, interviewees did not report having experienced harassment, violence, or aggression, which likely has a big impact regardless of occurring in a side job or in a career job. The potential lower impact of side jobs is further reflected in the group of young workers with "simple work" that we identified in **chapter 5**. These young workers reported high psychosocial work demands while reporting relatively low levels of emotional exhaustion. This "simple work" group is likely to consist of young workers with side jobs and not career jobs, characterized by least working hours, a high number of temporary contracts, little job security, and little development opportunities. Furthermore, research has shown

that life-events that are associated with changes in mental health (28) are occurring relatively close to the transition to career work time-wise (29), but are not likely to co-occur with starting a side job. Examples of life events are gaining financial independence (30) or leaving the parental home (31).

Altogether I propose that it is not chronological age, but the transition to career work that more precisely distinguishes young workers from other groups of workers in terms of the relation between the psychosocial work quality and mental health complaints. Therefore, I advise researchers as well as professionals to think about young workers as those who recently transitioned to career work, if the available data allows it.

Measuring young workers' psychosocial work environment

A potential limitation of our quantitative studies (**chapters 4**, **5**, and **6**) and those that are included in the systematic review (**chapter 2**) is that the measurements assessing the psychosocial work environment appear to be inspired by the existing, classic occupational health models (i.e., job demand control [resources] model, developed in the 1970s and early 2000s respectively (14, 32), and to a lesser extent Effort-Reward Imbalance model, developed in the 1980s [33]). These models were developed for the general working population. Consequently, the data might not have captured all aspects of the psychosocial work environment that are relevant for young workers' mental health complaints.

The literature provides some indications for psychosocial work factors that might be particularly relevant for young workers. A Swiss study (34) on vocationally educated young workers who started career work for example suggests that being appreciated at work and job control are important for young workers' mental health. Concerning job control, our own qualitative research (**chapter 3**) suggests that it might be important to grant young workers control over tasks at which they feel competent, but that too much control across all tasks might be detrimental. This is in line with earlier research, finding curvilinear effects of job control (35) and describing job control as a "double-edged sword" (36) that can have beneficial as well as detrimental effects on mental health, depending on a worker's ability to meet specific job demands. The results from **chapter 3** further suggests that three factors, responsibility for others, need for procedural support, and sense of community at work, which are not regularly included in psychosocial work environment assessments are aspects of the psychosocial work environment that seem to play a role for young workers' mental health.

Even when specific data on psychosocial work factors that are potentially influential for young workers' mental health are not available, the risk of misclassification is low when factors are combined into a composite score. The reason is that good and poor working conditions have been shown to be tightly clustered, also for young workers (37). Additionally, our own **chapter 3** indicates that a considerable overlap exists with the general working population concerning psychosocial work factors that appear to be relevant for mental health of young workers. Composite scores that provide a broad reflection of the psychosocial work environment are likely to be suitable for analyzing the relationship between psychosocial work quality and mental health complaints, also among young workers. This is because mental health complaints can be the result of different combinations of unfavorable psychosocial working conditions (i.e. mental health complaints as an equifinal phenomenon [38]). For more insights, a distinction into job demands and job resources (14) as we applied in **chapters 5** and **6** might further be useful. This distinction helped to identify psychosocial work environment configurations for describing the groups in **chapter 5** and provided an explanation for differences in mental health complaints. In **chapter 6** we showed that the ceiling line that depicts psychosocial work demands as necessary condition for mental health complaints shifted depending on the level of psychosocial work resources that young workers reported. More research is needed to assess what an informative as well as parsimonious set of factors is for making efficient use of composite measurements for young workers.

Altogether I suggest that existing psychosocial work quality measures that were developed for the general population (e.g. [12]) can be used for the assessments of overall psychosocial work quality among young workers when combined into a composite score. If researchers are interested in assessing broader psychosocial work quality, such composite scores are likely to be appropriate, even

when the included factors are not young worker specific. I recommend scholars to consider a distinction into respective job demands and job resource composite scores as this might provide a more complete picture. For other studies, researchers might be more interested in the association between individual psychosocial work factors and mental health complaints. In this case they should consider including the more young worker typical and relevant factors mentioned above. This requires the development of corresponding scales.

Causal interpretation of our results

Two methodological features in combination limit a causal interpretation of our findings that psychosocial work quality and mental health complaints are associated among young workers. First, the quantitative studies presented in **chapters 4**, **5**, and **6** make use of self-reports to measure both, psychosocial work quality and mental health complaints. Second, all quantitative studies are based on cross-sectional data with the exception of **chapter 4**. **In chapter 4** we used longitudinal data, but analyzed how a particular level of psychosocial work quality is associated with contemporaneous change in mental health complaints in the same wave (see also [3]). Consequently **chapter 4** is susceptible to similar methodological limitations as **chapters 5** and **6** (39). Therefore we can only conclude that psychosocial work quality and mental health complaints among young workers are associated but not that psychosocial work quality causes mental health complaints (40). Below I will elaborate why we cannot rule out that reversed causality and selection effects (i.e. healthy worker effects [41]) might be drivers underlying the association of psychosocial work quality and mental health complaints. I will then discuss arguments that favor a causal interpretation that psychosocial work quality is affecting mental health complaints despite the methodological limitations.

Reverse causality refers to mental health complaints causing reports of poor psychosocial work quality. These effects can be based on a negative appraisal of the psychosocial work environment for workers who have mental health complaints (the "gloomy perception effect" [42]) or can be based on workers with mental health complaints creating a factually more stressful work environment for themselves (the stressor creation effect [43]). **Chapter 3**, for which we interviewed young workers, provides indications for the occurrence of both, a gloomy perception effect and stressor creation effects. The former is illustrated by an interviewed young worker saying that "[when mental health is poor] life [including work] just looks less rosy"; the latter illustrated by a young workers saying that "I was underperforming and becoming sloppy and no longer paying close attention to the details […] if it is also emphasized that you are not doing things right, you get even deeper into it [mental health complaints]".

The healthy worker effect is a form of selection bias and comprises healthy hire effects and healthy survivor effects (41). Originally the term described an underestimation of the adverse effect of occupational hazards on health. The healthy worker effect emerged as a consequence of comparing the health of healthy workers – who were able to get and maintain jobs with adverse working conditions – to the health of the general population, which included healthy as well as unhealthy individuals (44). An underestimation of the effect of poor psychosocial work quality on mental health of young workers might also occur in young workers. Young workers with poor mental health might not be able to retain their jobs in workplaces characterized by poor psychosocial work quality and become unemployed, while young workers who started with a better mental health can better cope with the psychosocial work adversities and remain at a job (i.e. the healthy survivor effect). The original research on the healthy worker effect was based on physical aspects of work and implied that physically unhealthy workers could not possibly occupy a job with equal or more physical demands than those occupied by physically healthy workers. For psychosocial work quality, however, young workers who had to leave a job due to mental health complaints, might end up in a precarious job with equally poor or even worse psychosocial work quality due to a relatively lower employability. In the literature this has been described as "drift mechanism" (45). This mechanism describes that mentally healthy workers might be able to keep their job, while workers with mental health complaints who struggle at work "drift" into jobs with less favorable psychosocial working quality due to reduced work ability and employability. This selection might constitute an inverted variant of the original healthy worker effect and potentially contributes to an overestimation of the adverse effect of

psychosocial work quality on mental health complaints of young workers (46). The selection into jobs with poor psychosocial work quality due to mental health complaints might also play in the form of a healthy hire effect at the moment of first entering the labor market. Young workers who've had poor mental health prior to work might have constrained choices on the labor market, for example due to lower educational attainment (47). They might thus be more likely to end up in precarious jobs, characterized by poor psychosocial work quality compared to mentally healthy young workers. Research has shown that having mental health problems is associated with challenges of becoming and remaining employed among young workers (48). To sum up, this overestimation due to the described variant of the healthy worker effect is plausible but mostly speculative at the moment, and more research is needed to systematically test the proposed mechanisms.

However, scholars have proposed the existence of gain and loss spirals (46, 49) that lead to increased differences between workers' mental health that might have their origin even before entering career work. In **chapter 4** we observed that young workers who started career work in jobs with poor psychosocial job quality reported worse mental health before entering career work. These differences, however, were not statistically significant and rather small. Nevertheless, the same psychosocial work quality groups did show statistically significant differences in mental health complaints after the transition to work. More research is needed to assess whether these differences are increasing or attenuate over time.

While reverse causality and healthy worker effects are likely to have contributed to the observed association, there are also arguments in favor of a causal direction from psychosocial work quality to mental health of young workers. First, the young workers we interviewed (**chapter 3**) clearly stated how their experiences at work affected their mental health and these experiences were based in structural elements of the psychosocial work environment. Second, studies modelling both strain and stressor effects using longitudinal data provide evidence for a causal effect of psychosocial work quality on mental health as they consistently find stressor effects next to strain effects (45, 49, 50).

Altogether it is thus plausible that psychosocial work quality affects mental health complaints in young workers, but more research carefully taking reverse causality as well as healthy worker effects into account are needed to draw more robust conclusions than what we can offer based on our results.

Directions for future research

Below I suggest how better data can contribute to a better understanding of acute and long-term consequences of psychosocial work quality on mental health complaints and how system dynamics as new research perspective can complement more traditional exposure-outcome epidemiology. Both directions have potential to advance the understanding of mental health of young workers when considered in future research.

Better data is needed to study short and long-term effects of psychosocial work quality on mental health complaints

Above healthy worker effects and reverse causality were described as sources of bias concerning a causal interpretation of the association between psychosocial work quality and mental health complaints. Instead of biases that have to be reduced or controlled for in research designs, healthy worker effects and reverse causality can also be seen as essential mechanisms of society-wide mental health dynamics that unfold over the life course of a worker. The transition to work is a crucial moment, because first career job experiences and their psychosocial work quality might significantly contribute to an individual's life course including the development of potential mental health complaints. Analyzing such long-term effects requires longitudinal cohorts that are currently scarce (51) with TRAILS (52) being a notable exception. I recommend that scholars invest effort into setting up cohorts that (1) follow young individuals throughout their work life and start with data-collection before the transition to work, (2) include measures of mental health complaints and psychosocial work quality, and (3) include other risk factors contributing to mental health complaints outside of work (e.g. life events, general health).

Next to this focus on long term effects, more research is needed for better causal inference concerning the association between psychosocial work quality and mental health complaints. Research has shown that for the general working population the effect of the psychosocial work environment on mental health is both, acute and persistent (53). Focusing on acute effects, the collection ecological momentary assessment (EMA) (54) based data and analyzing within-person effects might lead to an unbiased estimate of such acute effects of the psychosocial work environment on mental health complaints.

Establishing a temporal order of proposed cause and effect can be valuable for ruling out reverse causality (55) and can benefit from EMA-typical high resolution longitudinal data. Using EMA young workers have to fill in very brief questionnaires on multiple time points (e.g. work-daily basis) for a short period of time (e.g. four weeks) (56). It might be promising to apply such EMA-based measurement during the time of starting career work as this might capture the acute effects of differing psychosocial work quality on mental health. This might overcome one of the biggest limitations of EMA-based measurement, namely that exposure and outcome must show sufficient within-person variability during the measurement period.

Concerning healthy worker effects, explicitly modelling within-person changes (i.e. individuals serving as their own controls) can help to eliminate bias due to selection effects, because these effects will not bias within-person estimates (57). Using EMA data, within-person effects can be modelled with short time-lags that capture the acute effect of psychosocial work quality on mental health complaints (39). Focusing on within-person effect also implies that variables that confound between-person associations of psychosocial work quality and mental health (e.g. mental health complaints before the transition to career work (58) cannot bias the estimate and therefore do not have to be included in the estimation process.

Combining approaches to model young workers' mental health

Traditionally most occupational mental health research follows a "risk-factor epidemiology" approach. This approach has the aim of making the least biased estimate of a specific exposure-outcome relationship (59). Within this approach, exposures or sets of exposures can take different roles in how they relate to the outcome. Most frequently researchers estimate on average associations using regression-based approaches (60). All papers included in our systematic review (**chapter 2**) assessed on average associations as did we in **chapters 4** and **5**. As an alternative to "on average" associations, exposures can also be related to outcomes as necessary conditions (see **chapter 6**) or sufficient conditions (61).

Mental health complaints of young workers are likely affected by many factors next to psychosocial work quality, including mental health earlier in life (58) and life events that are not limited to the work domain (28). These factors are also affecting each other, which in turn can have an effect on mental health complaints. Furthermore, mental health complaints themselves might have an effect on the circumstances (e.g. the psychosocial work environment) young workers are exposed to and also affect how young workers perceive these circumstances (i.e. reciprocal causality in exposure-outcome epidemiology terms). As a consequence of these many complex interactions, mental health complaints have been described as an emerging phenomenon, which cannot sufficiently be understood by solely focusing on exposure-outcome relationships. Recently scholars within the field of public health highlight the added value of a "system dynamic approach" (62, 63). With a system dynamics approach researchers can account for the interdependencies of factors by not conceptualizing them as exposure or outcome, but by understanding them as part of a complex system (64).

The interplay of the factors leading to the emergence of mental health complaints forms a complex system that can be modelled with a causal loop diagram (CLD). Following a system dynamics approach can improve our understanding of how factors underlying mental health complaints are interrelated, including the role of the psychosocial work environment. Only a few examples exist in which mental health of workers was modelled with a system dynamics approach (65, 66). This research describes the risks of entering an escalating loss spiral as well as a crucial role for the

supervisor in preventing mental health complaints from escalation. To date a system dynamics approach has not been applied to young workers specifically. In general, a system dynamics approach works better with more specific groups, e.g. young workers transitioning to first career work, than with a more heterogeneous target population, e.g. the general working population (65).

When applying a system dynamics approach, two features of the complex system can be modelled, system structure and system functioning (67). Modelling the system structure provides a qualitative overview of the most relevant factors that are assumed to be involved in the emergence of mental health complaints of young workers. The model also carries information on how factors are interrelated, including reinforcing and balancing feedback loops. System functioning describes the more global and long-term system dynamics. Modelling the system functioning might for example help to analyze loss and gain spirals, e.g. potentially growing inequalities in mental health complaints between young workers starting with good versus poor psychosocial job quality.

Exposure-outcome and system dynamic based research have their respective strengths and limitations and can complement each other (68). Exposure-outcome based research on large data sets can for example help to identify relevant factors that can consequently be included in a system dynamic based study. Furthermore, exposure-outcome research results in ideally unbiased estimates of a narrow, but clearly defined relationship, for example concerning how psychosocial work quality is associated with change of mental health complaints within a sample of young workers. A system dynamics approach can help in identifying factors that function as sufficient or necessary conditions for the outcome to occur, (61, 69) and that might consequently be studied with an exposure-outcome approach if researchers are interested in quantifying the association. A limitation of a system dynamics approach is that CLD's are characterized by a high degree of uncertainty that makes knowledge dissemination more challenging and can potentially limit its impact and uptake by practitioners or policymakers compared to supposedly objective exposure outcome estimates that can be distributed in a more straightforward manner.

Evidence gathered from system dynamics -based research can contribute to a better understanding of the role of psychosocial work quality, particularly over a longer period of time. Once this evidence exists it has the potential of eventually resulting in novelty concerning intervention goals and intervention timing. As Crielaard et al (2021) (70) state: "As differences in initial conditions may start out small but gradually push people towards entirely different trajectories, the timing of interventions within the life course appears crucial." Accordingly, interventions early in the career of a young worker can make use of leverage points within the complex system with the aim of interrupting vicious circles. This might prevent young workers from entering loss spirals co-fueled by poor psychosocial work quality. Future research based on a system dynamics approach has the potential to make a positive contribution to young workers mental health in a way that cannot be achieved by applying the more traditional epidemiological research methods alone.

Practical Recommendations

It appears that in the last years the interest in mental health of young workers increased as can be seen in the popularity of using "generational differences" as explanation for supposed differences between workers of different ages (71). These explanations mostly focus on young workers and this "generation" literature promotes stereotypes of today's young workers that have already been refuted by others (72). Thorough research on "generational differences" concludes that most age-related differences between workers can be explained by age effects or factors that are specific to a particular life phase like the transition to first career work. It is therefore principally advised to let go of the idea of systematic differences between generations. Instead, occupational mental health practice should give specific attention to young workers entering career work.

While my practical recommendations should be seen in light of the uncertainties of the evidence base that I described above, I believe that the findings presented here can nevertheless inspire occupational mental health practice in providing young workers with a good start of career work life. Below I will sketch what a program shaping this start can look like.

Improving the transition to career work – the first 1000 workdays

Intervening at critical moments in individuals' lives is crucial for many public health prevention efforts. Such efforts regularly aim at tackling potential problems before they lead to physical or mental health complaints and health inequalities. An example of this is the well-known "first 1000 days" approach for new born children's health (e.g. [73]). This approach recognizes the time frame from conception to the second birthday as critical for a child's development. Healthy first 1000 days are considered to be a necessary condition for prosperity later in life. Based on my findings, the first 1000 days approach can be used as inspiration for improving another critical moment in an individual's life, namely the transition to first career work. A program covering "the first 1000 workdays" might contribute to the prevention of mental health complaints among young workers and contribute to a mentally healthy as well as productive working life beyond the first 1000 workdays.

In analogy to the first 1000 days of a child, the first 1000 days of a young worker cover the transition from the last year of one's study up to and including the first two years of career work. The last year of education should be included as this is the time when a young adults' expectations concerning work become more concrete and when they first get to know potential employers as young workers start thinking about their career after graduation. Shaping the first 1000 workdays for the benefit of young workers requires collaboration between educational organizations (e.g. universities, schools providing vocational education) and employers, which both should have an active role in a first 1000 workdays program. From an educational institute perspective, improving the transition to career work should be in line with their mission of preparing young workers for work. From an employer perspective facilitating a good transition to career work is likely to lead to benefits beyond better mental health of young workers, such as productivity and retention.

Two more features from the child's first 1000 days can be inspirational for the first 1000 workdays and should be translated into features of a first 1000 workdays program. The first is the focus on the most vulnerable children and their parents as those are the one who can benefit most from health prevention efforts. Our results underscore that mental health complaint prevention efforts should focus on those who start career work in poorest psychosocial work quality. The second is the proposition that the parents' voices and experience should be at the center of any efforts. Because scientific evidence is still scarce, young workers themselves (e.g. graduates and starters) as well as their social environment (e.g. educators, HR-professionals) should be actively involved in shaping a first 1000 workdays program for the benefit of young workers' mental health.

Conclusion

The aim of my doctorate thesis is to contribute to the knowledge base regarding the relationship between the psychosocial work environment and mental health complaints of young workers. My studies showed that poor psychosocial work quality and mental health complaints are associated among young workers. Next to this on average association of psychosocial work quality and mental health complaints among young workers, psychosocial work adversities were found to be a necessary condition for very high levels of work-related mental health complaints. However, even with minimal psychosocial work adversities, work-related mental health complaints were still at a problematically high level for some young workers. More research is needed to draw conclusions concerning the causal nature and direction of these results. Furthermore, my studies showed that much overlap exists between young workers and the general working population concerning many psychosocial work factors and their link with mental health complaints. Nonetheless young workers appear to differ from the general working population in some aspects of the psychosocial work environment. This was reflected in young workers reporting psychosocial work factors that are not included in the extensive psychosocial work factor framework COPSOQ that has been developed for the general work population. I suggest that young workers should be distinguished from other workers as those who are starting career work and not as those who have not yet reached a particular age. As a direction for future research, I suggest approaching young workers' mental health from a complexity science perspective to complement traditional epidemiological approaches. This might lead to a better understanding of the dynamic relationship between the psychosocial work quality and mental health complaints over time, starting with the transition to career work. My recommendation for practice is to enable a healthy transition to first career work for young workers with a "first 1000 workdays" program. This program should take the specificities of young workers into account as suggested in this thesis. Young workers' active participation should be facilitated in shaping this program so that it corresponds to their needs. My research suggests that practical improvement should focus on young workers starting in jobs with poor psychosocial work quality. This is because poor psychosocial work quality appears to have the most detrimental impact on young workers' mental health complaints.

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7

Malte van Veen

Summary

Summary

Poor mental health has been linked to adverse outcomes on societal and personal levels. Action for improving mental health across the whole population is deemed necessary in industrialized countries, because the number of individuals who are reporting poor mental health has been increasing over the last years. This includes young adults who, as a group, have recently received considerable attention concerning their potentially declining mental health. Young adulthood has been shown to be a time in one's life that is accompanied by a high risk of developing mental health complaints. Most mental health complaints are diagnosed relatively early in life and prevalence of anxiety and depression symptoms are considerably higher than in older adults.

Work, and the psychosocial work environment in particular, are widely established as social determinants of mental health. Examples of psychosocial work factors that have been shown to be associated with mental health are workload, job control, and support from supervisor or colleagues. To date however a research gap exists concerning the relationship between the psychosocial work environment and mental health complaints of young workers. It is important to address this research gap as young workers might systematically differ from older workers in the way their mental health is affected by the psychosocial work environment. The start of career work can form the foundation for building self-esteem and financial independence whilst a less successful transition might result in being increasingly disadvantaged compared to one's mentally healthy peers.

In my thesis I focus on mental health as the presence of adverse mental health conditions. These adverse mental health conditions include different mental states that can be characterized by different symptoms and varying severity. Concerning severity, a distinction can be made between clinically diagnosed mental health problems and non-clinical mental health complaints. Non-clinical mental health complaints are more prevalent in the work domain than diagnosed mental health problems as the latter are associated with decreased work ability (despite many workers also being able to work while being diagnosed with a mental disorder). For this reason, my research addresses non-clinical mental health complaints. Concerning types of mental health complaints, occupational mental health research dominantly addresses symptoms of mental health problems that fall under the category of internalizing problems (i.e. complaints causing distress for the person expressing the symptoms) or are labelled common mental disorders (i.e. depression and anxiety related disorders). Also the widely studied mental health outcomes burnout and burnout-complaints can be considered to be conceptually close to internalizing problems and common mental disorders. I employ a broad conceptualization of mental health complaints in this thesis, encompassing these different mental states outlined above.

The studies in this doctorate thesis contribute to a better understanding of the relationship between the psychosocial work environment and mental health of young workers. In five empirical chapters in total, I am addressing three research questions, focusing on different aspects of young workers' mental health.

Research Question 1: Which aspects of the psychosocial work environment are associated with the mental health of young workers? (**chapters 2** and **3**)

We conclude that much of the existing knowledge concerning the relationship between the psychosocial work environment and mental health that is based on the general working population can likely be applied to young workers as well. This is the case even though we observed a paucity of research on samples solely consisting of young workers. This being said, we also concluded that young workers differ from the general working population in a few respects. Specifically, for some psychosocial work factors, there seems to be a 'young worker typical' way in how they come about in the workplace. Additionally, we observed two novel factors regarding how work appears to affect mental health of young adults, namely responsibility for others and need for procedural support. Moreover, we found a potentially important role for young workers experiencing a sense of community at work.

This answer to research question one is based on **chapters 2** and **3**. For **chapter 2** we conducted a systematic review with the aim of providing an overview of the evidence concerning psychosocial work factors affecting mental health of young workers with a maximum age of 35 years. Seventeen studies fit our inclusion criteria. A myriad of different exposure-outcome combinations hampered the synthesis of the evidence. Based on the GRADE-approach for assessing the certainty of the evidence, we identified a high risk of bias in the published literature. We concluded that practitioners currently cannot rely on scientific evidence on how to address mental health complaints of young workers at the workplace.

For **chapter 3** we conducted a qualitative study and interviewed 36 young workers with a maximum age of 30 and asked them how their experiences at work affect their mental health. We used open coding to inductively identify psychosocial work factors that were mentioned by young workers. Comparing these open codes to the widely used COPSOQ framework, we then deductively assessed if young worker typical relationships between psychosocial work factors and mental health complaints exist. We observed a substantial overlap between the general working population and young workers. However, some factors appear to play a role in a way that is more typical for young workers (i.e. Quantitative Demands, Influence at Work, Commitment to the Workplace, Job Insecurity, Quality of work, Job satisfaction, Vertical Trust). For instance, younger employees expressed distress that their older colleagues were reluctant to adapt their working methods to enhance the quality of work, which the younger workers reported was highly important to them. Additionally, we observed, two novel features regarding how work appears to affect mental health of young adults, i.e. need for procedural support and responsibility for others. We further observed that virtually all young workers mentioned a desire for a sense of community at work, which is included in the COPSOQ, but seems to play a particularly important role for young workers. Regarding influence at work we observed a potentially important nuance, namely that this factor can result in mental health complaints when not matched with sufficient experience to conduct a task.

Research Question 2: How do groups of young workers who are experiencing a variety of psychosocial work environments differ regarding their mental health? (**chapters 4** and **5**)

Our results show an association between the psychosocial work environment and mental health of young workers. Mental health complaints increased for young workers who started first career work in jobs with poor psychosocial work quality (**chapter 4**). Moreover, we could identify five subgroups of young workers who each shared comparable psychosocial work characteristic configurations, indicating that young workers are a heterogeneous group. Young workers in jobs that were characterized by high job demands showed significantly higher levels of emotional exhaustion than young workers in job characterized by fewer job demands (**chapter 5**).

This answer to research question two is based on **chapters 4** and **5**. For **chapter 4** we analyzed how mental health complaints changed for 850 young Dutch adults when entering first career work compared with not being at work and whether a change in mental health complaints was contingent on psychosocial work quality. We applied fixed effects regression analysis to test within-person changes around the first transition to career work accounting for all time-invariant confounding factors. Young workers' psychosocial work quality was categorized as poor, moderate, or good. While we did not find statistically significant changes in mental health complaints when disregarding psychosocial work quality, we found statistically significant differences when taking the psychosocial work quality of the first career job into account. Young adults who started career work in poor psychosocial work quality experienced a small and statistically significant increase of mental health complaints compared with not being at work. Those starting career work in moderate and good psychosocial work quality experienced no significant change in mental health complaints. We further tested if mental health complaints during adolescence moderated this potential change, but did not find evidence for a moderation effect.

For **chapter 5** we applied Latent Class Analysis to a sample of 7,301 young Dutch workers with a maximum age of 30 years. The aim of this study was to identify groups of young workers who experience comparable psychosocial work circumstances and to subsequently test whether these

groups differ concerning their mental health complaints. The groups were modelled based on nine psychosocial work factors (comprising five job demands and four job resources), physical job demands, and two working time related job demands (i.e. contract hours, shift work). Based on statistical fit indices and group content, we selected a five-group solution as the most appropriate model of categorizing young workers into groups with similar psychosocial work experiences. We identified five distinct groups of work characteristic configurations of young workers and labelled them (1) low-complexity work, (2) office work, (3) manual and non-interpersonal work, (4) non-manual and interpersonal work, and (5) manual and interpersonal work. Young workers from the latter two groups doing interpersonal work had significantly more mental health complaints than young workers from the other three groups. The two groups doing interpersonal work were characterized by high psychosocial job demands. Between the two groups, the group doing manual interpersonal work was further characterized by reporting fewer job resources than the group doing non-manual interpersonal work. The former group with fewer job resources scored even higher on mental health complaints than the group doing non-manual interpersonal work. This difference was statistically significant.

Research Question 3: Is a high level of psychosocial work adversities a necessity for work-related emotional exhaustion in young workers? (**chapter 6**)

We observed that a very high level of psychosocial work adversities is a necessary condition for very high levels of emotional exhaustion. However, we also observed that some young workers reported problematic levels of work-related emotional exhaustion even with very low levels of psychosocial work adversities. Therefore we cannot conclude that a low level of psychosocial work adversities guarantees the absence of problematic levels of work-related emotional exhaustion.

This answer to research question three is based on **chapter 6**. For this study we assessed whether a high level of psychosocial work adversities is necessary for a high level of work-related emotional exhaustion in young workers. We did this by applying necessary condition analysis (NCA) to a sample of 5,791 young Dutch workers with a maximum age of 30 years. NCA provides a theoretical view on causality as well as an accompanying a method, not yet widely used in occupational health research. While regression-based analyses regularly allow conclusions for the sample “on average”, NCA conclusions are applicable to every individual in a sample. In our study, psychosocial work adversities were operationalized with two composite scores. The first score reflected high job demands and low resources. The second score reflected high job demands only. Job resources were excluded from this second operationalization so that we could use the information from job resource factors in an additional analysis. For both operationalizations high level of psychosocial job adversity was necessary for very high levels of emotional exhaustion in our sample of young workers. However, even at a minimal level of psychosocial work adversity we observed cases of young workers reporting levels of mental health complaints that were high enough to be considered problematic (i.e. feeling exhausted more than once per month). Based on the second operationalization of psychosocial work adversities based on high job demands, we analyzed whether differences exist between young workers with low versus high resources concerning psychosocial work adversities as necessary condition for work-related emotional exhaustion. We found that for any given level of job demands, young workers with high job resources reported a lower maximal level of work-related emotional exhaustion than young workers with low job resources. This potentially indicates a buffering effect of experiencing high job resources in the face of high job demands.

Reflection on findings and implications

Some methodological considerations of our studies should be taken into account when interpreting the results presented in this thesis. Concerning how young workers are defined, we applied a maximum age criterion of 35 years for studies included in the systematic review (**chapter 2**) and 30 years for **chapters 3**, **4, 5,** and **6**. Defining young workers by maximum age leads to a group with varying levels of work experience: it comprises young adults with vocational education who regularly start career work in their late teens as well as young adults with academic education who start career work in their mid-to-late 20s. This is potentially problematic, because indications exist that it is not

young age by itself, but the transition to first career work that might distinguish young workers from the general working population. I consequently advise researchers to operationalize young workers as those who recently transitioned to career work, if the available data allows it.

Concerning the measurement of the psychosocial work environment of young workers, we cannot rule out that the composite scores in **chapters 4** and **6** missed aspects of the psychosocial work environment that contribute to mental health complaints of young workers. Particularly because the novel factors identified in our interview study (**chapter 3**) were not part of the composite scores. However, other research suggests that good and poor psychosocial work aspects are tightly clustered respectively, which limits potential risk of bias of not having a particular factor included. I suggest that existing psychosocial work quality measures that were developed for the general population can be used for the assessment of overall psychosocial work quality among young workers. If researchers are more interested in the association between individual psychosocial work factors and mental health complaints however, they also should address the more young worker typical and relevant factors mentioned above.

Concerning whether psychosocial work quality affects mental health complaints among young workers, methodological limitations of our study designs hamper a causal interpretation of the association. The methodological limitations are that we model a contemporaneous association of psychosocial work quality and mental health complaints in combination with self-report-based measurements. This implies that reverse causality due to a gloomy perception effect and selection effects cannot be ruled out. The gloomy perception effect describes that a young worker with mental health complaints might appraise and report the psychosocial work environment as more negative than a young worker who is having the exact same function at work but does not have mental health complaints. Concerning selection effects, young workers with mental health complaints might be disadvantaged in hiring processes and end up in work with poor psychosocial work quality. Additionally they might drift into jobs with poor psychosocial work quality over time, which might at least partly explain the association that we observed. This selection effect can be considered an inverted variant of the well-known healthy worker effect.

For future research gloomy perception bias and healthy worker effects can also be seen as contributing to real world mental health dynamics and health inequalities instead of biases that should be eliminated. Studying such longer-term dynamics requires the collection of longitudinal data, with data collection starting before young workers enter career work. Cohort data to address this is currently scarce. Future research should set up such cohorts that follow young adults and their mental health complaints already before the transition to career work. Once young adults make the transition to work, psychosocial work factors should be included as well. These cohorts should further include non-work-related factors that are likely to affect mental health complaints (e.g. adverse life events) so that their contribution can be accounted for. To overcome the described methodological limitations, researchers can make use of ecological momentary assessment spanning the transition to first career work could help overcome the described methodological limitations. High frequency measurements can be used to assess acute effects of changes in psychosocial work quality on mental health complaints in a temporal order, ruling out a gloomy perception bias. Using within-person analyses on this data can help to eliminate bias due to selection effects.

Another direction for future research is to complement more traditional “risk-factor epidemiology” with a system dynamics approach. Mental health complaints of young workers are likely affected by many factors next to psychosocial work quality, including mental health earlier in life and life events that are not limited to the work domain. These factors are also affecting each other, which in turn can have an effect on mental health complaints. With a system dynamics approach researchers can account for the interdependencies of factors by not conceptualizing them as exposure or outcome, but by understanding them as part of a complex system with mental health complaints as emerging outcome. Following a system dynamics approach can improve our understanding of how factors underlying mental health complaints are interrelated. The changes in a young adults’ life that precede, accompany, and follow the transition to first career work might be particularly interesting to address

with a system dynamics approach due to the potential long-term consequences of the transition to career work.

While my recommendations should be seen in light of the uncertainty of the evidence base that I described above, I believe that my findings presented here can nevertheless inspire occupational mental health practice in providing young workers with a good start of career work life. I propose that, in analogy to the well-known approach for improving children's health "first 1000 days", local programs should be set up to guide the "first 1000 workdays" of young workers. A program like this requires the collaboration of educational institutions and employers. It might be most promising when collaborators are located close to each other so that they can form a school-work ecosystem. The findings provided in my studies might provide starting points for developing principles of a first 1000 workday program. Analog to the first 1000 days of a child, the first 1000 workdays should focus on improvements for those young workers starting career work in poor psychosocial work quality as my findings suggest that these young workers experience most harm regarding their mental health. Importantly, young workers' own experiences and ideas should be central to the development of the first 1000 workdays approach.

Altogether, my take-home message is that fostering a young worker-friendly psychosocial work environment can contribute to prevent mental health complaints of young adults at the start of their career work life.

Samenvatting

Slechte mentale gezondheid is in verband gebracht met nadelige gevolgen op maatschappelijk en individueel niveau. In geïndustrialiseerde landen wordt actie noodzakelijk geacht om de mentale gezondheid van de gehele bevolking te verbeteren. De reden hiervoor is dat het aantal mensen dat een slechte mentale gezondheid rapporteert de afgelopen jaren is toegenomen. Dit geldt ook voor jongvolwassenen, die als groep recent veel aandacht hebben gekregen vanwege hun mogelijkerwijs afnemende mentale gezondheid. De jongvolwassenheid is aantoonbaar een levensfase waarin een hoog risico bestaat op het ontwikkelen van mentale gezondheidsklachten. De meeste mentale gezondheidsklachten worden relatief vroeg in het leven gediagnosticeerd en de prevalentie van angst- en depressiesymptomen is aanzienlijk hoger dan bij oudere volwassenen.

Werk, en in het bijzonder de psychosociale werkomgeving, wordt algemeen erkend als een sociale determinant van mentale gezondheid. Werkdruk, autonomie en steun van leidinggevende of collega's zijn voorbeelden van psychosociale werkfactoren die in verband zijn gebracht met mentale gezondheid. Tot op heden is er weinig kennis beschikbaar over de relatie tussen de psychosociale werkomgeving en mentale gezondheidsklachten van jonge werkenden. Het is belangrijk deze kennisklоof te dichten, omdat jonge werkenden systematisch kunnen verschillen van oudere werkenden in de manier waarop hun mentale gezondheid wordt beïnvloed door de psychosociale werkomgeving. De start van de loopbaan kan de basis vormen voor het opbouwen van zelfvertrouwen en financiële onafhankelijkheid, terwijl een minder succesvolle overgang naar werk kan leiden tot een toenemende achterstand ten opzichte van leeftijdsgenoten met een goede mentale gezondheid.

In dit proefschrift richt ik mij op mentale gezondheid als de aanwezigheid van ongunstige mentale gezondheidscondities. Deze ongunstige mentale gezondheidscondities omvatten verschillende mentale toestanden die gekenmerkt kunnen worden door verschillende symptomen en uiteenlopende gradaties van ernst. Wat betreft de gradaties van ernst kan een onderscheid worden gemaakt tussen klinisch gediagnosticeerde mentale gezondheidsproblemen en niet-klinische mentale gezondheidsklachten. Niet-klinische mentale gezondheidsklachten komen vaker voor op de werkvloer dan gediagnosticeerde mentale gezondheidsproblemen, aangezien laatstgenoemde gepaard gaan met verminderde arbeidsgeschiktheid (hoewel veel werkenden ook kunnen werken met een gediagnosticeerde mentale stoornis). Om deze reden richt mijn onderzoek zich op niet-klinische mentale gezondheidsklachten. Wat betreft typen klachten richt arbeidsgeneeskundig onderzoek, waaronder mijn onderzoek, zich vooral op symptomen van mentale gezondheidsproblemen die vallen onder de categorie internaliserende problemen (d.w.z. klachten die vooral lijden veroorzaken bij de persoon zelf) of die worden aangeduid als veelvoorkomende psychische stoornissen (zoals depressie en angststoornissen). Ook de veel bestudeerde uitkomsten burn-out en burn-outklachten kunnen conceptueel dicht bij internaliserende problemen en veelvoorkomende psychische stoornissen worden geplaatst. In dit proefschrift hanteer ik een brede conceptualisering van mentale gezondheidsklachten, waaronder bovengenoemde mentale toestanden vallen.

De studies in dit proefschrift dragen bij aan een beter begrip van de relatie tussen de psychosociale werkomgeving en de mentale gezondheid van jonge werkenden. In totaal behandel ik in vijf empirische hoofdstukken drie onderzoeksvragen, waarbij ik me richt op verschillende aspecten van de mentale gezondheid van jonge werkenden.

Onderzoeksvraag 1: Welke aspecten van de psychosociale werkomgeving hangen samen met de mentale gezondheid van jonge werkenden? (**hoofdstukken 2 en 3**)

We concluderen dat veel van de bestaande kennis over de relatie tussen de psychosociale werkomgeving en de mentale gezondheid, die gebaseerd is op de algemene werkende populatie, waarschijnlijk ook toepasbaar is op jonge werkenden. Dit is het geval ondanks het feit dat er weinig onderzoek is gedaan naar uitsluitend jonge werkenden. Tegelijkertijd concluderen we dat jonge werkenden op enkele punten verschillen van de algemene werkende populatie. Specifiek lijkt er voor sommige psychosociale werkfactoren een 'jongeren-typische' manier te zijn waarop deze tot

uitdrukking komen op de werkvloer. Daarnaast observeerden we twee nieuwe factoren met betrekking tot hoe werk de mentale gezondheid van jongvolwassenen lijkt te beïnvloeden, namelijk "verantwoordelijkheid voor anderen" en "behoefte aan procedurele ondersteuning". Ook vonden we een mogelijk belangrijke rol voor het ervaren van een gevoel van gemeenschap op het werk voor jonge werkenden.

Dit antwoord op onderzoeksvraag één is gebaseerd op **hoofdstukken 2 en 3**. Voor **hoofdstuk 2** voerden we een systematische review uit met als doel een overzicht te geven van het wetenschappelijk bewijs voor psychosociale werkfactoren die de mentale gezondheid van jonge werkenden (maximaal 35 jaar) beïnvloeden. Zeventien studies voldeden aan onze inclusiecriteria. Een veelheid aan verschillende combinaties van blootstellings- en uitkomstmaten bemoeilijkte de synthese van het bewijs. Op basis van de GRADE-methode voor het beoordelen van de bewijskracht, constateerden we een hoog risico op bias in de gepubliceerde literatuur. We concludeerden dat praktijkprofessionals momenteel niet kunnen vertrouwen op wetenschappelijk bewijs over hoe mentale gezondheidsklachten van jonge werkenden op de werkvloer moeten worden aangepakt.

Voor **hoofdstuk 3** voerden we een kwalitatieve studie uit en interviewden we 36 jonge werkenden (met een maximale leeftijd van 30 jaar) over hoe hun ervaringen op het werk hun mentale gezondheid beïnvloeden. Met open codering identificeerden we psychosociale werkfactoren die door jonge werkenden werden genoemd. Door deze open codes te vergelijken met het veelgebruikte COPSOQ-raamwerk, beoordeelden we deductief of er "jonge werkenden-typische" relaties bestaan tussen psychosociale werkfactoren en mentale gezondheidsklachten. We observeerden een substantiële overlap tussen de algemene werkende populatie en jonge werkenden. Toch lijken sommige factoren een rol te spelen op een manier die typisch is voor jonge werkenden (zoals kwantitatieve taakeisen, invloed kunnen uitoefenen op het werk, betrokkenheid bij de organisatie, baanonzekerheid, werkkwaliteit, werktevredenheid en verticaal vertrouwen). Bijvoorbeeld: jongere medewerkers gaven aan dat het hen stress opleverde als oudere collega's niet bereid waren hun werkwijze aan te passen om de kwaliteit van het werk te verbeteren, terwijl jonge werkenden dit juist erg belangrijk vonden. Daarnaast observeerden we twee nieuwe kenmerken van hoe werk de mentale gezondheid van jongvolwassenen lijkt te beïnvloeden, namelijk behoefte aan procedurele ondersteuning en verantwoordelijkheid voor anderen. Verder zagen we dat vrijwel alle jonge werkenden een verlangen naar een gevoel van gemeenschap op het werk noemden, wat weliswaar in de COPSOQ is opgenomen maar wat een bijzonder belangrijke rol lijkt te spelen voor jonge werkenden. Wat betreft invloed kunnen uitoefenen op het werk zagen we een belangrijke nuance: deze factor kan leiden tot mentale gezondheidsklachten als deze niet wordt afgestemd op de ervaring van een jonge werkende om een taak uit te voeren.

Onderzoeksvraag 2: Hoe verschillen groepen jonge werkenden die verschillende psychosociale werkomgevingen ervaren in hun mentale gezondheid? (**hoofdstukken 4 en 5**)

Onze resultaten tonen een verband aan tussen de psychosociale werkomgeving en de mentale gezondheid van jonge werkenden. Mentale gezondheidsklachten namen toe bij jonge werkenden die hun eerste carrièrebaan begonnen in een werkomgeving met een slechte psychosociale werkkwaliteit (**hoofdstuk 4**). Bovendien konden we vijf subgroepen van jonge werkenden identificeren die elk vergelijkbare psychosociale werkkenmerken deelden, wat aangeeft dat jonge werkenden een heterogene groep vormen. Jonge werkenden in banen met hoge taakeisen vertoonden significant hogere niveaus van emotionele uitputting dan jonge werkenden in banen met lagere taakeisen (**hoofdstuk 5**).

Het antwoord op onderzoeksvraag twee is gebaseerd op **hoofdstukken 4 en 5**. Voor **hoofdstuk 4** analyseerden we hoe mentale gezondheidsklachten veranderden bij 850 jonge Nederlandse volwassenen bij de overgang naar hun eerste carrièrebaan, vergeleken met niet werken, en of een verandering in mentale gezondheidsklachten afhankelijk was van de psychosociale werkkwaliteit. We pasten *fixed effects* regressieanalyse toe om veranderingen rond de overgang naar de eerste carrièrebaan te testen, waarbij we corrigeerden voor alle verstorende factoren die niet veranderen over de tijd binnen één persoon. De psychosociale werkkwaliteit van jonge werkenden werd

gecategoriseerd als slecht, matig of goed. Hoewel we geen statistisch significante veranderingen in mentale gezondheidsklachten vonden wanneer we geen rekening hielden met psychosociale werkkwaliteit, vonden we wel significante verschillen wanneer we de psychosociale werkkwaliteit van de eerste carrièrebaan meenamen. Jongvolwassenen die hun carrière begonnen in een baan met slechte psychosociale werkkwaliteit ervoeren een kleine maar significante toename van mentale gezondheidsklachten vergeleken met niet werken. Degenen die hun carrière begonnen in een baan met matige of goede psychosociale werkkwaliteit ervoeren geen significante verbetering of verslechtering van mentale gezondheidsklachten. We onderzochten ook of mentale gezondheidsklachten tijdens de adolescentie deze verandering modereerden, maar vonden hiervoor geen bewijs.

Voor **hoofdstuk 5** pasten we *Latent Class Analysis* toe op een steekproef van 7.301 jonge Nederlandse werkenden (maximaal 30 jaar). Het doel was om groepen jonge werkenden te identificeren die vergelijkbare psychosociale werkkenmerken ervaren en vervolgens te testen of deze groepen verschillen in hun mentale gezondheidsklachten. De groepen werden gemodelleerd op basis van negen psychosociale werkfactoren (vijf taakeisen en vier hulpbronnen), fysieke taakeisen en twee werktijdgerelateerde taakeisen (contracturen, ploegendienst). Op basis van statistische fit-indices en groepsinhoud selecteerden we een vijf-groepenoplossing als het meest geschikte model. We identificeerden vijf verschillende groepen werkkenmerken van jonge werkenden en labelden deze als (1) laag-complex werk, (2) kantoorwerk, (3) handmatig en niet-interpersoonlijk werk, (4) niet-handmatig en interpersoonlijk werk, en (5) handmatig en interpersoonlijk werk. Jonge werkenden uit de laatste twee groepen die interpersoonlijk werk deden, hadden significant meer mentale gezondheidsklachten dan jonge werkenden uit de andere drie groepen. De twee groepen die interpersoonlijk werk deden, werden gekenmerkt door hoge psychosociale taakeisen. Tussen deze twee groepen werd de groep die handmatig en interpersoonlijk werk deed verder gekenmerkt door minder hulpbronnen dan de groep die niet-handmatig en interpersoonlijk werk deed. De groep met handmatig en interpersoonlijk werk en minder hulpbronnen scoorde zelfs hoger op mentale gezondheidsklachten dan de groep die niet-handmatig interpersoonlijk werk deed. Dit verschil was statistisch significant.

Onderzoeksvraag 3: Is een hoog niveau van psychosociale belasting op het werk een noodzakelijke voorwaarde voor werkgerelateerde emotionele uitputting bij jonge werkenden? (**hoofdstuk 6**)

We observeerden dat een zeer hoog niveau van psychosociale belasting op het werk een noodzakelijke voorwaarde is voor zeer hoge niveaus van emotionele uitputting. We zagen echter ook dat sommige jonge werkenden problematische niveaus van werkgerelateerde emotionele uitputting rapporteerden, zelfs bij zeer lage niveaus van psychosociale belasting op het werk. Daarom kunnen we niet concluderen dat een laag niveau van psychosociale belasting op het werk de afwezigheid van problematische niveaus van werkgerelateerde emotionele uitputting garandeert.

Dit antwoord op onderzoeksvraag drie is gebaseerd op **hoofdstuk 6**. Voor deze studie onderzochten we of een hoog niveau van psychosociale belasting op het werk noodzakelijk is voor een hoog niveau van werkgerelateerde emotionele uitputting bij jonge werkenden. We deden dit door *Necessary Condition Analysis* (NCA) toe te passen op een steekproef van 5.791 jonge Nederlandse werkenden (maximaal 30 jaar). NCA biedt een theoretische kijk op causaliteit en een bijbehorende methode die nog niet veel wordt gebruikt in arbeid- en gezondheidskundig onderzoek. Terwijl regressieanalyses doorgaans conclusies trekken voor de steekproef “gemiddeld genomen”, zijn NCA-conclusies van toepassing op elk individu in een steekproef. In ons onderzoek werd psychosociale belasting op het werk geoperationaliseerd met twee samengestelde scores. De eerste score weerspiegelde hoge taakeisen en weinig hulpbronnen. De tweede score weerspiegelde alleen hoge taakeisen. Hulpbronnen werden uitgesloten van deze tweede operationalisatie, zodat we de informatie uit hulpbronnenfactoren in een aanvullende analyse konden gebruiken. Voor beide operationalisaties was een hoog niveau van psychosociale belasting op het werk noodzakelijk voor zeer hoge niveaus van emotionele uitputting in onze steekproef van jonge werkenden. Echter, zelfs bij een minimaal niveau van psychosociale belasting op het werk zagen we gevallen van jonge werkenden die niveaus van mentale gezondheidsklachten rapporteerden die hoog genoeg waren om als problematisch te worden

beschouwd (d.w.z. zich meer dan eens per maand uitgeput voelen door het werk). Op basis van de tweede operationalisatie van psychosociale belasting op het werk op basis van hoge taakeisen, analyseerden we of er verschillen bestaan tussen jonge werkenden met weinig versus veel hulpbronnen wat betreft psychosociale belasting op het werk als noodzakelijke voorwaarde voor werkgerelateerde emotionele uitputting. We vonden dat voor elk gegeven niveau van taakeisen jonge werkenden met veel hulpbronnen een lager maximaal niveau van werkgerelateerde emotionele uitputting rapporteerden dan jonge werkenden met weinig hulpbronnen. Dit duidt mogelijk op een bufferend effect van het ervaren van veel hulpbronnen bij hoge taakeisen.

Reflectie op bevindingen en implicaties

Sommige methodologische overwegingen van onze studies moeten in acht worden genomen bij het interpreteren van de resultaten die in dit proefschrift worden gepresenteerd. Wat betreft hoe jonge werkenden worden gedefinieerd, hebben we een maximale leeftijdsgrens van 35 jaar gehanteerd voor studies die zijn opgenomen in de systematische review (**hoofdstuk 2**) en 30 jaar voor **hoofdstukken 3, 4, 5** en **6**. Het definiëren van jonge werkenden op basis van een maximale leeftijd leidt tot een groep met uiteenlopende niveaus van werkervaring: het omvat jongvolwassenen met een beroepsopleiding die doorgaans hun loopbaan beginnen in hun late tienerjaren, evenals jongvolwassenen met een academische opleiding die hun loopbaan beginnen later in de twintig. Dit is potentieel problematisch, omdat er aanwijzingen zijn dat het niet zozeer de leeftijd zelf is, maar de overgang naar de eerste carrièrebaan die jonge werkenden onderscheidt van de algemene werkende populatie wat betreft de manier waarop de psychosociale werkomgeving hun mentale gezondheid beïnvloedt. Ik adviseer daarom onderzoekers om die groep als jonge werkenden te beschouwen als degenen die recent zijn gestart met een eerste carrièrebaan, als de beschikbare data dit toelaat.

Wat betreft de meting van de psychosociale werkomgeving van jonge werkenden, kunnen we niet uitsluiten dat de samengestelde scores in **hoofdstukken 4** en **6** aspecten van de psychosociale werkomgeving missen die bijdragen aan mentale gezondheidsklachten van jonge werkenden. Vooral omdat de nieuwe factoren die in onze interviewstudie (**hoofdstuk 3**) zijn geïdentificeerd, geen deel uitmaakten van de samengestelde scores. Ander onderzoek suggereert echter dat goede en slechte psychosociale werkaspecten respectievelijk sterk geclusterd zijn, wat het potentiële risico op vertekening door het ontbreken van een bepaalde factor beperkt. Ik stel voor dat bestaande meetinstrumenten voor psychosociale werkkwaliteit die zijn ontwikkeld voor de algemene populatie, kunnen worden gebruikt voor de beoordeling van de algehele psychosociale werkkwaliteit onder jonge werkenden. Als onderzoekers echter specifiek geïnteresseerd zijn in de relatie tussen individuele psychosociale werkfactoren en mentale gezondheidsklachten, moeten ze ook de meer typische en relevante factoren voor jonge werkenden meenemen.

Wat betreft de vraag of psychosociale werkkwaliteit mentale gezondheidsklachten bij jonge werkenden beïnvloedt, belemmeren methodologische beperkingen van onze onderzoeksopzet een causale interpretatie van de associatie. De methodologische beperkingen zijn dat we een gelijktijdige associatie van psychosociale werkkwaliteit en mentale gezondheidsklachten modelleren in combinatie met metingen op basis van zelfrapportage. Dit impliceert dat omgekeerde causaliteit door een “gloomy perception effect” en selectiemechanismen niet kunnen worden uitgesloten. Het *gloomy perception effect* beschrijft dat een jonge werkende met mentale gezondheidsklachten de psychosociale werkomgeving mogelijk negatiever beoordeelt en rapporteert dan een jonge werkende die exact dezelfde functie heeft maar geen mentale gezondheidsklachten ervaart. Wat betreft selectiemechanismen: jonge werkenden met mentale gezondheidsklachten kunnen benadeeld worden bij sollicitatieprocedures en terechtkomen in werk met een slechte psychosociale werkkwaliteit. Daarnaast kunnen ze in de loop van de tijd afglijden naar banen met een slechte psychosociale werkkwaliteit, wat mogelijk gedeeltelijk de waargenomen associatie verklaart. Dit selectiemechanisme kan worden beschouwd als een omgekeerde variant van het bekende *healthy worker effect*.

Voor toekomstig onderzoek kunnen *gloomy perception bias* en *healthy worker effects* ook worden gezien als bijdragen aan reële dynamiek van mentale gezondheid en gezondheidsongelijkheid, in plaats van als vertekeningen die geëlimineerd moeten worden. Het bestuderen van dergelijke langetermijndynamiek vereist het verzamelen van longitudinale data, waarbij de dataverzameling start voordat jonge werkenden hun carrière beginnen. Cohortdata om dit te onderzoeken zijn momenteel schaars. Toekomstig onderzoek zou dergelijke cohorten moeten opzetten die jongvolwassenen en hun mentale gezondheidsklachten al vóór de overgang naar carrièrewerk volgen. Zodra jongvolwassenen de overstap naar werk maken, moeten ook psychosociale werkfactoren worden meegenomen. Deze cohorten moeten bovendien niet-werkgerelateerde factoren bevatten die waarschijnlijk van invloed zijn op mentale gezondheidsklachten (zoals ingrijpende levensgebeurtenissen), zodat hun bijdrage kan worden meegewogen. Om de beschreven methodologische beperkingen te overwinnen, kunnen onderzoekers gebruikmaken van *ecological momentary assessment* die de overgang naar de eerste carrièrebaan overspant. Metingen met hoge frequentie kunnen worden gebruikt om acute effecten van veranderingen in psychosociale werkkwaliteit op mentale gezondheidsklachten in een temporele volgorde te beoordelen, waardoor een *gloomy perception bias* kan worden uitgesloten. Het gebruik van binnen-persoonsanalyses op deze data kan helpen om vertekening door selectiemechanismen te elimineren.

Een andere richting voor toekomstig onderzoek is het aanvullen van meer traditionele "risicofactor-epidemiologie" met een systeemdynamische benadering. Mentale gezondheidsklachten van jonge werkenden worden waarschijnlijk beïnvloed door veel factoren naast psychosociale werkkwaliteit, waaronder eerdere mentale gezondheid en levensgebeurtenissen die niet beperkt zijn tot het werkdomein. Deze factoren beïnvloeden elkaar ook, wat weer effect kan hebben op mentale gezondheidsklachten. Met een systeemdynamische benadering kunnen onderzoekers rekening houden met de onderlinge afhankelijkheden van factoren door ze niet te conceptualiseren als blootstelling of uitkomst, maar door ze te begrijpen als onderdeel van een complex systeem met mentale gezondheidsklachten als emergent verschijnende uitkomst. Het volgen van een systeemdynamische benadering kan ons begrip verbeteren van hoe factoren die ten grondslag liggen aan mentale gezondheidsklachten met elkaar samenhangen. De veranderingen in het leven van een jongvolwassene die voorafgaan aan, samengaan met en volgen op de overgang naar de eerste carrièrebaan, kunnen bijzonder interessant zijn om met een systeemdynamische benadering te onderzoeken vanwege de potentiële langetermijngevolgen van deze overgang naar carrièrewerk.

Hoewel mijn aanbevelingen moeten worden gezien in het licht van de onzekerheid van de hierboven beschreven bewijsbasis, geloof ik dat mijn bevindingen toch inspiratie kunnen bieden voor de praktijk van arbeid en gezondheid om jonge werkenden een goede start van hun carrière te geven. Ik stel voor om, analoog aan de bekende aanpak voor het verbeteren van de gezondheid van kinderen ("de eerste 1000 dagen"), lokale programma's op te zetten om de "eerste 1000 werkdagen" van jonge werkenden te begeleiden. Een dergelijk programma vereist samenwerking tussen onderwijsinstellingen en werkgevers. Het is waarschijnlijk het meest kansrijk als samenwerkende partijen dicht bij elkaar zijn gevestigd, zodat ze een school-werk-ecosysteem kunnen vormen. De bevindingen uit mijn studies kunnen aanknopingspunten bieden voor het ontwikkelen van uitgangspunten voor een eerste 1000 werkdagen-programma. Net als bij de eerste 1000 dagen van een kind, zouden de eerste 1000 werkdagen zich moeten richten op verbeteringen voor die jonge werkenden die hun carrière beginnen in een baan met slechte psychosociale werkkwaliteit, aangezien mijn bevindingen suggereren dat deze jonge werkenden het meeste nadeel ondervinden wat betreft hun mentale gezondheid. Het is belangrijk dat de eigen ervaringen en ideeën van jonge werkenden centraal staan in de ontwikkeling van een aanpak voor de eerste 1000 werkdagen.

Concluderend is mijn belangrijkste boodschap dat het bevorderen van een jonge-werkende-vriendelijke psychosociale werkomgeving kan bijdragen aan het voorkomen van mentale gezondheidsklachten bij jongvolwassenen aan het begin van hun loopbaan.

Thank you & About the author

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About the author

Malte van Veen
was born in 1991 in Bad Gandersheim, Germany. Malte studied business psychology with a focus on Human Factors at the Leuphana University Lüneburg. Germany and the University of Queensland, Brisbane Australia, graduating in 2015. In the same year Malte started pursuing his Masters in Social and Organizational Psychology at Leiden University from which he graduated in 2017.

Malte joined the Netherlands Organisation for Applied Scientific Research TNO in 2017 as a trainee, working as researcher and supporting policy-processes within the organization. After the end of the two-year trainee program, Malte joined the TNO research group Sustainable Productivity and Employability in Leiden in 2019.
In March 2020 Malte started his PhD-research on mental health of young workers at the Amsterdam University Medical Center (AUMC). This research was collaboratively funded by TNO and AUMC. At the same time Malte remained a researcher at TNO, where he switched to the research group Work Health and Technology in 2022. In 2022 Malte also gained his Masters degree in epidemiology from the Free University of Amsterdam.

Following the completion of his doctoral research, Malte continues to work with both TNO and AUMC. At AUMC, he currently holds a postdoctoral position focused on the impact of remote work on musculoskeletal complaints.