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Psychosocial Working Conditions and Subsequent Sickness Absence—Effects of Pain and Common Mental Disorders in a Population-Based Swedish Twin Sample

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Objective: To investigate pain and/or common mental disorders (CMDs) in the associations between psychosocial working conditions and sickness absence (SA) while controlling familial confounding. **Methods:** Prospective Prospective twin cohort study included survey data for pain and CMD, register data for SA and psychosocial working conditions. The follow-up from 2005 to 2016 of 28,916 twin individuals for first incident SA spell measured as the main International Classification of Diseases version 10 (ICD-10) diagnosis groups (F00-F99, I00-I99, and M00-M99), or the duration. We used regression models to obtain odds ratio (OR), incidence rate ratio (IRR), or relative risk ratio (RRR) with 95% confidence intervals (CI). **Results:** The covariate adjusted models of 9156 SA spells indicated almost no statistically significant associations between psychosocial working conditions and SA. **Conclusions:** Psychosocial working conditions were not associated with SA while familial confounding could not be ruled out.

Keywords: mental health, pain, psychosocial working conditions, sick leave, stress

Learning Objectives

- Discuss previous evidence on factors affecting associations between psychosocial working conditions and sickness absence (SA), including pain, common mental disorders (CMD), and genetic factors.
- Summarize the new findings on the relationship between psychosocial working conditions and SA, accounting for the effects of pain and CMD.
- Discuss the study implications for efforts to prevent SA.

Chronic diseases such as mental, musculoskeletal, and cardiovascular disorders are known to cause the majority of years lost due to disability.[1] On the other hand, remaining in the work force is important both at individual, workplace, and society levels for economic, wellbeing, and social consequences.[2,3] Sustainable working life can be defined as including both working and living conditions which support people in engaging and remaining in work throughout an extended working life.[4,5] Hence the fit between work disability and the individual characteristics or circumstances would need assessment both in relation to the characteristics of the job and the work environment, and the individual characteristics and circumstances. Psychosocial stressors at

work are common[6] and modifiable,[7] and they have been widely studied in association with sickness absence (SA).[8–12] A recent meta-analysis indicated that psychosocial stressors at work (ie, job demands, job control, and social support) were associated with an increased risk of SA due to mental disorders.[13] Furthermore, pain and common mental disorders (CMDs), including anxiety, and depression, are known to be linked with increased risk of SA.[14–18] However, how pain and/or CMDs might influence the associations between psychosocial working conditions and SA is far less studied, especially in association with SA due to circulatory diagnoses.

Genetic effects are known to underlie pain,[19] CMDs,[20–22] and their mutual associations[19,23–25] as well as to SA[26,27] highlighting the need to control for familial confounding, that is, genetics and shared, mainly childhood, environmental factors in such studies. Earlier research also indicate that genetics may play a role in psychosocial working conditions[28,29] hence it would be important to investigate the associations between psychosocial working conditions and SA controlling for familial factors, which are available in a twin sample. Hence, a study with possibility to utilize co-twin control design with national register data on SA data would be informative while assessing the associations between psychological working conditions and SA, also taking pain and CMDs into consideration.

Another factor of interest is the measure of SA. Studies vary on their definitions of SA both for duration and diagnosis groups,[9–11,16] but also vary their populations of interest, most commonly being focused on specific occupational groups.[9,30] It has been shown that the associations between psychosocial working conditions and SA may vary depending on definition of SA.[13,31]

This study had three aims. First, the aim was to investigate if pain and/or CMDs influence the associations between psychosocial working conditions and first incidence of SA in a population-based sample of twins. Second, we aimed to investigate if associations would differ depending on the duration of the first incident SA spell during follow-up, and third, by the main SA diagnosis group of the spell. Additionally, we investigated the effect of familial factors on these associations.

MATERIAL AND METHODS

This study was based on the data from the Swedish Twin project of Disability pension and Sickness absence (STODS) which is a prospective twin cohort study with survey and national register data.[32]

The sample from STODS was restricted to twins who had responded to the Screening Across the Lifespan Twin study (SALT) telephone interview of the Swedish Twin Registry between January 1998 and March 2003.[33] To the final sample, we included only those with baseline data for psychosocial working conditions, alive and living in Sweden at baseline (N = 28,916). The final sample included twins born 1925 to 1958, 53% women, 2408 complete monozygotic (MZ), and 3252 dizygotic same-sexed (DZ) twin pairs.

Sickness Absence

In Sweden, all citizens are covered by a national social security program and all those 16 years or older having income from work or unemployment benefits are entitled to sickness benefits when they are incapable to work. Eligibility for sickness absence benefits requires a medically confirmed disorder or injury. In this study, SA data had date and diagnosis according to the International Classification of Diseases version 10 (ICD-10)[34] obtained from the National Social Insurance Agency Micro-Data for Analysis of the Social Insurance System (MiDAS). We utilized one SA measure for covariates and three SA measures as outcomes for this study:

- Covariate: Prior SA in 1998 to 2004 was identified for the time from the date of SALT response (between January 1, 1998 and March 31, 2003) until the end of 2004 (December 31) since the diagnoses for SA were available from 2005. We used prior SA in 1998 to 2004 as covariate in our analyses due to the known association between earlier SA and future SA.[35]
- First outcome: First incident SA spell during the follow-up from January 1, 2005 to December 31, 2016 coded SA/no SA was used as an outcome to investigate effects of exposures of interest and covariates on SA.
- Second outcome: The duration (in days) of the first incident SA spell during the follow-up and categorized into categories: 1 to 30 days, 31 to 90 days, 91 to 180 days, and more than or equal to 181 days, or no SA as has been done before.[36]
- Third outcome: The main ICD-10 diagnosis groups of the first incident SA spell during the follow-up based on the frequencies. The groups were F00-F99 (mental and behavioral disorders), I00-I99 (diseases of the circulatory system), and M00-M99 (diseases of the musculoskeletal system and connective tissue). Although there were a few more spells with C00-D48 (neoplasms) and also S00-T98 (injury, poisoning, and certain other consequences of external causes) than I00-I99, we decided to analyze I00-I99 further since I00-I99 would be more susceptible for psychosocial working conditions.[37] However, we report C00-D48 and S00-T98 in the supplemental material, http://links.lww.com/JOM/B62.

The unique 10-digit Swedish identification number of each twin individual was used for linking data. We followed the individuals from January 1, 2005 until December 31, 2016.

Psychosocial Working Conditions

We obtained the information on psychosocial working conditions from the Longitudinal Integration Database for Health Insurance and Labor Market Studies (LISA), Statistics Sweden[38] in 2001 based on the Swedish psychosocial Job Exposure Matrix (JEM).[39] The JEM assigns each Nordic Job Classification (NYK) occupation to an age- and sex-specific mean score (range 1 to 10) for job demands, job control, and social support. However, our data included occupational codes according to Swedish Standard for Occupational Classification (SSYK by Swedish acronym). Therefore, the SSYK occupational codes were translated into NYK (see[40] for a more detailed description of translation of occupational codes). The job demands, job control, and social support scores were used as continuous variables in the statistical analyses and included in the models at the same time to account their mutual effects.

Exposures—Pain and CMD

Data on the main exposures of interest, pain, and CMDs, were available from the SALT[33] interview. Pain was evaluated using a set of three questions for lifetime pain. Three questions were stated for all: (a) the presence of back, shoulder, or neck pain was queried with "Have you been suffering from pain in [then came the list]?" with response yes/no. (b) Back pain was surveyed for sciatica with response yes/no. (c) A question about low back pain (yes/no). As has been done before,[41] we constructed a combined variable on number of pain locations. Those reporting no pain in any of the locations nor sciatica or low back problem were coded into "0." Then all the other categories were combined into yes, having pain at least in one location (one to five pain locations).

For CMDs, major depression was evaluated for lifetime major depression using the WHO's Composite International Diagnostic Interview (CIDI) procedure.[42] Major depression was considered as present if "yes" was responded to the "In your lifetime, have you ever had two weeks or more when you nearly every day felt sad, low, depressed?," and at least four out of eight additional symptoms were identified: lost interest (in general/in hobbies), weight change, trouble falling asleep, feeling tired, trouble concentrating, and/or thoughts about death. Anxiety (current or previous history) as an another part of CMDs was measured by DSM-IV[43] and queried by a yes/no question "Have you had an episode lasting at least a month, in which you felt worried and anxious most of the time?," and at least one out of five additional symptoms was reported: feeling tense, irritable, tired, trouble sleeping, and the combination of being restless and on the edge. CMD (ie, combined major depression and anxiety) was dichotomized into yes/no.

Then we combined pain (yes/no) and CMDs (yes/no) into four categories: 1: no pain and no CMD, 2: pain but no CMD, 3: CMD but no pain, and 4: pain and CMD.

Covariates

Data from Statistics Sweden at the time of SALT included years of education. We also used SALT data on age at the interview occasion, sex, and marital status (single/widow/separated vs married/living with someone) as covariates. Self-rated health (SRH) was assessed using the question: "How would you rate your general health status?" The responses were collapsed into three categories: good (together with excellent), moderate, and poor (fairly poor).[44] Use of painkillers were surveyed and we used the responses yes/no. Furthermore, we included prior SA in 1998 to 2004 as dichotomized yes/no.

The study was approved by the Regional Ethical ReviewBoard in Stockholm (2007/524–31; 2010/1346-32-5; 2017/128-32).

Statistical Analyses

First the descriptive statistics including frequencies and proportions were calculated for the study outcomes. For main exposures of interest and covariates that were continuous variables we calculated means with standard deviation (SD). For the first outcome of this study, we estimated odds ratios (OR) with 95% confidence intervals (CI) by logistic regression models for the associations of psychosocial working conditions, and covariates (age, sex, SRH, prior SA in 1998 to 2004, and education years) with first incident SA spell. All the regression models were stratified for existing pain, CMD, pain, and CMD or none. This was an approach to indicate moderation effects of pain and/or CMD to the associations between psychosocial working conditions and three SA measures. See the directed acyclic graph in the Fig. 1 to describe the used model. Since we assumed adjusting for SRH and prior SA in the same models might lead to over-adjustment, we tested the effect of removing them one by one from the model. The point estimates retained the magnitude and direction, hence we decided to keep both of them in the models. Furthermore, as we expected marital status to affect the results, that was also tested as a covariate but showed no effects on point estimates. Hence, we
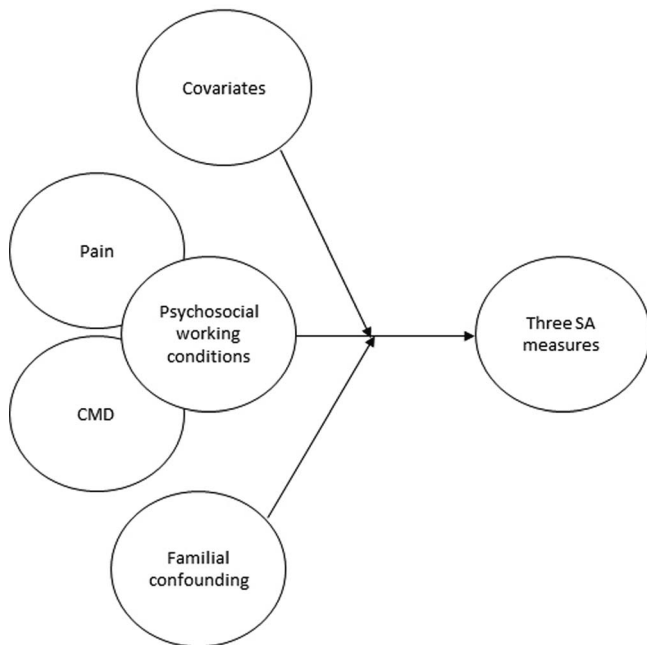
FIGURE 1. The diagram of the analytic model in this study.

decided not include marital status in the reported models. Second outcome was estimated with incident rate ratios (IRR) with 95% CI by Poisson regression model for the associations between psychosocial working conditions and the duration of first incident SA spell. For the third outcome, we applied multinomial regression model (relative risk ratios, RRR with 95% CI) to investigate the associations between psychosocial working conditions and the main diagnosis group of first incident SA spell. Fourth, to assess the role of familial confounding, we applied conditional models to logistic regression and Poisson regression to assess discordant twin pairs for SA and psychosocial working conditions. All statistical analyses were conducted with Stata version 17.0 MP (Stata Corporation, College Station, TX).

RESULTS

The final sample of 28,916 included 9156 first incident SA spells since 2005 until 2016. The descriptive characteristics were similar for those with SA and without, except mean age was lower (50.3 years) among those with SA than those without (59.4 years) (Table 1). The duration of the first incident SA spell was less than or equal to 30 days for 37%, 31 to 90 days for 35%, and the rest were either 91 to 180 days or longer (Table 1). The main diagnosis groups for SA are shown in Table 1.

For the first outcome, the first incident SA, psychosocial working conditions in the model with covariates showed the only significant association for each one-unit decrease in job demands with the risk of SA among those with pain but no CMD (Table 2). While investigating the second outcome, that is, duration of the first incident SA, each one-unit increase in job control was associated with SA among those with only pain, no CMD (Table 3). Adding control on familial confounding to these models (ie, discordant pair analyses) yielded similar estimates in direction and magnitude for the first SA spell. However, for the duration of SA spell, the magnitude of the associations (and statistical significance) increased and some of the associations changed direction (Table 4). This is indicative of familial confounding in the associations between psychosocial working conditions and SA.

The analysis of the third outcome, SA main diagnosis groups, indicated different effects of psychosocial working conditions to the

TABLE 1. Descriptive Characteristics for Those With First Incident SA and Those Without

	First Incident SA (*n* = 9156)		No SA (n = 19,760))	
	n	*%*	*n*	*%*
Duration of first SA spell				
1–30 days	3375	37		
31–90 days	3190	35		
91–180 days	1072	12		
≥181 days	1519	17		
Main diagnosis group of first SA spell				
C00-D48	684	8		
F00-F99	1208	13		
I00-I99	646	7		
M00-M99	2349	26		
S00–T98	1362	15		
All other diagnoses	2349	26		
Missing diagnosis	491	5		
Prior SA in 1998–2004	5119	56	6008	30
Women	5239	57	10,167	51
Use of painkillers (yes)	851	14	1300	14
Self-rated health				
Good	6955	76	14,665	75
Average	1664	18	3506	18
Poor	519	6	1465	7
Pain (yes, at least in one location)	4832	59	6608	52
CMD (yes)	2132	27	2381	20
Combined assessment of pain and CMD				
No pain, no CMD	2496	12	4852	24
Pain, no CMD	3240	16	4894	24
CMD, no pain	765	4	951	5
Pain and CMD	1367	7	1430	7
	Mean	**SD**	**Mean**	**SD**
Age (at the time of SALT)	50.3	4.8	59.4	8.6
Education, yrs	6.9	2.7	6.4	3.1
Job demands (range 1–10, high score is low)	6.4	1.2	6.5	1.3
Job control (range 1–10, high score is high)	6.2	0.7	6.1	0.7
Social support (range 1–10, high score is high)	6.4	0.6	6.4	0.6

risk of SA. For SA due to F00-F99, the ORs were not statistically significant. For SA due to M00-M99, each one-unit decrease of job demands predicted the risk of SA for those with pain but not CMD and for those with CMD but no pain. Each one-unit increase in social support was also associated with SA due to M00-M99 for those with CMD only. On the other hand, each one-unit increase in social support was associated with increased risk of SA due to I00-I99 among those with pain only and with CMD only. One-unit decrease in job demands indicted lower risk of SA due to I00-I99 among those with CMD only (Table 5).

DISCUSSION

This prospective twin study with over 28,000 Swedish twin individuals and comprehensive survey data linked with national registers aimed to investigate three SA outcomes. First, if pain and/or CMDs affect the associations between psychosocial working conditions and first incidence of SA. The second outcome was the duration of the first incident SA spell during follow-up, and the third main SA diagnosis group of the spell. The adjusted models controlled for age, sex, self-rated health, prior SA in 1998 to 2004, and education indicated almost no statistically significant associations between psychosocial working conditions and any of the studied SA measures. This adds

TABLE 2. Logistic Regression (Odds Ratio, OR With 95% Confidence Intervals, CI) for Associations Between Psychosocial Working Environment, Assessed Covariates, and First Incident SA Across Those Who Have No Pain and No CMD or At Least Either or Both

| | First Incident SA (n = 9156) | | | | | | | |
| | No Pain or CMD (n = 2496) | | Only Pain (n = 3240) | | Only CMD (n = 765) | | Both Pain and CMD (n = 1367) | |
	OR	95% CI	OR	95% CI	OR	95%CI	OR	95% CI
Prior SA in 1998–2004	**2.02**	**1.74, 2.34**	**2.11**	**1.84, 2.43**	**1.93**	**1.46, 2.54**	**1.99**	**1.55, 2.54**
Women	**1.36**	**1.13, 1.64**	**1.20**	**1.01, 1.44**	1.02	0.70, 1.48	1.08	0.78, 1.49
Use of painkillers (yes)	0.94	0.77, 1.14	0.97	0.80,1.17	1.10	0.73, 1.67	1.04	0.76, 1.41
Self-rated heath (good as reference)								
Average	**1.41**	**1.11, 1.80**	**1.31**	**1.11, 1.54**	0.98	0.67, 1.43	1.28	0.98, 1.67
Poor	**0.56**	**0.32, 0.98**	0.79	0.57, 1.09	0.88	0.49, 1.60	**0.59**	**0.40, 0.86**
Age (at the time of SALT)	**0.86**	**0.85, 0.87**	**0.84**	**0.83, 0.85**	**0.86**	**0.84, 0.88**	**0.83**	**0.81, 0.85**
Education, yrs	**0.96**	**0.92, 0.99**	**0.96**	**0.94, 0.99**	0.95	0.89, 1.01	1.01	0.97, 1.06
Job demands (range 1–10, high score is low)	0.95	0.85, 1.07	**1.17**	**1.04, 1.31**	1.03	0.82, 1.29	1.11	0.92, 1.33
Job control (range 1–10, high score is high)	0.93	0.87, 1.00	0.98	0.93, 1.05	1.03	0.90, 1.17	0.91	0.82, 1.02
Social support (range 1–10, high score is high)	0.98	0.85, 1.13	1.08	0.94, 1.23	1.31	0.93, 1.77	0.93	0.73, 1.19

Statistically significant point estimates with 95% CI's in boldface.

TABLE 3. Poisson Regression Model (Incidence Rate Ratio, IRR with 95% Confidence Intervals, CI) for the Association Between Psychosocial Working Environment and the Duration of First Incident SA, Among Those Who Have No Pain and No CMD, or At Least Either or Both

| | Duration of First Incident SA (n = 9156) | | | | | | | |
| | No Pain or CMD | | Only Pain | | Only CMD | | Both Pain and CMD | |
	IRR*	95% CI	IRR*	95% CI	IRR*	95% CI	IRR*	95% CI
Job demands (range 1–10, high score is low)	1.05	0.92, 1.20	0.99	0.85, 1.13	1.00	0.79, 1.27	0.85	0.70, 1.04
Job control (range 1–10, high score is high)	1.06	0.98, 1.15	**1.08**	**1.01, 1.16**	1.10	0.95, 1.27	0.99	0.88, 1.12
Social support (range 1–10, high score is high)	0.94	0.81, 1.08	1.07	0.89, 1.28	0.85	0.62, 1.17	0.95	0.76, 1.19

Statistically significant point estimates with 95% CI's in boldface.
*Model adjusted for age, sex, self-rated health, prior SA in 1998–2004 and education.

TABLE 4. Conditional Logistic Regression (Odds Ratio, OR with 95% Confidence Intervals, CI) for Associations Between Psychosocial Working Environment and First Incident SA Across Those Who Have No Pain and No CMD or At Least Either or Both and Conditional Poisson Regression (Incidence Rate Ratio, IRR With 95% CI) for the Duration of First Incident SA Spell

| | First Incident SA (Discordant Twin Pairs n = 2760) | | | | | | | |
| | No Pain or CMD (n = 332) | | Only Pain (n = 389) | | Only CMD (n = 24) | | Both Pain and CMD (n = 51) | |
	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI
Job demands (range 1–10, high score is low)	1.31	0.89, 1.93	1.33	0.92, 1.91	0.90	0.15, 5.31	0.30	0.09, 1.01
Job control (range 1–10, high score is high)	0.83	0.68, 1.02	0.95	0.79, 1.14	1.14	0.40, 3.23	1.11	0.61, 2.02
Social support (range 1–10, high score is high)	0.93	0.58, 1.46	0.90	0.56, 1.43	1.41	0.21, 9.41	4.03	0.94, 17.22
	Duration of First Incident SA							
	IRR	95% CI	IRR	95% CI	IRR	95% CI	IRR	95% CI
Job demands (range 1–10, high score is low)	**0.79**	**0.76, 0.83**	**1.07**	**1.04, 1.12**	**1.78**	**1.54, 2.06**	**0.89**	**0.82, 0.95**
Job control (range 1–10, high score is high)	**0.74**	**0.72, 0.77**	**1.02**	**1.00, 1.04**	**0.46**	**0.42, 0.50**	**1.29**	**1.26, 1.33**
Social support (range 1–10, high score is high)	**1.13**	**1.07, 1.18**	0.97	0.93, 1.01	**1.18**	**1.02, 1.35**	**1.39**	**1.27, 1.52**

Statistically significant point estimates with 95% CI's in boldface.

TABLE 5. Multinomial Logistic Regression (Relative Risk Ratio, RRR, with 95% Confidence Interval, CI) for the Association Between Psychosocial Working Conditions With Sickness Absence Due to the Main Diagnosis Groups

	SA Due to F00-F99							
	No Pain or CMD (*n* = 272)		Only Pain (*n* = 333)		Only CMD (*n* = 162)		Both Pain and CMD (*n* = 240)	
	RRR*	95% CI	RRR*	95% CI	RRR*	95% CI	RRR*	95% CI
Job demands (range 1–10, high score is low)	1.01	0.77, 1.31	0.92	0.72, 1.18	0.95	0.64, 1.40	0.91	0.67, 1.23
Job control (range 1–10, high score is high)	0.98	0.84, 1.15	1.16	0.99, 1.36	1.05	0.81, 1.36	1.12	0.93, 1.35
Social support (range 1–10, high score is high)	1.34	0.93, 1.93	1.15	0.81, 1.63	1.59	0.90, 2.82	0.80	0.54, 1.19
	SA Due to M00-M99							
	No Pain or CMD (*n* = 536)		Only Pain (*n* = 980)		Only CMD (*n* = 161)		Both Pain and CMD (*n* = 345)	
Job demands (range 1–10, high score is low)	1.00	0.81, 1.23	**1.27**	**1.08, 1.53**	**1.58**	**1.06, 2.36**	1.16	0.88, 1.54
Job control (range 1–10, high score is high)	0.99	0.88, 1.11	1.00	0.92, 1.10	1.04	0.85, 1.29	0.89	0.76, 1.04
Social support (range 1–10, high score is high)	1.05	0.81, 2.35	1.13	0.92, 1-39	**1.89**	**1.00, 3.56**	1.09	0.76, 1.56
	SA Due to I00-I99							
	No Pain or CMD (*n* = 212)		Only Pain (*n* = 241)		Only CMD (*n* = 39)		Both Pain and CMD (*n* = 77)	
Job demands (range 1–10, high score is low)	0.85	0.63, 1.13	1.15	0.84, 1.58	**0.85**	**0.45, 1.63**	0.95	0.60, 1.51
Job control (range 1–10, high score is high)	0.93	0.79, 1.10	0.93	0.79, 1.10	0.87	0.63, 1.21	0.98	0.74, 1.29
Social support (range 1–10, high score is high)	0.97	0.69, 1.36	**1.65**	**1.12, 2.41**	**2.02**	**1.01, 4.04**	1.11	0.60, 2.03

Statistically significant point estimates with 95% CI's in boldface.

*Model adjusted for age, sex, self-rated health, prior SA in 1998–2004 and education.

to the earlier results which have yielded mixed results with various SA measures.[9–11,16] Furthermore, we utilized population-based twin cohort which adds to the earlier results based on occupational groups.[9,30] We also assume that our results shed further light to the findings that the associations between psychosocial working conditions and SA may not vary depending on definition of SA,[13,31] but more due to occupational groups, that is, many previous studies have been done on selected populations.

Another specific interest of this study was to investigate the role of pain and/or CMD to the associations between psychosocial working conditions and three different SA measures. Based on the earlier research, we expected them to play a role.[13–18] Only pain seemed to affect the associations, but the effect varied for the different SA measures of this study. For workplaces and potentially also for occupational health care this might be indicative that early detection of pain for prevention of SA might benefit assessing the psychosocial stressors at work for interventions since they are common[6] and modifiable.[7] Although also CMD only showed some effect, we would like to interpret that with caution and to suggest that further studies would be merited to clarify the findings.

Since we utilized data of twin cohort, the design enabled to control the effect of familial confounding on the associations. Only for one of the outcomes, the duration of SA, the results indicate that we cannot rule out the effect of familial confounding in the associations with psychosocial working conditions. The finding was persistent whether pain or CMD existed or co-existed. Although we did not find this effect for the first incident SA, our results provide support for the assumption that genetics may play a role in the associations between psychosocial working conditions and SA. As shown by earlier studies, pain,[19] CMDs[20–22] but also their mutual associations,[19,23–25] SA,[26,27] and psychosocial working conditions,[28,29] all carry a genetic effect raising the expectation that genetics would influence their mutual associations as well, which was partially confirmed by this study.

In this study, we investigated three different measures for SA. Until now such studies have been rare, and most have focused on one measure at the time.[9–11,16] Although various outcome measures may add complexity due to varying regression models, the aim was to clarify if the results would vary between the measures. We assumed that both the diagnosis group for SA and the duration of SA (in which longer duration might reflect more chronic or severe condition) might yield different results. Instead, we found almost no statistically significant associations between psychosocial working conditions and SA. Since we utilized a population-based twin cohort, further studies would be merited to investigate if this finding would remain while accounting for occupational sector or group.

The strengths of this study include comprehensive survey data linked with national registers without loss to follow-up. Furthermore, the register-based SA data is not affected by recall bias, and our large sample size enabled investigation of various groups for pain, CMD, and their combination. The twin sample enabled to control for familial confounding in the association which has rarely been done for SA— although earlier studies for associations between psychosocial working conditions and disability pension based on partially the same data exist.[45–48] Although we utilized the well-documented psychosocial working conditions from the LISA database, Statistics Sweden[38] based on the Swedish psychosocial JEM,[39] these were from 2001. This can be considered as a weakness of this study, although we assume that this rather early (we initiated the follow-up from 2005, ie, 4 years later) evaluation of psychosocial working conditions might dilute our results rather than overestimate them. This may also relate to reverse causation which we cannot fully avoid despite the longitudinal design with exposure and covariate evaluation before first incident SA. Furthermore, although JEM includes occupational sector and we focused on assessing the effects of pain and/or CMD, further studies could confirm the role of occupational groups which was not evaluated in this study. Yet another weakness might be residual confounding, that is, not all influential factors playing a role for psychosocial working conditions, SA, pain, and/or CMD, or the between associations such as physical activity[49] or BMI[50] was controlled for in this study. Hence further studies should address this. In addition, perhaps even larger sample sizes would be needed since despite our more than 28,000 individuals, some of the evaluated pain and/or CMD groups might have lacked power. Since we utilized the Swedish JEM for psychosocial working conditions and utilized twin and register data of

Sweden, our results might be generalizable to the Nordic countries with rather similar welfare society and working life including social benefits for SA but less to other countries.

CONCLUSIONS

Psychosocial working conditions were not consistently associated with SA when measured as first incidence, main diagnosis group, or as duration. Pain and/or CMD had only minor effect to the associations, but familial confounding (ie, genetics and shared environment—mainly in childhood) could not be ruled out. These findings might indicate that the associations between psychosocial working conditions and SA may not vary depending on definition of SA, but more due to other population characteristics as for example occupational groups.

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