

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

Malte van Veen ^{1,2,3,4}, Roosmarijn MC Schelvis,^{1,3,5} Trynke Hoekstra ⁶,
Paulien M Bongers,^{2,3,4} Cécile RL Boot,^{1,3,4} Karen M Oude Hengel^{2,3}

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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 7301 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.

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

STRENGTHS AND LIMITATIONS OF THIS STUDY

- ⇒ This study of heterogeneity of work characteristics of young workers contributes to a better understanding of the association between work characteristics and mental health outcomes for this group.
- ⇒ In this study, we used a large sample size from a well-established dataset (the Netherlands Working Conditions Survey (NWCS)) and carefully selected the indicator variables for the latent class analysis using a systematic process.
- ⇒ We could replicate our results using the 2017 and 2021 wave of the NWCS.
- ⇒ Causal conclusions concerning the association between work characteristic configurations and emotional exhaustion cannot be drawn from this cross-sectional study.
- ⇒ Relying on the most common jobs within each identified subgroup for naming and interpreting the subgroup might understate heterogeneity of work characteristic configurations for young workers sharing the same function.

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'



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For numbered affiliations see end of article.

Correspondence to

Malte van Veen;
malte.vanveen@amsterdamumc.nl

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 (eg, 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 7301 young workers. We followed the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) reporting guidelines for cross-sectional studies²⁴ (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

Table 1 Description, background information and operationalisation of latent class analysis indicator variables

Variable name: description*	Scale or item background	Operationalisation and response categories
Demographics		
Sex	Statistics Netherlands	'Male', 'female'
Educational level†: the highest obtained degree	Statistics Netherlands uses 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 coworkers 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?'‡
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?'
*Elaborate descriptions of each variable in Dutch can be found in Hooftman <i>et al</i>²¹; the original Dutch wording of all items for the indicator variables and for emotional exhaustion can be found in 50. †Elementary education represents maximal 1 year of completed vocational education; vocational education represents more than 1 year of completed vocational education without completed academic education; academic education represents a bachelor's degree from a university or university of applied sciences. ‡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 (ie, close or equal to 95 per week) and therefore we transformed every value higher than 60 to a value of 60. COPSOQ, Copenhagen Psychosocial Questionnaire; JCQ, Job Content Questionnaire; LFS, Labour Force Survey; NWCS, Netherlands Working Conditions Survey; POLS, Permanent Onderzoek Leef Situatie (Statistics Netherlands (CBS)).		

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.

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 (eg, ‘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 $\alpha=0.88$.

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 codes³⁴ 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 (2017³⁵ and 2021³⁶) 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

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	123 194.7	246 443.4	246 629.6	246 543.8	NA	NA	100%
2	120 676.8	241 445.6	241 762.8	241 616.6	0	0.73	29.5%
3	118 823.3	237 776.5	238 224.7	238 018.2	0	0.71	25.2%
4	117 379.0	234 926.0	235 505.2	235 238.3	0	0.77	13.4%
5 (chosen)	116 493.1	233 192.2	233 902.5	233 575.2	0	0.78	9.9%
6	115 959.7	232 163.5	233 004.8	232 617.1	0	0.79	3.4%
7	115 613.4	231 508.7	232 481.0	232 033.0	0	0.81	1.2%
8	115 274.2	230 868.4	231 971.7	231 463.2	0	0.76	3%
9	114 934.5	230 226.9	231 461.3	230 892.4	0	0.78	1.1%
10	114 515.3	229 426.6	230 792.0	230 162.8	0	0.79	1%

aBIC, adjusted BIC; AIC, Akaike Information Criterion; BIC, Bayesian Information Criterion; BLRT, p value based on bootstrapped likelihood ratio test; LL, log likelihood; NA, not applicable.

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.

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 (eg, building workers of which 84% belonged to 'manual and non-interpersonal work'), whereas other occupations were spread across groups (eg, 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.

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.

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.

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

	Total	Low-complex work	Office work	Manual & non-interpersonal work	Non-manual & interpersonal work	Manual & interpersonal work
	N=7301	N=1784	N=2357	N=905	N=1536	N=719
Subgroup	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%)
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%)

Continued

Table 3 Continued

	Total	Low-complex work	Office work	Manual & non-interpersonal work	Non-manual & interpersonal work	Manual & interpersonal work
	N=7301	N=1784	N=2357	N=905	N=1536	N=719
Subgroup	100%	24.4%	32.3%	12.4%	21%	9.9%
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%)
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 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,

Subgroup	Job Demands										Job Resources				
	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.

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.

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 ($n=5496$) and 2021 ($n=6115$) 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).

Table 4 Simple comparisons of emotional exhaustion between the five subgroups

Subgroup comparison		Emotional exhaustion	
		Mean difference	95% CI
Low-complexity work (reference)*			
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

*Bold font indicates 95% CIs not containing 0.

Sensitivity analysis: excluding sex and educational level as indicator variables

Not including sex and educational level as indicator variables resulted in a five-class solution using the criteria as described in the Methods section. No relevant differences in the features of those classes, nor in the distribution of emotional exhaustion were observed compared with the main analysis (see online supplemental file F).

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 review⁴³ 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 (eg, ISCO) or the regularly applied, but ambiguous descriptions of jobs as 'blue collar' or 'white collar' (eg, 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.

Author affiliations

¹Amsterdam Public Health, Societal Participation & Health, Amsterdam UMC, Amsterdam, The Netherlands

²Unit Healthy Living & Work, TNO Location Leiden Sylviusweg, Leiden, The Netherlands

³Body@Work, Amsterdam, The Netherlands

⁴Public and Occupational Health, Amsterdam UMC, location VUmc, Amsterdam, Netherlands

⁵Public and Occupational Health, Amsterdam UMC Location AMC, Amsterdam, The Netherlands

⁶Department of Health Sciences and Amsterdam Public Health research institute, Faculty of Science, VU University Amsterdam, Amsterdam, The Netherlands

Twitter Trynke Hoekstra @TrynkeHoekstra

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Patient and public involvement Patients and/or the public were not involved in the design, or conduct, or reporting, or dissemination plans of this research.

Patient consent for publication Obtained.

Ethics approval This study involves human participants. The TNO Internal Review Board approved the NWCS and assessed the NWCS as not being subject to the requirements of the Dutch Medical Research Involving Human Subjects Act (case 2018-066). Participants gave informed consent to participate in the study before taking part.

Provenance and peer review Not commissioned; externally peer reviewed.

Data availability statement Data may be obtained from a third party and are not publicly available. The conditions under which the NWCS is accessible are described by Statistics Netherlands (<https://www.cbs.nl/en-gb/our-services/customised-services-microdata/microdata-conducting-your-own-research>). Analysis scripts are available upon request.

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ORCID iDs

Malte van Veen <http://orcid.org/0000-0002-8980-5432>

Trynke Hoekstra <http://orcid.org/0000-0002-0535-0056>

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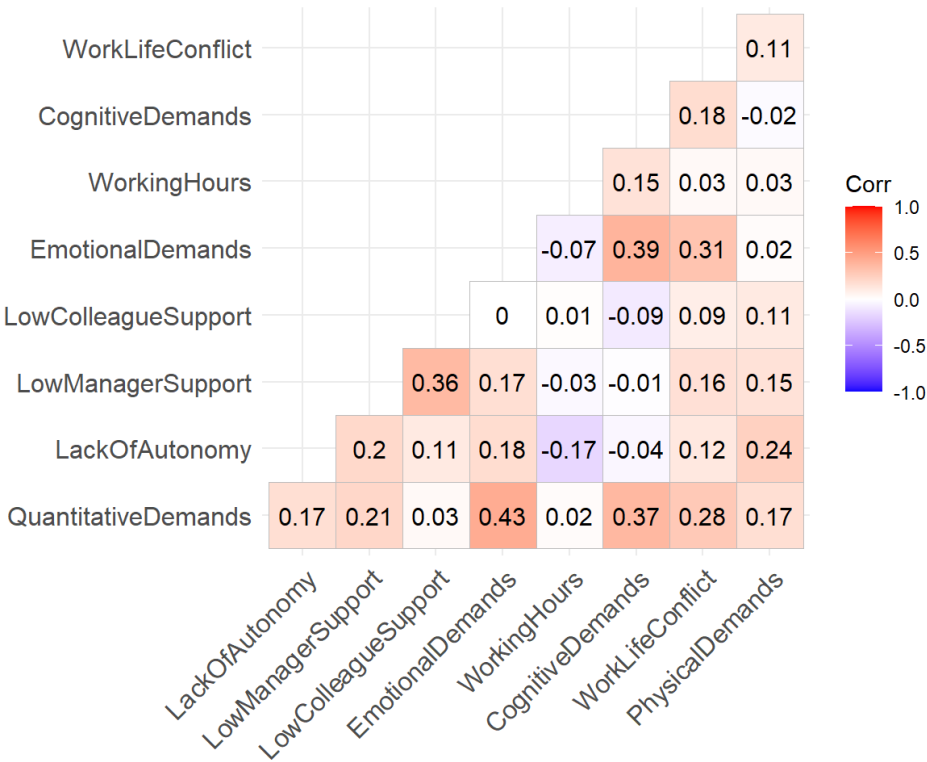
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Supplementary File A - Completed STROBE statement

	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—eg numbers potentially eligible, examined for	5

		eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	
		(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 (eg 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 (eg, 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—eg 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-interpersonal work	(iv) Non-manual & interpersonal work	(v) Manual & interpersonal 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	36.0	30.0	40.0	40.0	36.0	32.0

[Min, Max]	[17.0, 60.0]	[17.0, 50.0]	[18.0, 60.0]	[17.0, 60.0]	[17.0, 60.0]	[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

^aIf 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]

^aBold 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-interpersonal work	(iv) Non-manual & interpersonal work	(v) Manual & interpersonal 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 (0.5)
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

^aIf 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]

^aBold 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-interpersonal work	(iv) Non-manual & interpersonal work	(v) Manual & interpersonal 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]

^aBold font indicates 95% CI's not containing 0.