Associations of depressive symptoms and psychosocial working conditions with sickness absences in a Finnish cohort of 11,495 employees

Anniina Anttila [a,b,*], Mikko Nuutinen [c], Mark Van Gils [a], Anu Pekki [b], Riitta Sauni [a]

[a] Tampere University, Arvo Ylpön Katu 34, PL 100, 33014 Tampereen yliopisto, Finland
[b] Finla Työterveys, PL 42, 33211 Tampere, Finland
[c] NHG Group Finland, Vattuniemenranta 2, 00210 Helsinki, Finland

ABSTRACT

Objective: To examine the relevance of questions on psychosocial working conditions and depressive symptoms, as used in a screening questionnaire in preventive occupational health care, to predict repetitive short or long sickness absences.

Methods: The participants were 11,495 employees of various occupations in Finnish companies. The data were prospectively collected by one occupational healthcare service provider (Finla) and included register data of sickness absences and responses to a questionnaire used in pre-employment and periodic health examinations between 2011 and 2019. Long sickness absences of > 30 days and repetitive short sickness absences of one to ten days in a 24-month follow-up were used as outcome variables for multiple logistic regression analysis.

Results: Strong associations were found between repetitive short and long sickness absences, and the questions on depressive symptoms "felt hopeless about the future", "felt melancholic", "felt everything was an effort", and "feelings of worthlessness". Among questions on psychosocial working conditions, strong associations were found between sickness absences and questions on decision authority, self-reformation opportunities, job versatility, and appreciation for their work.

Conclusions: Questionnaires on depressive symptoms and psychosocial work environment can help identify patients with an increased risk of sickness absence. Data accumulating in occupational health care should be used more systematically to reduce the risk of work disability through targeted occupational health interventions.

1. Introduction

Work disability causes enormous socioeconomic challenges for the individual and society. Often, the term work disability is used in the context of disability pensions, but prolonged or repetitive sickness absences can also indicate future permanent work disability (Kivimaki, 2004; Leino-Arjas et al., 2021; López-Bueno et al., 2021; Wallman et al., 2009). Reducing work disability has been widely recognized as an important goal across OECD countries (OECD, 2010). A strong increase in the prevalence of depressive symptoms occurred during the COVID-19 pandemic, which stayed elevated in its aftermath in the spring of 2022, when, according to Eurofound's e-survey, approximately 55 % of people across EU countries could be considered at risk of depression (Eurofound, 2020; Oecd, 2022). Correlations between depressive symptoms and long sickness absences have been found in general

working populations in different fields (Bültmann et al., 2006) and among young adults working in the public and private sectors (Narusyte et al., 2022). Common mental disorders, especially depression, are a frequent cause of sickness absence and disability pensions (Lahelma et al., 2015).

Depression can be screened for at health check-ups with different screening questionnaires. Slightly elevated scores in a survey on depressive symptoms, even below the levels of clinical depression, are associated with sickness absences (Hjarsbech et al., 2011). In a Danish study, two questionnaires, the Major Depression Inventory (MDI) and the Mental Health Inventory (MHI-5), had a highly significant prediction capacity of long-term sickness absence, the MHI-5 being somewhat superior to the MDI (Thorsen et al., 2013). Also, single questions in a depression rating scale have been shown to predict long-term sickness absence (Rugulies et al., 2013). In the Finnish Current Care Guidelines of

Depression (Working group set by the Finnish Medical Society Duodecim and the Finnish Psychiatric Society, 2023), the two Whooley questions, which provide high sensitivity and modest specificity in detecting depression (Arroll, 2003; Bosanquet et al., 2015), are recommended for screening depression in primary health care. Other recommended options per the guidelines are the Patient Health Questionnaire, Beck Depression Inventory, and the Finnish Depression Scale (DEPS).

Psychosocial work stressors are associated with depressive symptoms in multiple European studies (Almroth et al., 2021; Madsen et al., 2017; Pohrt et al., 2022; Russo et al., 2019). Psychosocial work environment factors and their effect on work disability have been studied through several different questionnaires and study settings. Low influence, low authority in decision-making, role conflicts, and bullying have been associated with sickness absences of varying lengths in several studies (Rugulies et al., 2010; Thorsen et al., 2021).

Various studies have been conducted on predictors of sickness absences but implementing these results in a real-world setting can be challenging for occupational health physicians and nurses. New tools are needed to recognize individuals with an increased risk of work disability to target occupational health interventions more efficiently. Ideally, this targeting could be accomplished through data constantly accumulating in digital health records and enhanced with a screening questionnaire concise enough to be used repetitively to facilitate not only recognizing individuals at risk but also optimizing timing for interventions in occupational health. This study analyzed questions from an occupational health screening questionnaire on psychosocial working conditions and depressive symptoms. We aimed to recognize a set of effective individual questions and investigate their ability to predict future short repetitive and/or long sickness absences.

2. Study design and settings

The study design was a retrospective analysis of prospectively collected registry data. We had access to the database of one Finnish occupational healthcare service provider (Finla), including responses to the questionnaire used in pre-employment and periodic health examinations and a registry of sickness absence. This study focused on questions concerning depressive symptoms (DEPS) and a questionnaire on psychosocial working conditions. The DEPS questionnaire has been validated and is widely used to screen depressive symptoms in Finland (Poutanen et al., 2010; Salokangas et al., 1995). The questionnaire on psychosocial working conditions has not been validated previously but resembles the Dutch Questionnaire on the Experience and Evaluation of Work (QUEEV), covering 12 of the 19 scales of QUEEV (van Veldhoven et al., 2015) and including the themes of decision latitude, psychological demands, social support, and job insecurity as in Karasek et al.'s (1998) Job Content Questionnaire.

The Finnish data authority (Findata) approved the research plan (THL/1850/14.02.00/2022). Ethics approval was not required for the retrospective registry study with pseudonymized data. Patient information was pseudonymized, and only the members of the research team had access to process and analyze data in a secure closed environment.

The study setting was a real-world study of occupational health care in Finland. In Finland, permanent employees are paid their full salary in the early phase of their sick leave. After ten working days, the employer receives a sickness allowance from Kela (The Social Insurance Institution of Finland). Generally, after one to three months, depending on the collective labor agreement and length of the employment relationship, the employee starts receiving Kela's sickness allowance, and the employer no longer pays the salary. The employee receives Kela's sickness allowance for the same illness for a maximum of one year. If the work disability lasts over a year, the responsibility for paying the benefits is transferred to the pension insurance company. The present study defined the outcomes as sickness absence days within a two-year follow-up after completing the questionnaire.

2.1. Participants

The participants were the employees who used Finla's occupational healthcare services from 2009 to 2021 and completed the questionnaire at least once from 2011 to 2019. Fig. 1 illustrates how participants were selected for the analyses. Altogether, 22,919 completed questionnaires were found in the database, 18,840 of which could be linked to service usage data (e.g., sickness absences). Questionnaires where the response date was not recorded were excluded (N = 334). Other exclusion criteria were as follows: other than first response (N = 4,822); response within two years before COVID-19 restrictions (N = 1,585) to exclude the pandemic's effect on sickness absences; and initial health check within one year before or within three months after completing the questionnaire (N = 604) to exclude patients at the beginning of their employment when sickness absence data from the previous two years would be unavailable. The final number of patients with the completed questionnaire and service use data was N = 11,495. Table 1 presents the subject demographic properties of all patients and the outcome groups.

2.2. Exposure variables

We explored ten depression items (the DEPS questionnaire) and twelve psychosocial work-related exposures from the occupational healthcare questionnaire that were considered factors that could increase the risk of sickness absence (Tables 2 and 3). The response options for depression questions were "Not at all", "To some extent", "Quite a lot", and "Very much". The response options for psychosocial questions were "Agree", "Partially agree", "Partially disagree", and "Disagree". Responders of "Quite a lot" and "Very much" from depression and "Partially disagree" and "Disagree" from psychosocial exposures were combined due to a low number of these responses. Supplementary tables S1–S4 present the prevalence of the responses to the question options.
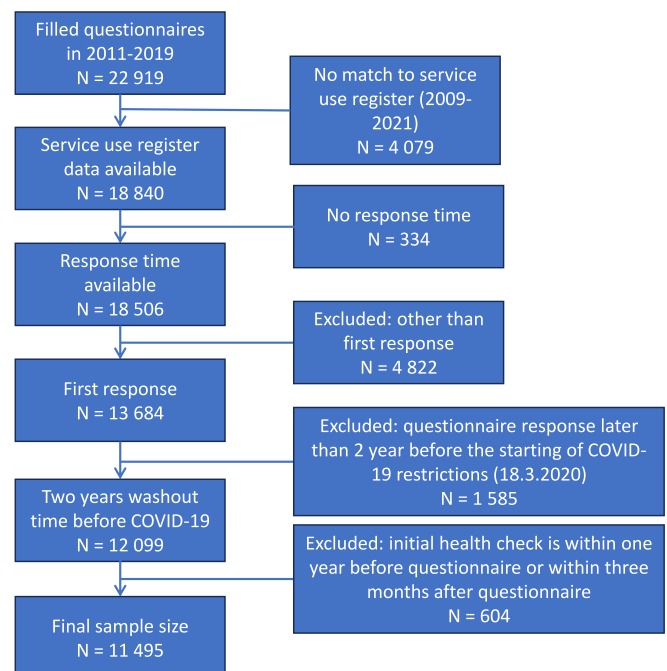
Fig. 1. Study flow in a Finnish occupational health cohort in 2011–2019. Note: For the study we selected employees who filled out the occupational health care questionnaire at least one time from 2011 to 2019 and whose questionnaires could be linked to service usage data. Employees whose responses were later than two years before the onset of COVID-19 restrictions were excluded from the study. Furthermore, employees whose initial health check was carried out within one year before or within three months after responding to the questionnaire were excluded. The final study sample consisted of 11,495 employees.

Table 1

Descriptive statistics of background variables and their distribution in the different outcome groups in a Finnish occupational health cohort in 2011–2019.

Item name	All	Sickness absence 1–10 days periods > 5 (0–24 months)	Sickness absence > 30 days periods > 0 (0–24 months)	P-values
Patients, n	11,495	994	692	
Age*, mean (std)	43.2 (11.3)	39.8 (10.8)	46.99 (10.5)	0<.001
Sex (female)*, n (%)	4878 (42.4)	592 (59.6)	397 (57.4)	0.397
BMI*, mean (std)	26.6 (4.5)	27.24 (5.1)	27.68 (5.1)	0.0831
Smoking (Yes)*, n (%)	2901 (25.2)	357 (35.9)	207 (29.9)	0.0118*
Exercise habits (Yes)*, n (%)	6784 (59.0)	632 (63.6)	407 (58.8)	0.0537
Professional group – Supervisor, n (%)	1987 (17.3)	70 (7.0)	81 (11.7)	0.0013
Professional group – White-collar, n (%)	4995 (43.5)	143 (14.4)	177 (25.6)	0<.001
Professional group – Blue-collar*, n (%)	6128 (53.3)	818 (82.3)	479 (69.2)	0<.001
Shift work*, n (%)	2695 (23.4)	454 (45.7)	239 (34.5)	0<.001
Night work*, n (%)	694 (6.0)	116 (11.7)	54 (7.8)	0.012
Disease makes it difficult to cope at work*, n (%)	1083 (9.4)	154 (15.5)	169 (24.4)	0<.001
Asthma, n (%)	757 (6.6)	86 (8.7)	69 (10.0)	0.4029
Diabetes, n (%)	404 (3.5)	36 (3.6)	50 (7.2)	0.0014
Cardiovascular disease, n (%)	606 (5.3)	55 (5.5)	66 (9.5)	0.0024
Hypertension, n (%)	1463 (12.7)	125 (12.6)	124 (17.9)	0.003
Musculoskeletal disease*, n (%)	1522 (13.2)	164 (16.5)	197 (28.5)	0<.001
Mental illness*, n (%)	709 (6.2)	116 (11.7)	91 (13.2)	0.4034
Insomnia, n (%)	1744 (15.2)	187 (18.8)	156 (22.5)	0.0703
Cancer, n (%)	230 (2.0)	18 (1.8)	33 (4.8)	0<.001
Sickness absence, F diagnosis, 12 months before, n (%)	297 (2.6)	77 (7.8)	48 (6.9)	0.5961
Sickness absence, M diagnosis, 12 months before, n (%)	1678 (14.6)	418 (42.1)	263 (38.0)	0.1063
Sickness absence days, 12 months before*, mean (SD)	6.92 (19.8)	19.2 (29.7)	26.03 (45.2)	0.4773

BMI = Body Mass Index, * = Confounder variables of multiple logistic regression analyses, F-diagnosis = Mental, Behavioral and Neurodevelopmental Disorders in the International Classification of Diseases (ICD-10), M−diagnosis = Diseases of the Musculoskeletal System and Connective Tissue (ICD-10). Statistical differences (p-values) are calculated using the Fisher's exact or Mann-Whitney *U* test for the outcome groups of repetitive short and long sickness absence periods.

For the statistical models, responders of "Not at all" from depression and "Agree" from psychosocial exposures were classified as belonging to the reference classes. Thus, the exposure variables of depression consist of the following categories: 1) not at all (reference); 2) to some extent; 3) quite a lot or very much. The exposure variables of psychosocial exposures consist of the following categories: 1) agree (reference); 2) partially agree; 3) partially disagree or disagree.

Table 2

Ten depression-related questions used as factors that could link to an increased risk of sickness absence in a Finnish occupational health cohort from 2011 to 2019.

Variable short	Sickness absence 1–10 days periods > 5	Sickness absence > 30 days periods > 0
Suffered from insomnia		
disagree	Reference	Reference
partially disagree	0.01 (0.00–0.03)	0.02 (0.01–0.03)
agree, partially agree	0.03 (0.01–0.05)	0.04 (0.03–0.06)
Felt melancholic		
disagree	Reference	Reference
partially disagree	0.01 (−0.01–0.02)	0.02 (0.01–0.03)
agree, partially agree	0.06 (0.04–0.09)	0.06 (0.04–0.08)
Felt everything was an effort		
disagree	Reference	Reference
partially disagree	0.01 (−0.00–0.02)	0.03 (0.02–0.04)
agree, partially agree	0.03 (0.00–0.06)	0.06 (0.05–0.08)
Felt unenergetic		
disagree	Reference	Reference
partially disagree	0.01 (−0.00–0.02)	0.021 (0.01–0.03)
agree, partially agree	0.03 (0.00–0.05)	0.055 (0.04–0.07)
Felt lonely		
disagree	Reference	Reference
partially disagree	0.02 (0.0–0.03)	0.02 (0.00–0.03)
agree, partially agree	0.04 (0.01–0.07)	0.02 (−0.00–0.05)
Felt hopeless about the future		
disagree	Reference	Reference
partially disagree	0.02 (0.00–0.03)	0.03 (0.02–0.04)
agree, partially agree	0.07 (0.03–0.10)	0.07 (0.05–0.09)
Felt impossible to find pleasure in life		
disagree	Reference	Reference
partially disagree	0.02 (−0.00–0.03)	0.03 (0.02–0.04)
agree, partially agree	0.04 (0.00–0.08)	0.06 (0.04–0.09)
Had feelings of worthlessness		
disagree	Reference	Reference
partially disagree	0.03 (0.01–0.04)	0.01 (−0.0–0.03)
agree, partially agree	0.06 (0.02–0.09)	0.05 (0.02–0.08)
Felt all joy has gone from life		
disagree	Reference	Reference
partially disagree	0.02 (0.00–0.04)	0.04 (0.03–0.05)
agree, partially agree	0.02 (−0.03–0.07)	0.05 (0.02–0.08)
Felt that even help from my family and friends cannot ease my melancholy		
disagree	Reference	Reference
partially disagree	0.01 (−0.01–0.03)	0.03 (0.02–0.04)
agree, partially agree	0.05 (0.01–0.09)	0.05 (0.02–0.08)

Columns from left to right present AME values and 95% confidence intervals of the logistic regression models for the following outcomes: five or more short (1–10 days) sickness absences during a two-year follow-up time and one or more long (>30 days) sickness absences during a two-year follow-up time.

2.3. Outcome measures

As registry data on the first ten days of sickness absence is seldom available for studies in a setting of various workplaces and industries, we were interested in including these as outcome variables alongside the more commonly used long sickness absence episodes. We used two binary outcomes: 1) more than five short (one to ten days) sickness absences during a two-year follow-up time and 2) one or more long (>30 days) sickness absences during a two-year follow-up. The follow-up time began on the date of response to the questionnaire. If one to three days

Table 3

Twelve questions related to psychosocial working conditions used as factors that could link to an increased risk of sickness absence in a Finnish occupational health cohort from 2011 to 2019.

Variable short	Sickness absence 1–10 days periods > 5	Sickness absence > 30 days periods > 0
I enjoy my job		
Agree	Reference	Reference
Partially agree	0.03 (0.02–0.04)	−0.00 (−0.01–0.01)
Partially disagree or disagree	0.04 (0.02–0.06)	0.01 (−0.01–0.03)
The mental workload of my job is suitable for me		
Agree	Reference	Reference
Partially agree	0.02 (0.00–0.03)	0.01 (−0.00–0.02)
Partially disagree or disagree	0.04 (0.02–0.05)	0.02 (0.00–0.03)
I am familiar with the expectations and contents of my work tasks		
Agree	Reference	Reference
Partially agree	−0.00 (−0.01–0.01)	0.00 (−0.01–0.01)
Partially disagree or disagree	−0.01 (−0.04–0.02)	0.01 (−0.01–0.03)
My capabilities are in proportion with the demands of my job		
Agree	Reference	Reference
Partially agree	0.00 (−0.01–0.01)	−0.00 (−0.01–0.01)
Partially disagree or disagree	0.02 (−0.01–0.04)	0.01 (−0.01–0.03)
My work is appreciated, and I get praise for a work well done		
Agree	Reference	Reference
Partially agree	0.01 (0.00–0.02)	0.01 (−0.01–0.02)
Partially disagree or disagree	0.04 (0.03–0.05)	0.02 (0.01–0.03)
My job is versatile		
Agree	Reference	Reference
Partially agree	0.02 (0.01–0.04)	−0.00 (−0.01–0.01)
Partially disagree or disagree	0.05 (0.04–0.06)	0.02 (0.01–0.04)
I can influence the contents, pace and hours in my job		
Agree	Reference	Reference
Partially agree	0.03 (0.02–0.05)	0.01 (−0.01–0.02)
Partially disagree or disagree	0.08 (0.07–0.09)	0.04 (0.03–0.05)
I have the possibility of self-reformation at my job		
Agree	Reference	Reference
Partially agree	0.02 (0.00–0.03)	0.01 (0.00–0.02)
Partially disagree or disagree	0.05 (0.03–0.06)	0.03 (0.02–0.05)
I can rely on the continuance of my employment		
Agree	Reference	Reference
Partially agree	0.01 (−0.01–0.02)	−0.01 (−0.02–0.00)
Partially disagree or disagree	0.01 (−0.01–0.02)	0.02 (0.00–0.03)
I face a threat of violence in my job		
Partially disagree or disagree	Reference	Reference
Partially agree	0.03 (0.01–0.05)	0.01 (−0.01–0.03)
Agree	0.02 (−0.01–0.06)	0.02 (−0.00–0.05)
There is a good spirit within our personnel		
Agree	Reference	Reference
Partially agree	0.01 (0.0–0.02)	0.01 (−0.00–0.02)
Partially disagree or disagree	0.03 (0.02–0.05)	0.01 (−0.00–0.02)
I have not witnessed bullying or harassment at our workplace		
Agree	Reference	Reference
Partially agree	0.02 (0.01–0.04)	0.01 (0.00–0.02)
Partially disagree or disagree	0.04 (0.02–0.05)	0.02 (0.01–0.03)

Columns from left to right present AME values and 95% confidence intervals of the logistic regression models for the following outcomes: five or more short (1–10 days) sickness absences during a two-year follow-up time and one or more long (>30 days) sickness absences during a two-year follow-up time.

separated the ending and the beginning of two sickness absences, the episodes were combined into one sickness absence and classified in the outcome groups according to their combined length.

2.4. Potential confounding factors

As confounding factors, we adjusted all analyses for patients' characteristics that have shown evidence of being associated with depression, psychosocial factors, and sickness absence in earlier studies (Hultin et al., 2012; Ropponen et al., 2019; Suur-Uski et al., 2023; Timp et al., 2024; Virtanen et al., 2018). These factors included age, sex, BMI (body mass index), smoking (yes; no), exercise (yes; no), musculoskeletal disease (yes; no), mental illness (yes; no), disease makes coping at work difficult (yes; no), professional group − blue-collar worker (yes; no), shift work (yes; no), night work (yes; no), and sickness absence days (0–12 months before questionnaire). We adjusted all analyses for these characteristics. Supplementary Figure S1 presents the histograms of the confounder factors for the study set.

2.5. Statistical methods

The means and frequencies of the baseline characteristics were used to examine the differences between the four groups of outcomes. Fisher's exact test was used to test the differences in the categorical data between the outcome groups. The Mann–Whitney U test compared sickness absence days between different outcome groups. A t-test was used to compare mean age and BMI between different outcome groups. A p-value of < 0.05 was considered statistically significant. Multiple logistic regression analyses were conducted to estimate the associations between depression and psychosocial factors and outcome measures. Average Marginal Effects (AMEs) and 95 % confidence intervals (CIs) were calculated after adjusting for potential confounders. AME measures how the change from the reference level in question increases (>0) or decreases (<0) an outcome's probability. All analyses were performed using Python (version 3.9.12) and SciPy.stats (version 1.11.4) packages.

3. Results

The final study sample consisted of 11,495 employees who had responded to the questionnaire in 2011–2019 (Fig. 1). Altogether, 8.6 % of the employees belonged to the outcome group of short sickness absences and 6.0 % to the outcome group of long sickness absences. The average age of the employees was 43.2 (SD 11.3; range 16.8–69.8). Of them, 42 % (N = 4878) were female, 17.3 % worked in a supervisor role, 43.5 % worked in a white-collar position, 23.4 % did shift work, and 6.0 % did night work. The most common self-reported diseases in the questionnaire data were insomnia (15.2 %), musculoskeletal disease (13.2 %), and hypertension (12.7 %).

The outcome groups for repetitive short (one to ten days) or long (>30 days) sickness absences differed on several baseline characteristics (Table 1). The mean age of the long sickness absence episode group was significantly higher than that of the short sickness absence episode group (p < 0.001). The feeling that the disease makes coping at work difficult was significantly (p < 0.001) more common in the group with long sickness absences than in those with short sickness absences. Employees in the group with long sickness absences had more frequent diabetes, cardiovascular diseases, hypertension, musculoskeletal disease, and cancer (p < 0.001). In contrast, employees in the groups with short sickness absences were more often in the professional group of blue-collar workers (p < 0.001) and did shift work more often (p < 0.001).

Based on the AME values, hopelessness about the future was the depressive symptom most strongly associated with both repetitive short (0.065 [95 % CI: 0.034–0.0959]), and long (0.068 [95 % CI: 0.046–0.09]) sickness absence periods. Feeling melancholic was also

strongly associated with both outcomes. The feeling that everything was an effort as well as feeling it impossible to find pleasure in life were associated especially with the occurrence of long sickness absence periods. The AME (95 % CI) values for all the exposure variables from the depression questionnaire for the outcomes of short and long sickness absences are presented in Fig. 2 and Table 2. Supplementary Table S5 presents Odds Ratio (95 % Cl) values of these variables and outcomes.

Among the questions on psychosocial working conditions, the lack of influence on the contents, pace and hours in their job stood out as the most strongly associated variable with especially repetitive short, but also long sickness absence episodes. The AME values for this question were 0.079 (95 % CI: 0.065–0.048) and 0.04 (95 % CI: 0.028–0.051), respectively. The experiences of work being monotonous (answers partially disagree or disagree to the question "my job is versatile") and not having possibilities for self-reformation at their job were also among the variables with the strongest association with both outcomes. Fig. 3 and Table 3 present AME (95 % Cl) values for the exposure variables from the psychosocial questionnaire for the outcomes of short and long sickness absences. For this question group, OR (95 % Cl) values can be found in supplementary table S6.

The screening questions on depression were 50 % more strongly associated with long sickness absences than questions on the psychosocial work environment. In fact, in the long sickness absence outcome group, nine out of the ten DEPS questions had a larger AME value than any of the questions on psychosocial work environment. With repetitive short sickness absences, the questions on depressive symptoms had slightly larger AME values than the questions on psychosocial working conditions, but the differences were less prominent. Answering "disagree" or "partially disagree" to having the possibility of influencing the contents, pace, and hours of their job had a higher AME value for short sickness absences than did any of the depression questions.

4. Discussion

In this study, the strongest association with repetitive short and long sickness absences in the 24-month follow-up was found with recipients who answered feeling "quite a lot" or "very much" hopeless about the future in the depression questionnaire. Other questions most strongly associated with long sickness absences were "felt everything was an effort" and "felt melancholic". The other questions most strongly

associated with the short sickness absences were "felt melancholic" and "had feelings of worthlessness". The strongest association of questions on psychosocial working conditions with both outcomes regarded decision authority, learning opportunities, and variability. Higher decision authority has also been associated with fewer sickness absence days (Christensen et al., 2005; Roelen et al., 2009). A lack of learning opportunities has been associated with long mental health-related sickness absence (Van Hoffen et al., 2021), like in our data, where a lack of opportunities for self-reformation correlated with sickness absences for all diagnosis groups.

Various studies have shown the association between depression and sickness absences, but to our knowledge, only a few studies have been performed to assess the potential value of single questions on depression screening tools to predict work disability. Similar to our findings, the study of Danish female eldercare workers found that being sad and in low spirits, lacking energy and strength, and having sleep disturbances predict long-term sickness absence (Rugulies et al., 2013). In our study, sleeping disturbances were not among the four questions most strongly related to sickness absence outcomes but still had statistically significant positive AME values (0.032 [0.012–0.053] and 0.042 [0.026–0.057]).

Employees with long sickness absences had diabetes, hypertension, musculoskeletal disease, and cancer more frequently—all of which have been predictors of work disability (Nyberg et al., 2023). Of these background variables, only the prevalence of musculoskeletal disease was significantly increased in the employees with repetitive short sickness absences, although the impact was much more prominent for the group with long sickness absences. Conversely, shift workers had a high prevalence of repetitive short sickness absences. The prevalence of long sickness absences was also increased among shift workers, but to a much smaller extent. The association between shift work and repetitive short sickness absences has also been reported (Ropponen et al., 2019).

A definite strength of our study setting was having a large real-world dataset where the distribution of different industries was close to the proportions of industries in Finland nationwide (Supplementary Fig. S2). Another strength was having access to sickness absence data from the first day of absence. Sickness absence data in national registries are unavailable for the first ten days of sickness absence before a sickness allowance is granted from the Social Insurance Institution. Therefore, studies where short sickness absences of one to ten days are included are generally limited to settings where the employer's own
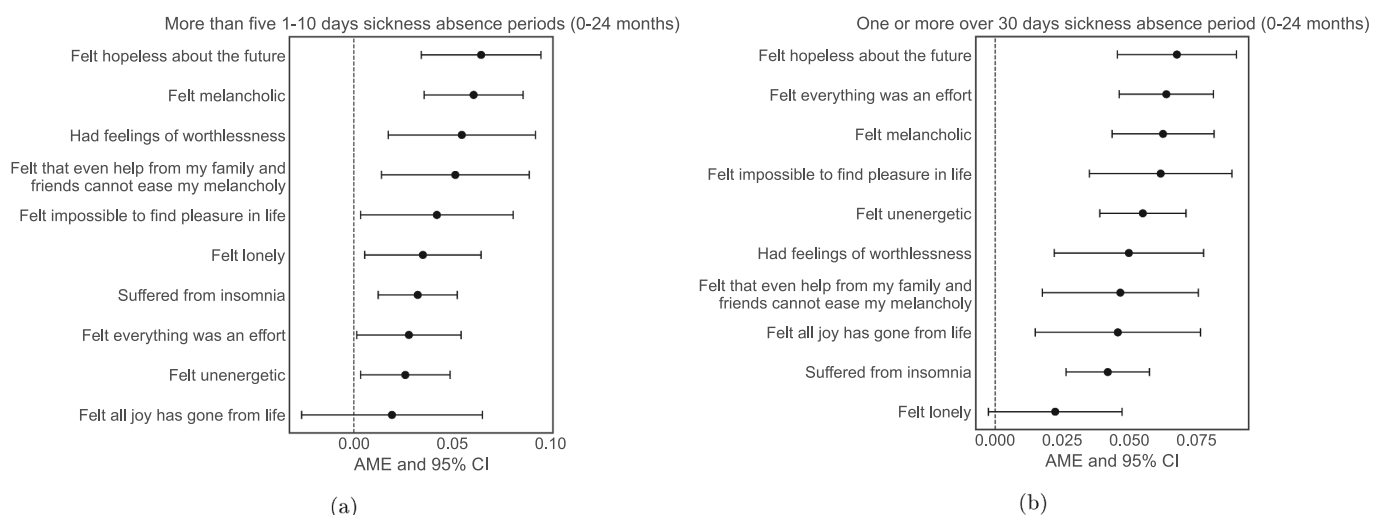
Fig. 2. Associations of exposure questions from a depression questionnaire with repetitive short and long sickness absences in a Finnish occupational health cohort in 2011–2019. Note: Average Marginal Effects (AME) values and 95 % confidence intervals of the logistic regression models of the following outcomes: (a) more than five short (1–10 days) sickness absence episodes during two years follow-up time and (b) one or more long (>30 days) sickness absence episode during two years follow-up time. The models were adjusted by age, gender, BMI (body mass index), smoking (yes; no), exercise (yes; no), musculoskeletal disease (yes; no), mental illness (yes; no), disease makes it difficult to cope at work (yes; no), professional group – worker (yes; no), shift work (yes; no), night work (yes; no), sickness absence days (0–12 months before questionnaire). The exposure questions are sorted by AME values.
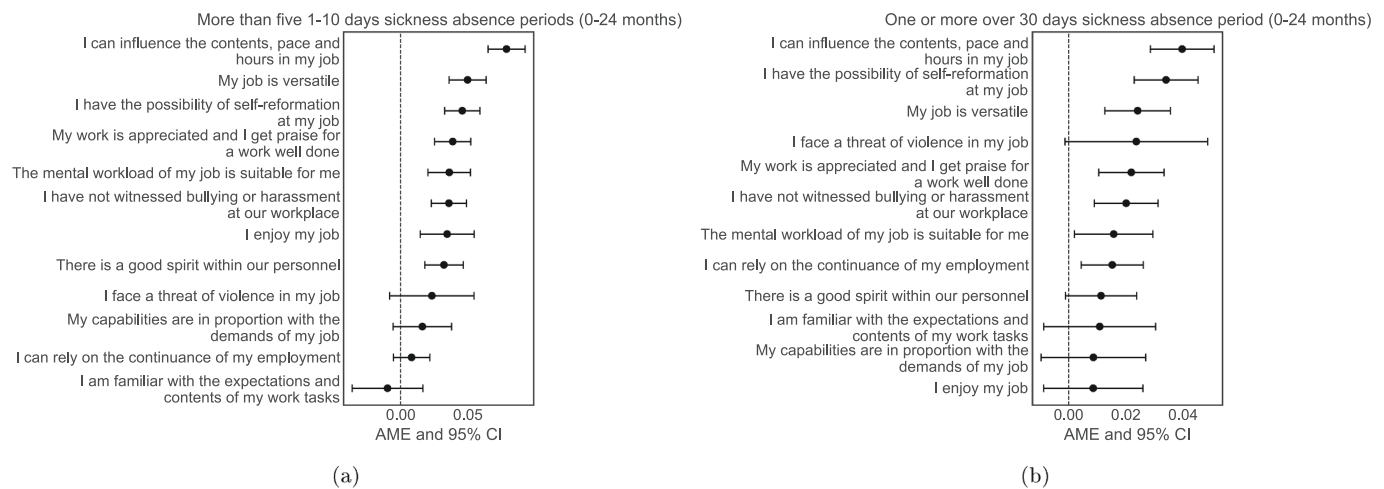
Fig. 3. Associations of exposure questions from a psychosocial questionnaire with repetitive short and long sickness absences in a Finnish occupational health cohort in 2011–2019. Note: Average Marginal Effects (AME) values and 95 % confidence intervals of the logistic regression models of following outcomes: (a) more than five short (1–10 days) sickness absence episodes during two years follow-up time and (b) one or more long (>30 days) sickness absence episode during two years follow-up time. The models were adjusted by age, gender, BMI (body mass index), smoking (yes; no), exercise (yes; no), musculoskeletal disease (yes; no), mental illness (yes; no), disease makes it difficult to cope at work (yes; no), professional group – worker (yes; no), shift work (yes; no), night work (yes; no), sickness absence days (0–12 months before questionnaire). The exposure questions are sorted by AME values.

sickness absence records can be accessed, limiting the generalizability of the results. The correlation between short and long sickness absences has, however, been shown in single-company settings and municipal cohorts such as the Helsinki Health Study comprising approximately 38,000 employees of the city of Helsinki (Harkko et al., 2021; Sumanen et al., 2017). Data on short sickness absences is not widely available, but sickness absences of one to three days accounted for 37 % of all sickness absences in a Danish study (Mathisen et al., 2022). For companies, the expenses of short sickness absence spells are significant, as no financial compensation is available for the lost workdays or reduced productivity.

Our study analyzed questions on depressive symptoms and psychosocial working conditions. The relationship between psychosocial working conditions and mental health-related sickness absences has been studied, but to our knowledge, these have not been combined with questions for screening depression in analyses on the same dataset. Thus, another novelty of our study is the possibility of simultaneously analyzing the associations of both themes with various outcomes on data that is generally available or easily obtained at occupational health services, which could be used more efficiently in targeting occupational health interventions.

Our health survey data was collected between 2011 and 2019. The COVID-19 pandemic affected sickness absences from March 2020 onward in various ways (Grøsland et al., 2023). Living, working, and COVID-19 surveys performed multiple times since April 2020 by Eurofound have demonstrated the pandemic's impact on Europeans' well-being, health, and work-life balance (Eurofound, Publications Office of the European Union, 2020). The increased prevalence of telework and the reorganization of work (Ervasti et al., 2022), among other factors, caused diverse changes to the physical and psychosocial work environment for different employee groups. Because of the inevitable effect of the pandemic on sickness absences, we decided to restrict using sickness absence data in our study to questionnaires completed 24 months (March 18th, 2018) before the onset of COVID-19 restrictions in Finland.

A limitation of our study was that assessing the working status of the study population during follow-up was not possible. Thus, some sick leaves during follow-up after the date of the health survey might be absent from the data for any reason of not being present in the initial employment, such as changing employers, being unemployed, retired, or on parental leave.

Interaction analyses between depressive symptoms and psychosocial

working conditions on sickness absences were not reported in this study. This is an interesting focus for further research.

5. Conclusions

Our results indicate that in a Finnish cohort of 11,495 occupational health patients, answers to certain questions on screening questionnaires regarding depressive symptoms and the psychosocial work environment had predictive value for repetitive short and long sickness absences in a 24-month follow-up. Questionnaires on depressive symptoms and the psychosocial work environment can help target occupational health interventions more efficiently for patients with an increased risk of sickness absence. Composing a shorter questionnaire using only questions with the best predictive value would make a more frequent screening possible, which would optimize the timing of these interventions. At the workplace level, measures aiming to improve the psychosocial work environment could reduce sickness absences and provide financial benefits through a smoother workflow and increased productivity.

Additional information

Contributions: AA, MN, RS, MV, and AP participated in planning the study. MN conducted the statistical analyses. AA, MN, and RS interpreted the results. AA and MN wrote the first draft of the manuscript, and all authors commented on and approved the final manuscript as submitted.

CRediT authorship contribution statement

Anniina Anttila: Writing – original draft, Project administration, Conceptualization. **Mikko Nuutinen:** Writing – original draft, Methodology, Formal analysis. **Mark Van Gils:** Writing – review & editing, Methodology. **Anu Pekki:** Conceptualization. **Riitta Sauni:** Writing –

review & editing, Supervision, Conceptualization.

Declaration of competing interest

The authors declare the following financial interests/personal relationships which may be considered as potential competing interests: The research group (coordinated by Finla Occupational Health) reports financial support was provided by Finnish Work Environment Fund. If there are other authors, they declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability

The data that has been used is confidential.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.pmedr.2024.102899.

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