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ORIGINAL ARTICLE

Do psychosocial job demands and job resources predict long-term sickness absence? An analysis of register-based outcomes using pooled data on 39,408 individuals in four occupational groups

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Abstract
Purpose To investigate whether psychosocial job demands (work pace and quantitative demands) and job resources (influence at work and quality of leadership) predict long-term sickness absence (LTSA) for more than three consecutive weeks in four occupational groups.
Methods Survey data pooling 39,408 respondents were fitted to a national register containing information on payments of sickness absence compensation. Using multi-adjusted Cox regression, respondents were followed for an 18-month follow-up period to assess risk of LTSA.
Results In the entire study population, low and medium levels of influence at work and low quality of leadership predicted a significantly increased risk of LTSA, whereas medium levels of quantitative demands predicted a significantly reduced risk of LTSA. For employees working with clients and for office workers, low and medium influence at work associated with a significantly increased risk of LTSA. For employees working with clients, low quality of leadership predicted a significantly increased risk of LTSA. For manual workers, low influence at work predicted a significantly increased risk of LTSA and medium quantitative demands were associated with a significantly reduced risk of LTSA. For employees working with customers, medium quantitative demands predicted a significantly reduced risk of LTSA. Finally, in predicting LTSA, we found significant interaction effects between job demands and job resources.
Conclusions The study indicates that a lack of job resources—particularly influence at work—are more important predictors of LTSA than high job demands.

Keywords Epidemiology · Job demands-resources model · Longitudinal analysis · Occupational health · Psychosocial work environment · Register data

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Background and objectives

It appears commonplace to suggest a link between psychosocial work conditions and sickness absence, as abundant empirical evidence affirms this association on both self-reported and registered cases of sickness absence (Christensen et al. 2005; Nielsen et al. 2004, 2006; Rugulies et al. 2007; Lund et al. 2005; Clausen et al. 2012; Borritz et al. 2010; Gimeno et al. 2004; Head et al. 2006; Lidwall and Marklund 2006). Over the coming decades, most western societies are faced with the prospect of ageing populations as working-aged strata will be in decline relative to the proportion of citizens who have retired from the labour market (Nordic Council of Ministers 2008). One possibility of increasing labour supply may be to reduce long-term sickness absence (LTSA). Prevention of LTSA also assumes importance as LTSA significantly increases risk of permanent labour market exit (Lund et al. 2008).

Most of the studies on the association between psychosocial work conditions and risk of sickness absence are based on the study populations that are representative of general working populations (Christensen et al. 2005; Lund et al. 2005; Nielsen et al. 2004, 2006; Head et al. 2006) or

analyse risk of sickness absence among more narrowly defined populations, as for instance professional groups (Rugulies et al. 2007; Clausen et al. 2012; Borritz et al. 2010). It could be argued, however, that different aspects of the psychosocial work environment are important in predicting sickness absence in different occupational groups, as different occupational groups may be characterised by differing configurations of job demands and job resources in their psychosocial work environment (Bakker and Demerouti 2007). Accordingly, it is important to identify predictors of LTSA in different occupational groups, to enhance the possibilities of preventing LTSA with preventive strategies targeted towards specific occupational groups.

The Job Demands-Resource model (JD-R) (Bakker and Demerouti 2007; Schaufeli and Bakker 2004) may contribute towards understanding associations between psychosocial work conditions and LTSA. According to the JD-R model, specific occupations are characterised by specific configurations of psychosocial job demands and job resources (Bakker and Demerouti 2007). Schaufeli and Bakker (2004) describe job demands as 'those aspects of the job that require sustained physical and/or psychological (i.e. cognitive or emotional) effort and are, therefore, associated with certain physiological and/or psychological costs' and job resources as the aspects of the job that '(1) reduce job demands and the associated physiological and psychological costs, (2) are functional in achieving work goals [and/or] (3) stimulate personal growth, learning and development' (p. 296). On the basis of the JD-R model, we expect that high job demands and low job resources will be associated with an increased risk of LTSA.

The JD-R model furthermore implies an interaction between job demands and job resources as job resources are expected to 'reduce job demands and the associated physiological and psychological costs'. Such an interaction is also expected by the conservation of resources (COR) theory (Hobfoll 2001, 2002) that states that the ability of individuals to cope with situational demands in, e.g., the work situation depends on the resources that the individual has at his/her disposal. To test this proposition of the JD-R model, we will investigate interaction between the two job demands and the two job resources that are investigated in this study.

The aim of the present study is, therefore, to investigate whether two psychosocial job demands—work pace and quantitative demands—and two psychosocial job resources—influence at work and quality of leadership—predict risk of LTSA for more than three consecutive weeks in four different occupational groups—employees working with customers, employees working with clients (in health care, educational institutions, child care, etc.), office workers and manual workers. It will also be investigated whether it is possible to identify interaction effects between job demands and job resources. The study provides new knowledge on three counts by (a) investigating whether psychosocial job demands and job resources are differentially associated with risk of LTSA across four different occupational groups, (b) by providing a detailed analysis of the impact of specific job demands and job resources on onset of LTSA as registered in a national register on sickness absence compensation (DREAM) and (c) by providing analysis on interactions between job demands and job resources in predicting LTSA.

Methods

The present study is based on data from a synthesis of five existing Danish surveys that were merged with the Danish DREAM register that contains information on all social transfer payments in Denmark—including sickness absence compensation. The five existing surveys were as follows: Project on Burnout, Motivation and Job Satisfaction [PUMA-I ($N = 1{,}797$), PUMA-II ($N = 1{,}638$), PUMA-III ($N = 1{,}606$) (Borritz et al. 2006)]; The Danish Work Environment Cohort Study [DWECS-2000 ($N = 5{,}552$), DWECS-2005 ($N = 8{,}589$) (Feveile et al. 2007; Burr et al. 2003)]; The Copenhagen Psychosocial Questionnaire Study [COPSOQ-I ($N = 1{,}722$) (Kristensen et al. 2005), COPSOQ-II ($N = 4{,}491$) (Pejtersen et al. 2010)]; Social and Health Care Study [SOSU-I ($N = 9{,}405$), SOSU-II ($N = 9{,}485$), SOSU-III ($N = 7{,}910$) (Clausen and Borg 2011)]; and Nursing: Work Environment, Wellbeing and Health [SATH-I ($N = 4{,}364$) (Wethje and Borg 2003), SATH-II (4,743) (Wethje and Borg 2008)].

All studies aimed at conducting thorough investigations of associations between psychosocial work conditions, health and well-being. The COPSOQ and DWECS studies were drawn randomly from the Danish working-age population, whereas the PUMA and SOSU studies investigated all employees in specific workplaces in the human service sector. Finally, in the SATH study, all registered nurses in Denmark were eligible for participation. All studies were open cohort studies and were conducted between 1997 (COPSOQ-I) and 2008 (SOSU-III). Response rates varied between 60 per cent (COPSOQ-II) and 80 per cent (PUMA-I). In this study, we analyse first responses from participants in the original surveys to investigate risk of LTSA as registered in the DREAM register (Hjollund et al. 2007).

The pooled data contain response from 39,408 individual respondents. Respondents were subdivided into four mutually exclusive occupational groups (working with customers, working with clients, office workers and manual workers) based on the information on job titles from the original data sets.

Outcome: long-term sickness absence

Long-term sickness absence was measured in the DREAM register on social transfer payments and was defined as three or more consecutive weeks of absence in the 18-month follow-up period that started upon completion of the individual surveys that were pooled for the present analyses.

Predictors and covariates

Influence at work was measured using a four-item scale from the COPSOQ (Kristensen et al. 2005; Pejtersen et al. 2010). Sample item: 'Do you have a large degree of influence concerning your work?' Cronbach's alpha: 0.78. *Quality of leadership* was measured using a four-item scale from COPSOQ. Sample item: 'To what extent would you say that your immediate superior gives high priority to job satisfaction? Cronbach's alpha: 0.89. *Work pace* was measured using a single-item from COPSOQ: 'Is it necessary for you to work very fast?' *Quantitative demands* were measured using a single-item from COPSOQ: 'How often does it happen that you do not have the time to complete your work tasks?' Work pace and quantitative demands were assessed with single-items as these two single-items were the only indicators of work pace and quantitative demands that were represented in all five data sets that were pooled for this study. However, these two single-items show satisfactory test–retest reliability for single-item measures (intraclass correlation = 0.67 for both items, unpublished data). As stated above, the present study is based on five existing cohort studies. All the studies (PUMA-I, PUMA-II, PUMA-III, DWECS-2000, DWECS-2005, SOSU-I, SOSU-II, SOSU-III, SATH-I, SATH-II, COPSOQ-I and COPSOQ-II) used the same questions from COPSOQ (Kristensen et al. 2005; Pejtersen et al. 2010) to measure the four predictors described above.

Response was scored on five-point Likert scales. Scales and single-items were scored from 0 to 100 with 100, representing the highest degree of the measured dimension of the work environment. Subsequently, the scales measuring influence at work and quality of leadership were divided into three levels: the first level approximately consisted of the lower quartile, the second level approximately consisted of the two middle quartiles, and the third level approximately consisted of the upper quartile. The two single-items were also divided into three levels: the highest level consisted of the two response categories that were in highest agreement with the item, the middle level consisted of the middle response category, and the lowest level consisted of the two response categories in least agreement with the item.

The smoking status of the respondent was measured by self-reports, and response options were 'current smoker', 'ex-smoker' and 'never smoker'. Age and gender of respondents were derived from register data. Finally, analyses were adjusted for the mode of interviewing that was deployed in the surveys that were pooled for this study—face-to-face interview, telephone interview, postal questionnaires and internet questionnaires.

Statistical analysis

To investigate the impact of job demands and job resources on risk of LTSA during follow-up, data were analysed using Cox proportional hazards model. Hazard ratios (HR) and 95 % confidence intervals (95 % CI) were calculated. The risk time was calculated as time from answering the questionnaire until first onset of sickness absence or end of the 18-month follow-up period. Respondents who were sickness absent at the baseline were excluded from the study. Respondents who emigrated, retired or died during follow-up were censored from the study. The analyses were cumulatively adjusted in two steps. In the first step, we adjusted for age, gender, smoking status and mode of interviewing. In the second step, we additionally adjusted for influence at work, leadership quality, work pace and quantitative demands. We also adjusted for random effects from original studies by stratifying models for the original study, and this approach also takes clustering in the original studies into account (Katsahian et al. 2008; Madsen et al. 2011). To test for interaction effects, the relevant scales were simultaneously entered into our explanatory models in conjunction with an interaction term consisting of the two scales multiplied with each other, while adjusting for potential confounders. To investigate whether associations between job demands, job resources and LTSA varied significantly between occupational groups, we conducted interaction analyses in which each occupational group was coded as a 'dummy' variable (e.g. manual workers vs. other respondents) that was multiplied with the predictor variable while the predictor and the 'dummy' variables were also entered into the analysis. In the analyses, we investigate interactions between four predictors and four occupational groups, which implies that we investigate 16 associations for possible interactions. Data were analysed using SAS 9.2 (SAS Institute Inc., Cary, NC, USA).

Results

Of the 39,408 respondents in this study, 5,164 (13 per cent) recorded a sickness absence period of three or more consecutive weeks during the 18-month follow-up period.

Table 1 Descriptive statistic for main study variables for the entire study population and four occupational groups

	Entire study population	Working with customers	Working with clients	Office workers	Manual workers
Observations (N/percent)	39,408/100.0	2,104/5.3	25,718/65.3	5.521/14.0	6,065/15.4
Long-term sickness absence (events/percent)	5,164/13.1	167/7.9	3,882/15.1	404/7.3	711/11.7
Quality of leadership [mean (SD)]	56.4 (22.0)	57.8 (23.4)	56.3 (22.0)	58.2 (21.1)	55.1 (22.1)
Influence at work [mean (SD)]	48.5 (22.4)	48.4 (26.2)	48.0 (21.2)	54.7 (22.6)	45.7 (25.1)
Work pace [mean (SD)]	62.4 (22.1)	63.2 (23.6)	62.9 (21.4)	63.6 (22.1)	58.5 (24.4)
Quantitative demands [mean (SD)]	36.8 (26.0)	30.4 (26.5)	37.0 (25.5)	46.0 (26.9)	29.9 (25.0)
Age [mean (SD)]	41.9 (10.8)	35.1 (11.6)	42.3 (10.5)	42.9 (10.2)	41.4 (11.5)
Female gender (percent)	78.9	55.2	89.6	62.7	43.5
Smoking status (percent)					
Current smoker	32.5	34.7	32.2	27.1	37.7
Ex-smoker	25.7	21.6	26.4	26.9	23.0
Never smoker	41.8	43.8	41.4	46.0	39.2
Mode of interviewing (percent)					
Telephone	16.1	48.5	7.3	28.3	35.8
Face-to-face	0.7	1.9	0.4	1.0	1.7
Postal questionnaire	75.8	31.0	88.2	56.8	48.6
Internet	7.5	18.6	4.1	13.9	13.9

Table 1 shows that the rates of LTSA varied considerably between the four occupational groups with the highest prevalence among employees working with clients and the lowest among office workers.

Table 2 shows associations between psychosocial work conditions and risk of LTSA in the entire study population and in the four occupational groups. When looking at the entire study population, low influence at work, medium influence at work and low quality of leadership were associated with a significantly increased risk of LTSA and medium quantitative demands significantly reduced the risk of LTSA during follow-up. For employees working with customers, we found a significantly reduced risk of LTSA for respondents with medium quantitative demands in model 2 (adjusted for age, gender, smoking status, mode of interviewing and other job demands and resources), but not in model 1 (adjusted for age, gender, smoking status and mode of interviewing). For employees working with customers, we found an increased risk of LTSA for respondents with high work pace, but this association became insignificant in model 2. For employees working with clients, we observed a significantly increased risk of LTSA for respondents with low and medium influence at work and low quality of leadership. In office workers, we found a significantly increased risk of LTSA for respondents with low influence at work and low quality of leadership also associated with increased risk of LTSA in model 1, but not in model 2. Finally, for manual workers, we found that low influence at work was associated with an increased risk of LTSA, whereas medium quantitative demands predicted significantly reduced risk of LTSA.

Table 3 shows interaction effects between the two job demands (work pace and quantitative demands) and job resources (influence at work and quality of leadership). In predicting LTSA during follow-up, Table 3 shows a significant interaction effect between influence at work and quantitative demands ($p = 0.0059$) and this interaction effect was also replicated in the occupational groups working with customers ($p = 0.0119$) and clients ($p = 0.0320$). For office workers, we found a borderline significant interaction effect between quality of leadership and work pace ($p = 0.0470$).

We also investigated interaction effects between occupational group and the four predictors in predicting LTSA. However, of 16 possible combinations, only two were statistically significant. Accordingly, the results showed that quantitative demands interacted significantly with occupational group as we observed a significantly different association between quantitative demands and risk of LTSA for office workers when compared to the other groups ($p = 0.0102$). Results furthermore indicate that work pace interacted significantly with occupational group as we observed a significantly different association between work pace and risk of LTSA for employees working with customers when compared to the other occupational groups ($p = 0.0166$) (results not shown in tables).

Table 2 Hazard ratios (HR) and 95 % confidence intervals (95 % CI) for onset of long-term sickness absence during the 18-month follow-up for low, medium and high levels of quantitative demands, work pace, influence at work and quality of leadership for the entire study population and four occupational groups

	Risk of LTSA for 3 weeks			
	Model 1[a]		Model 2[b]	
	HR	|95 % CI|	HR	|95 % CI|
All respondents[c]				
Quantitative demands				
High	0.94	|0.88–1.00|	0.92	|0.85–1.00|
Medium	0.96	|0.89–1.04|	0.92	|0.86–0.98|
Low	1	Reference	1	Reference
Work pace				
High	1.12	|1.02–1.23|	1.10	|0.99–1.23|
Medium	1.00	|0.90–1.10|	0.99	|0.89–1.10|
Low	1	Reference	1	Reference
Influence				
Low	1.39	|1.28–1.51|	1.31	|1.20–1.43|
Medium	1.14	|1.06–1.23|	1.13	|1.04–1.22|
High	1	Reference	1	Reference
Quality of leadership				
Low	1.21	|1.13–1.31|	1.13	|1.04–1.22|
Medium	1.03	|0.96–1.10|	0.99	|0.92–1.07|
High	1	Reference	1	Reference
Working with customers				
Quantitative demands				
High	0.64	|0.42–0.99|	0.81	|0.49–1.32|
Medium	0.75	|0.47–1.20|	0.55	|0.33–0.92|
Low	1	Reference	1	Reference
Work pace				
High	1.92	|1.12–3.32|	1.72	|0.96–3.15|
Medium	1.14	|0.63–2.05|	0.79	|0.41–1.52|
Low	1	Reference	1	Reference
Influence				
Low	1.14	|0.77–1.69|	1.23	|0.77–1.94|
Medium	0.98	|0.68–1.41|	1.12	|0.73–1.72|
High	1	Reference	1	Reference
Quality of leadership				
Low	0.79	|0.51–1.22|	0.72	|0.45–1.13|
Medium	0.77	|0.52–1.14|	0.78	|0.52–1.17|
High	1	Reference	1	Reference
Working with clients				
Quantitative demands				
High	0.98	|090–1.07|	0.94	|085–1.03|
Medium	0.96	|0.89–1.03|	0.95	|088–1.02|
Low	1	Reference	1	Reference
Work pace				
High	1.06	|0.95–1.19|	1.04	|0.92–1.17|
Medium	0.97	|0.87–1.10|	0.97	|0.86–1.09|
Low	1	Reference	1	Reference
Influence				
Low	1.40	|1.27–1.54|	1.31	|1.18–1.45|
Medium	1.16	|1.06–1.26|	1.13	|1.03–1.24|
High	1	Reference	1	Reference
Quality of leadership				
Low	1.22	|1.12–1.33|	1.15	|1.05–1.25|
Medium	1.06	|0.97–1.15|	1.02	|0.94–1.11|
High	1	Reference	1	Reference
White collar workers				
Quantitative demands				
High	1.07	|0.83–1.37|	0.95	|0.72–1.26|
Medium	1.15	|0.90–1.47|	1.07	|0.82–1.40|
Low	1	Reference	1	Reference
Work pace				
High	1.24	|0.89–1.73|	1.57	|0.96–2.56|
Medium	0.99	|0.70–1.41|	1.25	|0.76–2.06|
Low	1	Reference	1	Reference
Influence				
Low	1.59	|1.20–2.10|	1.53	|1.13–2.09|
Medium	1.10	|0.87–1.40|	1.13	|0.87–1.47|
High	1	Reference	1	Reference
Quality of leadership				
Low	1.36	|1.01–1.82|	1.22	|0.90–1.66|
Medium	1.10	|0.84–1.44|	1.05	|0.80–1.38|
High	1	Reference	1	Reference
Blue collar workers				
Quantitative demands				
High	0.90	|0.70–1.14|	0.88	|0.68–1.14|
Medium	0.80	|0.66–0.98|	0.76	|0.62–0.93|
Low	1	Reference	1	Reference
Work pace				
High	1.21	|0.97–1.50|	1.24	|0.97–1.59|
Medium	1.06	|0.85–1.33|	1.07	|0.83–1.38|
Low	1	Reference	1	Reference
Influence				
Low	1.37	|1.11–1.68|	1.29	|1.03–1.61|
Medium	1.17	|0.96–1.43|	1.15	|0.93–1.43|
High	1	Reference	1	Reference
Quality of leadership				
Low	1.16	|0.94–1.43|	1.09	|0.87–1.35|
Medium	0.88	|0.72–1.07|	0.84	|0.69–1.03|
High	1	Reference	1	Reference

All estimates are adjusted for random effects from the original surveys that the pooled data are based upon

[a] Model 1: Hazard ratios are adjusted for age, gender, smoking status and mode of interviewing

[b] Model 2: plus mutual adjustment for psychosocial work conditions

[c] Model 3: plus adjustment for occupational group

Discussion

The aim of the present study was to investigate whether psychosocial job demands (work pace and quantitative

Table 3 Results from analysis of interaction between job demands and job resources in predicting risk of long-term sickness absence in the entire study population and four occupational groups

	Interaction term	χ^2	*P* value
All respondents[a]	Influence at work*Quantitative demands	7.58	0.0059
	Influence at work*Work pace	0.67	0.4123
	Quality of leadership*Quantitative demands	3.06	0.0804
	Quality of leadership*Work pace	1.53	0.2166
Working with customers	Influence at work*Quantitative demands	6.32	0.0119
	Influence at work*Work pace	1.68	0.1947
	Quality of leadership*Quantitative demands	2.17	0.1410
	Quality of leadership*Work pace	0.02	0.8864
Working with clients	Influence at work*Quantitative demands	4.60	0.0320
	Influence at work*Work pace	0.52	0.4726
	Quality of leadership*Quantitative demands	1.42	0.2338
	Quality of leadership*Work pace	0.04	0.8322
Office workers	Influence at work*Quantitative demands	0.43	0.5144
	Influence at work*Work pace	0.04	0.8508
	Quality of leadership*Quantitative demands	3.02	0.0822
	Quality of leadership*Work pace	3.95	0.0470
Manual workers	Influence at work*Quantitative demands	0.14	0.7076
	Influence at work*Work pace	0.64	0.4230
	Quality of leadership*Quantitative demands	0.51	0.4730
	Quality of leadership*Work pace	0.36	0.2430

Adjusted for age, gender, mode of interviewing and the individual scales that make up the interaction term. Estimates are furthermore adjusted for random effects from the original surveys that the pooled data are based upon

[a] Adjusted for occupational group

demands) and psychosocial job resources (influence at work and quality of leadership) predicted risk of LTSA in four occupational groups. The main finding of the study was that low influence at work and medium influence at work were associated with increased risk of LTSA for more than three consecutive weeks during the 18-month follow-up period. The results further demonstrated significant interaction effects, which support the expectations of the JD-R model that the availability of job resources may have a bearing on associations between psychosocial job demands and risk of LTSA.

The most remarkable finding of the study was the strong association between the job resource 'influence at work' and risk of LTSA. The association between influence at work and risk of LTSA manifested itself in the entire study population and in all occupational groups except employees working with customers. For office workers and for employees working with clients, the results showed that employees with low and medium levels of influence had a significantly higher risk of LTSA than employees with high levels of influence at work. The results therefore suggest that being able to exert influence on central aspects of one's work situation is important to well-being at work and for risk of sickness absence. According to Keyes (2007), the psychological well-being of individuals is dependent on the satisfaction of basic psychological and social needs—for instance feelings of competence and autonomy. A work situation in which these needs are not satisfied may therefore imply a risk of degradation of psychological resources, which may lead towards reduced psychological well-being and, ultimately, sickness absence for extended periods. The importance of influence at work is underlined by studies that have demonstrated longitudinal associations between low levels of influence at work and increased risk of LTSA (Clausen et al. 2012; Rugulies et al. 2007; Lund et al. 2005), disability pensioning (Christensen et al. 2008; Robroek et al. 2012), coronary heart disease (Kivimäki et al. 2013) and musculoskeletal disorders (Hauke et al. 2011; Clausen 2013). Regarding the associations between quality of leadership and risk of LTSA, the results show that low quality of leadership is associated with increased risk of LTSA among employees working with clients and office workers—however, for office workers, this association became non-significant in the fully adjusted model.

Looking at the psychosocial job demands, the results only offered weak support for the expectations of the JD-R model that high job demands would predict adverse outcomes. High work pace only was found to predict increased risk of LTSA in the overall study population (model 1). The investigation of quantitative demands also offered mixed evidence as the results indicate that medium and high quantitative demands were associated with a reduced risk of LTSA, when compared to low quantitative demands. This finding counters the expectations of the JD-R model and may be explained with reference to Podsakoff et al.'s (2007) distinction between hindrance stressors and challenge stressors. In this case, quantitative demands can be considered challenge stressors that activate and energise

employees, which again may contribute towards increasing motivation (Deci and Ryan 1985), work-related well-being (Csikszentmihalyi 2000; Nakamura and Csikszentmihalyi 2005) and, hence, decrease the risk of LTSA.

According to the COR theory, resources are seen as playing a key role in the association between human agency and environmental stimuli. In the work context, for instance, psychological resources affect employee health and well-being through the ability of the employee to adapt to and cope with the stresses and strains experienced in the work situation (Hobfoll 2001, 2002). For instance, if a worker experiences influence at work or good relations to colleagues or managers, it may be easier to cope with high job demands than if the employee did not harbour any positive emotions towards the work context. The analyses of interaction effects in the present study do indeed support the propositions of the COR theory, as we observed significant interaction effects between influence at work and quantitative demands among employees working with customers and employees working with clients. We also observed a significant interaction between quality of leadership and work pace for office workers. These findings imply that the availability of resources in the psychosocial work environment has an impact on the ability of the individual to cope with high job demands. This finding also supports the propositions of the Job Demands-Resource model (Bakker and Demerouti 2007; Schaufeli and Bakker 2004).

Finally, we observed both similarities and differences between the four occupational groups that were investigated. The analysis showed significant interaction effects between occupational group and predictors in predicting LTSA, and these findings imply that the associations between predictors and LTSA are differing significantly across occupational groups in some instances. However, we investigated 16 possible interactions between psychosocial work conditions and occupational group in predicting LTSA and only found significant interactions in two instances. This indicates that the similarities may be more conspicuous than the differences. The observed differences and similarities therefore lend only partial backing to the claims of the JD-R model that different occupational groups are characterised by differing configurations of job demands and job resources in their psychosocial work environment (Bakker and Demerouti 2007).

It is a strength of the present study that it is based on a large data set counting almost 40,000 respondents, which allows us to investigate associations at the occupational group level. It also adds to the credibility of the study that we have measured the outcome—sickness absence—in a national register on payment of sickness absence compensation as this allows us to assess LTSA in a way that is free from the bias of self-reported sickness absence. Another advantage of using registered data on sickness absence is that we thereby avoid the pitfall of common method biases (Podsakoff et al. 2003). Finally, it is a strength of the study that we have censored all observations where the respondent was sickness absent at the baseline.

A limitation of the present study is that we have used pooled data. First, this implies that we have used a data set that has not been designed for the purposes of the present study. Therefore, we are to some extent limited to choose variables for our analyses that are available in all five data sets that were pooled. This also implies that there may be potential confounders that we have been unable to take into account, as for instance mental health, body mass index, physical workload, etc. However, we have been able to adjust our analyses for age, gender and smoking behaviour, which are potential confounders in the investigated associations. Furthermore, by stratifying the analyses by occupational group, we have also to some extent been able to take potential confounding by socioeconomic status into account. It can be considered a particular weakness that the two job demands are measured by single-items. The two items showed satisfactory test–retest reliability for single-item measures; however, additional analyses on data from the COPSOQ-II study (Pejtersen et al. 2010) using multi-item scales to measure quantitative demands and work pace confirm the patterns of the findings of the present study. Second, in our pooled data, the occupational groups are unevenly distributed, as we have many observations from employees working with clients, whereas we have relatively few observations on the employees working with customers. Finally, the surveys that were pooled for the present study span a period of eleven years and it cannot be ruled out that the associations between our predictors and outcomes may vary over time (e.g. Lidwall et al. 2009). While these potential variations must be taken into account in the interpretation of the results, it is important to note that the results of the present study also show which factors in the psychosocial work environment consistently predict LTSA across studies spanning a period of eleven years.

Conclusions

In the present study, we have investigated associations between psychosocial job demands and job resources and risk of long-term sickness absence. The results showed that both job demands and job resources predicted risk of LTSA. Influence at work was the strongest predictor of LTSA, but it was also noteworthy that the strength of the association between influence at work and risk of LTSA varied across the four occupational groups. Overall, the study indicates that the generative characteristics of job resources may be more important predictors for LTSA than

the energy-depleting characteristics of job demands. Strategies for enhancing such job resources in contemporary work settings may be important to promote sustainable work lives over the coming decades.

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Conflict of interest The authors declare that they have no conflict of interests.

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