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Musculoskeletal Health Climate Is a Prognostic Determinant of Sickness Absence Among Female Eldercare Workers

A Prospective Cohort Study

Merete Ajstrup, MSc, Cecilie Rud Budtz, MSc, Kent Jacob Nielsen, PhD, Dorte Raaby Andersen, PhD, Johan Hviid Andersen, PhD, and David Høyrup Christiansen, PhD

Objectives: The present study investigated the association between musculoskeletal health climate, that is, the shared perceptions among workers concerning musculoskeletal health, and sickness absence. **Methods:** Questionnaire data on two domains of musculoskeletal health climate, perceived management priority (PMP) and pain acceptance at work (PAW), were collected at baseline. Data on sickness absence were extracted at 1-year follow-up. Data were analyzed using negative binomial multivariable regression. **Results:** The final study population comprised 390 female eldercare workers. Compared with participants with low PMP scores, participants with high PMP scores had lower risk of sickness absence (incidence rate ratio, 0.6; 95% confidence interval, 0.4–0.9). Participants with high PAW scores had higher risk of sickness absence than participants with low PAW scores (incidence rate ratio, 1.4; 95% confidence interval, 0.9–2.2). **Conclusions:** The results showed an association between the musculoskeletal health climate and sickness absence.

Keywords: musculoskeletal disorders, workplace culture, perceived management priority, work group pain acceptance, pain acceptance at work

Musculoskeletal disorders are a widespread and increasing problem, with approximately 1.71 billion people affected globally.[1] Musculoskeletal disorders cause 25% to 50% of all sickness absences, making them one of the most significant causes of sickness absence.[2,3] Thus, musculoskeletal disorders can have a substantial impact both on the individuals affected and at societal level. In Denmark, costs related to musculoskeletal disorders reach more than €1.3 billion annually,[3] and analyses have estimated that the total annual costs of work-related musculoskeletal disorders in the European Union are in the region of €240 billion.[2] The incidence of musculoskeletal disorders and sickness absence is higher in professions characterized by manual labor and caregiving, such as eldercare.[3–7] Elements of physical work such as lifting, pushing, and pulling heavy loads; excessive repetition; and awkward posture are indicated as risk factors for causing work-related musculoskeletal disorders.[5,8,9] Furthermore, psychosocial factors, such as lack of control, poor influence, and poor social support from management, seem to amplify the effect of physical workloads.[5] Although research has provided knowledge regarding physical and psychosocial risk factors for musculoskeletal disorders and sickness absence, interventions targeting these areas have so far shown limited effect.[10,11]

These findings emphasize the issue's complexity and indicate the importance of addressing multiple aspects of the work environment when exploring the association between musculoskeletal disorders and sickness absence.

One aspect that has received scant attention in relation to musculoskeletal disorders and sickness absence is workplace culture. Previous studies among occupational groups with similar demands in 18 different countries have shown that, even after adjusting for known physical and psychosocial risk factors, such as lifting, working with hands above shoulder height, and job dissatisfaction, an unexplained variation in the prevalence of musculoskeletal disorders between countries remains.[12,13] This variation may affect sickness absence rates, and it is suggested that culturally determined differences in health-related beliefs and behaviors may modify responses to pain.[14] However, research investigating the consequences of differences in workplace culture in the musculoskeletal area is limited, although the importance of workplace culture is widely recognized in other areas, such as workplace accidents.[15,16] The culture of a group at a workplace can be defined as the group's accumulated shared learning as it solves its problems of external adaptation and internal integration, which has worked well enough to be considered valid and, therefore, is taught to new members as the correct way to perceive, think, and feel in relation to those problems.[17] Employees are socialized into a specific workplace culture that affects their handling of the work, including the handling of their own and colleagues' musculoskeletal pain, which can vary considerably among workplaces.[18] For example, cultural perceptions of when it is acceptable for an employee to register as sick may differ. Organizational culture is expressed through organizational climate,[16] which includes employee perceptions of certain characteristics or features of their organizational environment.[15] For example, safety climate aims to capture employees' perceptions of managers' and colleagues' safety behaviors and prioritization of safety.[19,20] Similarly, we propose that the culture of handling musculoskeletal disorders in a workplace is expressed through the musculoskeletal health climate, which reflects employees' perception of managers' and colleagues' prioritization and behavior regarding musculoskeletal disorders. An Australian cross-sectional study examining musculoskeletal pain and organizational factors found perceived management commitment to be strongly correlated with musculoskeletal pain and discomfort.[21] In addition, studies have supported the importance of management in relation to sickness absence in the general population[22] and among eldercare and hospital employees.[23–25] Recently, a cross-sectional study established a relationship among musculoskeletal health climate, number of pain sites, and sickness

From the Department of Occupational Medicine, University Research Clinic, Danish Ramazzini Centre Goedstrup Hospital, Herning, Denmark (Ms Ajstrup, Ms Budtz, Dr Nielsen, Dr Andersen, Dr Andersen); Department of Clinical Medicine, Health, Aarhus University, Aarhus, Denmark (Dr Andersen, Dr Christiansen); Research, Regional Hospital Central Jutland, Viborg, Denmark (Dr Christiansen); and Elective Surgery Centre, Silkeborg Regional Hospital, Silkeborg, Denmark (Dr Christiansen).

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Ethical considerations and disclosures under Danish law this study did not need ethics approval (Act on Research Ethics Review of Health Research Projects). The collection and storage of questionnaire data were handled via the REDCap system Clinical Trial Unit, Department of Clinical Medicine, Aarhus University https://redcap.au.dk/. Participation in the study was based on informed consent and registered at the notification system for research projects conducted under the responsibility of Central Denmark Region (1-16-02-33-19).

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Address correspondence to: Merete Ajstrup, MSc, Department of Occupational Medicine, Univerity Research Clinic, Danish Ramazzini Centre, Goedstrup Hospital, Møllegade 16, 1. sal, DK-7400 Herning, Denmark (merajs@rm.dk).

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absence across different job groups.[26] These findings add to the understanding of musculoskeletal pain and sickness absence, and can complement workplace interventions targeting physical, psychosocial, and individual risk factors, as well as suggest new prevention possibilities. However, the cross-sectional nature of these previous studies prevents any conclusions to be made about causality, and therefore these associations need further confirmation in longitudinal studies.

OBJECTIVE AND HYPOTHESIS

The aim of the present study was to investigate the longitudinal association between musculoskeletal health climate and sickness absence among eldercare workers. Thus, the study's objective was to investigate if musculoskeletal health climate could predict future sickness absence among eldercare workers. We hypothesized that a high musculoskeletal health climate at baseline would be associated with less sickness absence during a 1-year follow-up.

METHODS

Study Design

The study is part of a larger mixed methods study (MSK Culture) that investigates the existence of musculoskeletal health climate as part of workplace culture and its impact on the prevalence of musculoskeletal pain and sickness absence.[26] The present study was a prospective cohort study of eldercare workers in a Danish municipality. The reporting of the study follows the guideline Strengthening the Reporting of Observational Studies in Epidemiology in cohort studies.[27]

Setting and Participants

The study population consisted of eldercare workers employed in a municipality in Denmark. The eldercare workers were employed at 18 different units and were either occupied in nursing homes or home care. In October–November 2019, 733 eldercare workers were invited to fill in an online questionnaire with questions related to work environment, lifestyle, and health. Data from the questionnaires were used to measure the musculoskeletal health climate.

Eligibility criteria were as follows: aged ≥18 years; adequate understanding of the Danish language to be able to self-complete the questionnaire; and employed during follow-up, 1 year from baseline.

The study is based on self-reported questionnaire data and register-based sickness absence extracted from the participants' workplace administrative system.

Ethical Approval

According to Danish law, this study did not need ethics approval (Act on Research Ethics Review of Health Research Projects). The collection and storage of questionnaire data were handled via the REDCap system Clinical Trial Unit, Department of Clinical Medicine, Aarhus University: https://redcap.au.dk/. Participation in the study was based on informed consent and registered at the notification system for research projects conducted under the responsibility of Central Denmark Region (1-16-02-33-19).

Exposure Variables

Musculoskeletal health climate was assessed by a newly developed measure of musculoskeletal health climate, which includes two subscales: (1) perceived management priority (PMP), which captures employees' views on the management's prioritization of workers' musculoskeletal health, and (2) pain acceptance at work (PAW), which captures the shared employee perceptions of musculoskeletal pain.[26]

Perceived Management Priority

The PMP scale is a modified subscale from the Nordic Safety Climate Questionnaire,[28] which captures employees' perception of the manager's prioritization of the workers' musculoskeletal health. The scale includes five items scored on a scale of 1 to 4, from strongly disagree to strongly agree. Higher scores represent employees' positive views on management's prioritization of workers' musculoskeletal health.

Pain Acceptance at Work

The PAW scale was inspired by the activity subscale of the Chronic Pain Acceptance Scale.[29] Five items were created to capture employees' perceptions of whether pain is considered and accepted as part of the job. The items were scored on a scale of 1–4 from strongly disagree to strongly agree. Higher scores represent greater acceptance of pain as part of the job at the workplace.

For the analyses, PMP scores and PAW scores were dichotomized into high and low using 2.7 as the cutoff point.[20] For the PMP score, the cutoff point was chosen based on the rule of thumb for interpreting results of the dimensions of the NOSACQ-50, where a score below 2.7 indicates a low level and a great need of improvement.[20] A similar reference for cutoff values does not exist for the PAW scores, and thus, for that scale, the choice was somewhat pragmatic.

The structural validity and internal consistency of the two subscales have been established.[26]

Outcome Variable

The outcome variable was the total number of days of all-cause sickness absence during the calendar year after completion of the questionnaire. We chose all-cause sickness absence as this could be extracted from the participants' workplace register, meaning no lack of information or risk of recall problems. Sickness absence related to pregnancy was excluded. Information about sickness absence 1 year before baseline and 1 year after baseline was obtained from the workplace register.[30,31]

Potential Confounders

Potential confounders were considered and chosen a priori, based on previous literature and theoretical assumptions of possible associations with PMP and/or PAW and sickness absence.

The selected variables covered the domains of sociodemographics, work environment, mental well-being, and musculoskeletal pain.

Sociodemographics

First, age at baseline was obtained from the Danish Social Security Register and categorized into four subcategories to ensure the participants' anonymity: 18–30 years, 30–45 years, 46–60 years, and older than 60 years. Second, educational level was self-reported and categorized into three subcategories according to length of education to distinguish among workers who had completed primary school, short-level education (nurse's aides, nurse's assistants), and medium-level education (nurses, therapists), where unskilled, lower level education was defined as ≤3 years and medium-level education was defined as >3–4 years.

Work Environment

Job satisfaction was measured using a single-item question adapted from the Danish Psychosocial Work Environment Questionnaire (DPQ): "Overall, how satisfied are you with your job?"[32] (translation from the English version of DPQ), answered on a numerical scale ranging from 0 (the lowest possible level of job satisfaction) to 10 (the highest possible level of job satisfaction). As no validated single-item cutoff point for the DPQ exists, the scores were dichotomized at their median to create low (≤7) and high (>7) job satisfaction.

Mental well-being was measured using the WHO-5 Well-Being Index, which is a questionnaire measuring current mental well-being.[33] The index contains five statements about mental well-being, each scored on a 0–5 scale, where higher scores indicate better well-being. A

percentage score ranging from 0 to 100 was calculated.[33] Scores of 0 to 35 indicated high risk of depression or stress; scores of 36 to 50, moderate risk of depression or stress; and scores above 50, no immediate risk of depression or stress.[34] For the analyses, the scores were dichotomized into risk of depression or stress (scores 0–50) and no immediate risk of depression or stress (scores >50).

Musculoskeletal Pain

The number of musculoskeletal pain sites at baseline was measured using a modified scale from the Pain Module of the Standard Evaluation Questionnaire.[35] The scale consisted of six items relating to pain or discomfort in six different parts of the body during the previous 4 weeks. Each item was scored on a 1–4 scale, indicating none at all, a little, some, and much pain or discomfort. For the analyses, the pain sites marked some or much were divided into three subcategories: 0 pain sites, 1 pain site, and ≥2 pain sites to distinguish multisite pain from no pain and 1 pain site.

Statistical Methods

The participant flow was presented graphically in a flowchart, and descriptive analyses of the study population were performed. The groups of participants reporting high and low PMP, and high and low PAW, respectively, were compared with sociodemographics, work environment, mental well-being, and musculoskeletal pain. Descriptive statistics were displayed in the form of frequencies and percentages.

The association between PMP score and PAW score as independent variables, and days of sickness absence as dependent variable were analyzed using negative binomial regression. We report incidence rate ratios (IRRs) with corresponding 95% confidence intervals (CIs). Regression analyses were adjusted for the covariates age, educational level, job satisfaction, mental well-being, number of musculoskeletal pain sites, and workplace cluster effect. Clustering effects may arise when a potential exists for correlation of outcomes among participants in similar groups; in this case, participants in the same workplace. This can result in loss of independence of observations, and therefore analysis taking this potential correlation into account was used. In addition, a sensitivity analysis was performed to test the robustness of the results, where the cutoff points for high and low PMP scores and PAW scores were altered to 3.0. The sensitivity analysis was performed to ensure that the primary conclusions were robust and not depending on the cutoff points.

Available characteristics and outcome measure for included study participants and responders excluded of the analysis were analyzed using Wilcoxon rank sum test to test whether there was a significant difference in age and sickness absence between the two groups.

The follow-up period was marked by the COVID-19 pandemic. Therefore, it was hypothesized that there was a plausible risk that sickness absence could be higher than previous years due to guidelines that recommended particular occupational groups working with people at risk of a severe illness of COVID-19 such as the elderly[36] to stay at home and isolate in case of cold or flu symptoms. Thus, a supplementary analysis was performed using a Wilcoxon signed rank test to compare the number of days of sickness absence in the follow-up period with the number of days with sickness absence in the year before baseline. If the analysis showed the number of days of sickness absence to be significantly higher, potential biases due to this should be considered when evaluating the results of the main regression analyses by excluding the period with COVID-19 lock down from the analyses.

Statistical analyses were performed with the statistical software package Stata, version 16.1 (Stata Corporation, College Station, Texas).

RESULTS

The flow of participants is shown in Figure 1. In total, 434 of the 721 invited eldercare workers responded (60.2%). The reasons for nonparticipation are unknown. As only 11 (2.5%) of the responders were men, the study population was restricted to women to eliminate potential confounding by gender.[37] A total of 33 (7.6%) responders were excluded because of incomplete data (no scoring on any of the two exposure scales, PMP scale and PAW scale). The final study population comprised 390 female eldercare workers.

The median for the overall sickness absence in the follow-up period was 3 days (interquartile range, 11).

Analysis of available information about study participants and responders excluded due to incomplete data showed no statistically significant differences in age (P = 0.65) and sickness absence (P = 0.53) (data not shown).

Table 1 shows the baseline sociodemographics, work environment, mental well-being, and musculoskeletal pain characteristics of the study population. Furthermore, Table 1 shows the characteristics by participants with high and low PMP scores, and by participants with high and low PAW scores. All variables had less than 1% missing values.

Table 2 shows the IRR for experiencing sickness absence during follow-up by PMP score and PAW score. The adjusted IRR for experiencing sickness absence was 0.6 (0.4–0.9) for participants with high PMP scores compared with participants with low PMP scores. The adjusted IRR for experiencing sickness absence was 1.4

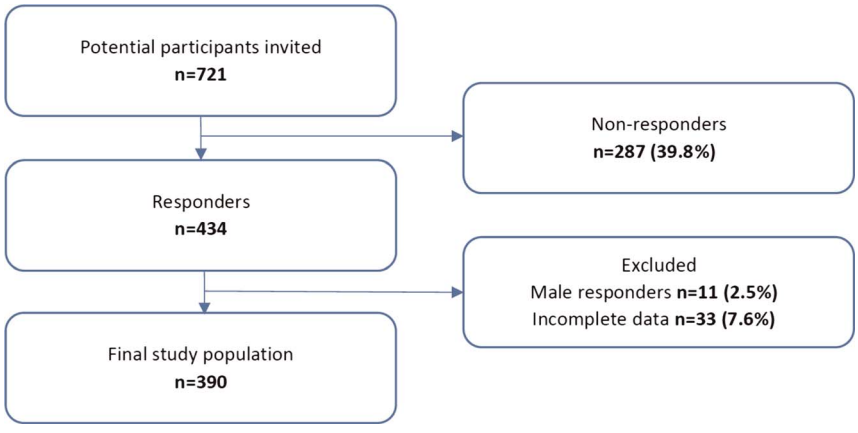

FIGURE 1. Flowchart of the study population.

TABLE 1. Baseline Characteristics of Study Participants

Variable	Total	Perceived Management Priority		Pain Acceptance at Work	
	n (%)	High, *n* (%)	Low, *n* (%)	High, *n* (%)	Low, *n* (%)
Total		301 (77.2)	89 (22.8)	92 (23.6)	297 (76.2)
Age, yrs					
18–30	39 (10.0)	28 (9.3)	11 (12.4)	15 (16.3)	24 (8.1)
31–45	123 (31.5)	96 (31.9)	27 (30.3)	26 (28.3)	96 (32.3)
46–60	186 (47.7)	141 (46.8)	45 (50.6)	44 (47.8)	142 (47.8)
>60	42 (10.8)	36 (12.0)	6 (6.7)	7 (7.6)	35 (11.8)
Educational level					
Unskilled	17 (4.4)	14 (4.7)	3 (3.4)	5 (5.4)	12 (4.0)
Lower level (≤3 yrs)	158 (40.5)	123 (40.9)	35 (39.3)	39 (42.4)	119 (40.1)
Medium level (>3–4 yrs)	215 (55.1)	164 (54.5)	51 (57.3)	48 (52.2)	166 (55.9)
Job satisfaction					
Low	112 (28.7)	61 (20.3)	51 (57.3)	36 (39.1)	75 (25.3)
High	277 (71.0)	239 (79.4)	38 (42.7)	56 (60.9)	221 (74.4)
Mental well-being					
Risk[a]	44 (11.3)	21 (7.0)	23 (25.8)	20 (21.7)	24 (8.1)
No immediate risk[a]	346 (88.7)	280 (93.0)	66 (74.2)	72 (78.3)	273 (91.9)
Number of pain sites[b]					
0	164 (42.1)	137 (45.5)	27 (30.3)	22 (23.9)	142 (47.8)
1	64 (16.4)	50 (16.6)	14 (15.7)	10 (10.9)	53 (17.9)
≥2	162 (41.5)	114 (37.9)	48 (53.4)	60 (65.3)	102 (34.3)

For the total study population, and by high and low perceived management priority, and by high and low pain acceptance at work, respectively.
[a]Of stress or depression according to WHO-5 well-being index.
[b]Number of body parts with musculoskeletal pain during the previous 4 weeks.

(0.9–2.2) for participants with high PAW scores compared with participants with low PAW scores.

Overall, the sensitivity analyses showed that, when the negative binomial regression analyses were performed with altered cutoff points, the same tendency seemed in the associations between PMP and PAW, and sickness absence. IRR (sensitivity) for experiencing sickness absence was 0.6 (0.4–0.9) for participants with high PMP scores compared with participants with low PMP scores. The IRR (sensitivity) for experiencing sickness absence was 1.8 (1.0–3.4) for participants with high PAW scores compared with participant with low PMP scores. Thus, the associations found in the main analysis were not dependent on the cutoff points of the exposure variables.

Furthermore, the total sickness absence 1 year before baseline was compared with total sickness absence 1 year after baseline to assess the potential influence of the COVID-19 pandemic on sickness absence. The median for days of sickness absence pre-COVID was 3 (interquartile range, 11). The analysis showed no statistically significant difference in days of sickness absence when comparing the year pre-COVID with the year of follow-up ($P = 0.54$).

DISCUSSION

Key Results

The present study aimed to determine if musculoskeletal health climate was a predictor of sickness absence among eldercare workers as measured by scales of PMP and PAW. Both subscales were strongly associated with sickness absence, but these findings only remained statistically significant for the PMP scores when adjusted for possible confounders. The sickness absence among workers with high PMP scores was 38% lower than for those reporting low PMP scores, whereas workers with high PAW scores had 41% more sickness absence than those with low scores. Changing the cutoff value for the two scores did not affect the results.

Strengths and Limitations

A strength of the study is its prospective design and the use of sickness absence data from the employers' registers. As information about the outcome variable was extracted from the participants' workplace administrative system, there was no lack of information about outcome and thereby no loss to follow-up or risk of recall bias was present. A limitation of the study is that 40% of the invited eldercare workers did not respond to the baseline questionnaire, and a further 5% of the workers had to be excluded due to incomplete data. However, nonparticipation is likely to be non-differentiated due to the prospective nature of the study, thereby not leading to bias of the IRR.[38] For the statistical analyses, the exposure scales were dichotomized into high or low. Dichotomization can be problematic as it simplifies a complex area such as workplace culture. However, sensitivity analyzes of cutoff points for the exposure variables were performed and did not alter the overall conclusions. Furthermore, as information about the cause of sickness absence was not available from workplace registers, we could only analyze all-cause sickness absence, which could potentially have weakened the observed association. Stronger associations might have been demonstrated if the analyses had been based exclusively on musculoskeletal sickness absence. However, in a cross-sectional study,[26] similar associations were found between the subscales and self-reported sickness absence due to musculoskeletal disorders, which supports the results of the present study. The analyses were adjusted for potential confounders. However, due to statistical

TABLE 2. IRR for Experiencing Sickness Absence During 1 Year Follow-up Among Female Eldercare Workers

	IRR Crude (95% CI)	IRR Adjusted[a] (95% CI)
PMP low score (ref)	1.0	1.0
PMP high score	0.6 (0.4–0.9)	0.6 (0.4–0.9)
PAW low score (ref)	1.0	1.0
PAW high score	1.6 (1.1–2.2)	1.4 (0.9–2.2)

IRR, incidence rate ratio; CI, confidence interval; PMP, perceived management priority; PAW, pain acceptance at work.
[a]Adjusted for age-group, educational level, job satisfaction, mental well-being, and number of musculoskeletal pain sites.

strength, the number of confounders included in the analyses was restricted and categorized or dichotomized to obtain power for the analyses. In a larger study population, more confounders could have been included to ensure the most robust estimates. Finally, we explored the possible impact of COVID-19 on sickness absence. Contrary to assumptions, we found no statistically significant difference in days of sickness absence between the year affected by the pandemic and the previous year. This indicates that COVID-19 only had a limited effect on sickness absence, and that it did not affect the results significantly.

Interpretation

In line with previous studies, the present study observed a stronger and more consistent association between PMP scores and sickness absence than between PAW scores and sickness absence.

In the present study, a statistically significant association between high PMP and lower risk of sickness absence was found, indicating that participants reporting high PMP were less likely to experience sickness absence during follow-up. Previous research has shown similar associations between aspects of management and musculoskeletal disorders[21] and sickness absence,[24,25,39] supporting the association demonstrated in the present study. However, no statistically significant association was found between PAW and sickness absence. The results indicated that a high PAW score was associated with higher risk of sickness absence, although the wide CI means that the estimate is to be interpreted cautiously. The association was interesting, though, as the initial assumption was that employees reporting a high work group acceptance of attending work with pain would have less sickness absence than employees reporting low acceptance. This apparent contradiction can be due to a contrast in what an individual reports and how the individual acts when experiencing pain. This could indicate that even though the PAW scale reflects the employee's perception of work group pain acceptance, this perception may not reflect the employee's sickness absence behavior.

However, the association can also indicate that a work group can have a high acceptance of pain and a high tolerance for colleagues working with pain, at the same time as they have a high tolerance and understanding for sickness absence because of pain.

The association observed between the PAW scores and sickness absence may be particularly dependent on the specific culture at the workplace or in a job group as an inverse association has been indicated for slaughter-house workers who have a different workplace culture and a seemingly opposite perception of how musculoskeletal pain should be handled in a work group.[26]

Future research could advantageously focus on further investigation and validation of the PAW scale.

Generalizability

Among the invited eldercare workers, 40% did not respond, and the representativeness of the study population can therefore be questioned. Furthermore, since the present study focused on a single occupational group, and the study population consisted exclusively of women, the generalizability of the results is limited to similar populations such as female eldercare workers, or similar professions, such as healthcare workers, in other municipalities in Denmark or similar countries.

Concluding Remarks

The estimates resulting from the analyses showed a strong independent association between PMP and sickness absence, whereas the association between PAW and sickness absence seemed to some extent to be explained by other factors. Thereby, the results added new knowledge about the relationship among workplace culture, musculoskeletal disorders, and sickness absence. Future research could focus on developing and validating the new scales and investigating further the importance of musculoskeletal health climate.

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