



HAL
open science

Associations between work-related factors and sickness presenteeism: a prospective study using the national French working conditions survey

Isabelle Niedhammer, Elodie Pineau, Sandrine Bertrais

► **To cite this version:**

Isabelle Niedhammer, Elodie Pineau, Sandrine Bertrais. Associations between work-related factors and sickness presenteeism: a prospective study using the national French working conditions survey. Occupational and Environmental Medicine, 2024, Online ahead of print. 10.1136/oemed-2023-109202 . hal-04717806

HAL Id: hal-04717806

<https://hal.science/hal-04717806v1>

Submitted on 2 Oct 2024

HAL is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.



Distributed under a Creative Commons Attribution - NonCommercial 4.0 International License



OPEN ACCESS

Original research

Associations between work-related factors and sickness presenteeism: a prospective study using the national French working conditions survey

Isabelle Niedhammer , Elodie Pineau, Sandrine Bertrais 

► Additional supplemental material is published online only. To view, please visit the journal online (<https://doi.org/10.1136/oemed-2023-109202>).

INSERM, Univ Angers, Univ Rennes, EHESP, Irset (Institut de recherche en santé, environnement et travail) - UMR_S 1085, ESTER Team, Angers, France

Correspondence to

Dr Isabelle Niedhammer;
isabelle.niedhammer@inserm.fr

Received 9 September 2023

Accepted 20 August 2024

ABSTRACT

Objectives The objectives were to assess the prospective associations between work-related factors, including psychosocial and physical work factors and working time/hours factors, and sickness presenteeism alone or combined with sickness absence.

Methods The study relied on prospective data of a national representative sample of 16 129 employees followed up from 2013 to 2016 in France. Work-related factors were assessed in 2013 and included 20 psychosocial work factors, 4 working time/hours factors and 4 physical work factors. Sickness presenteeism was studied using two items in 2016: the presence and duration of sickness presenteeism within the last 12 months. Weighted Hurdle and multinomial logistic regression models were performed to study the prospective associations between work-related factors at baseline and sickness presenteeism (both presence and duration) and sickness absence at follow-up. Models were adjusted for covariates.

Results Almost all psychosocial and physical work factors were predictive of sickness presenteeism (ORs ranging from 1.30 to 2.07 for men, and from 1.16 to 2.30 for women) but only some of them predicted its duration. Dose–response associations were observed between multiple exposures to these factors and sickness presenteeism. These factors predicted more sickness presenteeism alone or combined with sickness absence than sickness absence alone. Gender differences were observed in these associations, as some associations were found to be stronger among women than among men.

Conclusions There is a need to study sickness presenteeism and sickness absence combined. Prevention oriented towards the psychosocial and physical work environment may contribute to reduce sickness presenteeism and sickness absence.

INTRODUCTION

Sickness presenteeism has been defined by going to work despite being unhealthy and can be seen as a marker of health status among working populations.¹ This definition has often been used in epidemiological studies and was the definition adopted for the present study, epidemiological in nature, whereas other disciplines are more prone to use other definitions of presenteeism such as productivity loss at work due to health problems.² Sickness presenteeism, defined as a marker of health status, and sickness absence can thus be considered

WHAT IS ALREADY KNOWN ON THIS TOPIC

⇒ Work-related factors were found to be associated with sickness absence and sickness presenteeism separately. However, prospective studies were missing on the associations of these factors with sickness presenteeism and even more with sickness absence and sickness presenteeism combined. There was also a lack of prospective studies on the duration of sickness presenteeism.

WHAT THIS STUDY ADDS

⇒ Psychosocial and physical work factors were found to be predictive factors of sickness presenteeism in our study. These factors were more likely to predict the presence of sickness presenteeism than its duration. The study of sickness presenteeism and sickness absence combined showed that psychosocial and physical work factors had a stronger predictive role on sickness presenteeism than on sickness absence.

HOW THIS STUDY MIGHT AFFECT RESEARCH, PRACTICE OR POLICY

⇒ Prevention towards the psychosocial and physical work environment may help to reduce both sickness presenteeism and sickness absence. There is a strong need to study sickness absence and sickness presenteeism combined in further studies.

as two faces of the same coin. Indeed, unhealthy workers may face the dilemma of taking sickness absence or not. Consequently, the study of sickness absence and sickness presenteeism combined may be a better approach to study health status among working populations than the study of each one separately. Furthermore, the study of both outcomes would be informative, as according to other authors, there may be complex associations between sickness presenteeism and sickness absence.³ Prospective studies showed that sickness presenteeism was predictive of future morbidity outcomes such as poor general health, depression and coronary heart diseases, and also of sickness absence including long-term sickness absence.⁴ Furthermore, presenteeism was found to be more costly than sickness absence and medical treatment combined.⁵ Consequently, there is a clear need for



© Author(s) (or their employer(s)) 2024. Re-use permitted under CC BY-NC. No commercial re-use. See rights and permissions. Published by BMJ.

To cite: Niedhammer I, Pineau E, Bertrais S. *Occup Environ Med* Epub ahead of print: [please include DayMonthYear]. doi:10.1136/oemed-2023-109202

more research on sickness presenteeism and on its risk factors, especially work-related risk factors, in order to guide preventive policies at the workplace.

A recent review of the literature⁶ underlined that there was 'not enough research on effects of work-related factors on presenteeism'. Although the authors stated that their review focused on presenteeism, as defined by health-related productivity loss, it was not the case for all included primary studies. Various psychosocial work factors were found to be associated with presenteeism in the primary studies included in this review. However, the level of evidence was low, as among the 30 included studies, almost all of them had a cross-sectional design, and three studies were prospective, including only one study exploring the associations between work-related factors and presenteeism. The authors concluded to the need of more high-quality prospective studies on this topic. Consequently, the limitations of these previous studies can be underlined. Almost all of them had a cross-sectional design, focused on a limited number of work-related factors, explored sickness presenteeism as a binary variable (without any information about duration) and did not take sickness absence into account.

Our hypotheses were the following:

1. Work-related factors are expected to be associated with sickness presenteeism. This hypothesis is supported by two facts: work-related factors such as psychosocial work factors are risk factors for various health outcomes⁷ and sickness presenteeism is considered as a marker of health status.¹⁸
2. Dose-response associations are expected between multiple exposures to work-related factors and sickness presenteeism, or in other words, the higher the number of exposures, the higher the risk of sickness presenteeism, in line with one of the criteria for causation.⁹
3. Work-related factors are expected to be associated with sickness presenteeism even after taking sickness absence into account. This hypothesis is supported by the fact that sickness presenteeism and sickness absence may coexist and are not just alternative.³

The objectives were to study the prospective associations of a large number of work-related factors and multiple exposures with sickness presenteeism in a nationally representative sample of the working population. Attention was given to both the presence of at least 1 day of sickness presenteeism and the duration in days. Finally, our study also took sickness absence into account, a point that can be considered crucial in the study of sickness presenteeism.⁸

METHODS

The prospective data were those from the national French working conditions survey, set up by DARES (Direction de l'Animation de la Recherche, des Etudes et des Statistiques) of the French ministry of labour and collected in 2013 and 2016. The data were collected using a questionnaire by interviewer and a self-administered questionnaire among a national representative sample of the French working population. Our previous publications using these data can be found in the online supplemental references and included a prospective study on sickness absence.¹⁰ This study explored sickness absence only and did not consider sickness presenteeism. For the purpose of the present study, we focused on the subsample of employees. Among the initial sample of 30 274 working people of the survey in 2013, a total of 2939 were excluded: 2898 were self-employed workers, and 41 were over 65. A total of 1294 did not respond to the self-administered questionnaire in 2013, leading to a response rate

of 95.3% (26 041/27 335), and 834 were on sickness absence during the week preceding the survey in 2013 and were also excluded. A total of 6320 were lost to follow-up in 2016, leading to a follow-up rate of 74.9% (18 887/25 207). A total of 2758 were excluded because they were not working (n=2410) or not employees any longer (n=300), were over 65 (n=24) in 2016, or had missing values for the outcome (n=24). Finally, the study sample included 16 129 employees aged 15–65, with 6815 men and 9314 women.

The following work-related factors collected in 2013, whose content and construction were presented with more details in the online supplemental appendix, were studied:

1. Psychosocial work factors included 20 factors constructed using 61 items. Most of these items were selected because their content was close to the Copenhagen Psychosocial Questionnaire (COPSOQ).¹¹ Two additional factors were studied: changes at work and temporary employment. All these 20 factors were grouped into 5 domains.
2. Working time/hours factors included four factors.
3. Physical work factors also included four factors.

Low/high exposure groups were defined using the initial coding for the factors with one item and using the median of the total sample for the factors based on the sum of two or more items.

Multiple exposures for each domain of psychosocial work factors, and for working time/hours and physical work factors were assessed using the number of exposures. Multiple exposure for all psychosocial work factors together was assessed using the overall sum of all exposures (ranging from 0 to 20 exposures) and categorised using quintiles.

Sickness presenteeism was measured using the two following items in 2016: first a yes/no item, 'Within the last 12 months did you work when you were sick', and second, if yes, 'how many days'. We studied two outcomes, the presence of at least 1 day of sickness presenteeism and the total duration in days within the last 12 months, among the study sample of employees who were not on sickness absence during the week preceding the survey in 2013. We studied an additional outcome which was the combination of sickness presenteeism and/or sickness absence (binary variables) within the last 12 months in 2016 in four groups: neither sickness presenteeism nor sickness absence, sickness presenteeism alone, sickness absence alone and both sickness presenteeism and absence.

The following variables were used as covariates in 2013: gender, age, marital status, occupation and economic activity of the company.

The statistical analyses were done using weighted data that allowed us to take potential non-response and attrition bias into account and to provide results that could be extrapolated to the national population of employees. The statistical analyses included descriptive statistics for all studied variables. Comparisons were performed between genders using the Rao-Scott χ^2 test and Wilcoxon rank-sum test adapted to weighted data. The associations between work-related factors in 2013 and sickness presenteeism in 2016 were studied using Hurdle models. These models included two parts: (1) a first one, called zero-inflated part, that estimated the odds of having at least 1 day of sickness presenteeism associated with the explanatory variables using a weighted logistic regression model among the total study sample, and (2) a second part, called binomial negative part, that estimated the rate ratio of sickness presenteeism duration for the explanatory variables using weighted binomial negative models among the subsample of those who had at least 1 day of sickness presenteeism. The associations

Table 1 Sickness presenteeism and sickness absence within the last 12 months among the study sample in 2016

| | Men (n=6815) n (w%) | Women (n=9314) n (w%) | P value |
|---|------------------------|--------------------------|---------|
| Sickness presenteeism | | | <0.001 |
| No | 4162 (61.1%) | 4420 (46.9%) | |
| Yes | 2653 (38.9%) | 4894 (53.1%) | |
| Number of days of sickness presenteeism (among the subsample of those with at least 1 day of sickness presenteeism) | | | 0.012 |
| Median (IQR) | 3.0 (2.0–5.0) | 3.0 (2.0–6.0) | |
| Mean (SD) | 6.1 (14.9) | 7.7 (18.4) | |
| Range | 1.0–365.0 | 1.0–365.0 | |
| Sickness presenteeism and/or sickness absence | | | <0.001 |
| No | 3187 (46.4%) | 3181 (33.7%) | |
| Yes | 3620 (53.6%) | 6104 (66.3%) | |
| Number of days of sickness presenteeism and/or sickness absence (among the subsample of those with at least 1 day of sickness presenteeism and/or sickness absence) | | | 0.021 |
| Median (IQR) | 5 (3–15) | 6 (3–18) | |
| Mean (SD) | 18 (37) | 21 (43) | |
| Range | 1–365 | 1–365 | |
| Combination of sickness presenteeism and/or sickness absence | | | <0.001 |
| Neither sickness presenteeism, nor sickness absence | 3187 (46.5%) | 3181 (33.9%) | |
| Sickness presenteeism alone | 1495 (23.0%) | 2670 (30.1%) | |
| Sickness absence alone | 967 (14.7%) | 1210 (13.0%) | |
| Both sickness presenteeism and absence | 1149 (15.8%) | 2202 (23.0%) | |
| P value for the comparison between genders (Rao-Scott χ^2 test and Wilcoxon rank-sum test). | | | |
| n (w%), unweighted number (weighted %). | | | |

between work-related factors in 2013 and the combined variable of sickness presenteeism and sickness absence in 2016 were studied using weighted multinomial logistic regression models. In all models, each work-related factor or multiple exposure was studied separately, that is, one by one. As the results were very close before and after adjustment for covariates, the results were presented with adjustment for covariates. The analyses were performed for men and women separately, and gender-related interactions were tested.

Sensitivity analyses included: (1) the study of the associations after the exclusion of employees who changed jobs between 2013 and 2016, (2) the study of the associations after the exclusion of employees with 8 days or more of sickness presenteeism within the last 12 months in 2013, (3) the study of the associations with additional adjustment for part/full-time work and the presence of chronic disease in 2013 and (4) the study of the associations for psychosocial work factors with additional adjustment for working time/hours and physical work factors.

RESULTS

The description of the study sample can be found in [table 1](#) for the outcomes of sickness presenteeism and sickness absence in

2016. Women were more likely to have sickness presenteeism and a higher number of days of sickness presenteeism than men. This gender-related difference was also observed for sickness absence and when sickness presenteeism and sickness absence were combined. A substantial percentage of men (15.8%) and women (23.0%) had both sickness presenteeism and sickness absence. Online supplemental tables S1–S3 show the description of the study sample according to covariates and work-related factors. Most of the work-related factors displayed significant differences between genders. Significant differences between genders were also found for age, marital status, occupation and economic activity.

[Table 2](#) shows the prospective associations between work-related factors in 2013 and sickness presenteeism in 2016 after adjustment for covariates. Most psychosocial and physical work factors predicted at least 1 day of sickness presenteeism for men and women. Significant gender-related interactions showed that the associations for quantitative demands, cognitive demands and long working hours were stronger among women whereas the associations of biomechanical exposure and toxic/dangerous products were stronger among men (online supplemental table S4). The results for the duration of sickness presenteeism among the subsample of those with at least 1 day of sickness presenteeism are also presented in [table 2](#). Three psychosocial work factors (high demands for hiding emotions, low sense of community and low job satisfaction) predicted the duration of sickness presenteeism among men, whereas among women the number of psychosocial work factors predictive of this outcome was higher. Furthermore, among women, fumes/dust and noise were also predictors of the duration of sickness presenteeism. Significant gender-related interactions suggested that the associations of low role clarity, role conflict, low job satisfaction, internal violence and noise with the duration of sickness presenteeism were stronger among women than among men (online supplemental table S4).

[Table 3](#) shows the results for the associations of multiple exposure to work-related factors with sickness presenteeism. All multiple exposures, except multiple exposure to working time/hours, displayed dose–response associations, which meant that the higher the number of exposures, the higher the risk of at least 1 day of sickness presenteeism. There were marked differences in the results for the duration of sickness presenteeism between genders. Among men, two prospective dose–response associations between multiple exposure to demands at work and to all psychosocial work factors and the duration of sickness presenteeism were found. Among women, all multiple exposures displayed dose–response associations with the duration of sickness presenteeism, except multiple exposure to working time/hours.

The study of the associations of work-related factors and the combination of sickness presenteeism and/or sickness absence showed that most psychosocial and physical work factors predicted sickness presenteeism alone and both sickness presenteeism and sickness absence (online supplemental table S5). Only one factor (low degree of freedom) among men and some factors (low influence, low degree of freedom, low role clarity, low job satisfaction, internal violence and shift work) among women predicted sickness absence alone. Multiple exposure to psychosocial and physical work factors predicted sickness presenteeism alone and both sickness presenteeism and sickness absence (online supplemental table S6). The associations of multiple exposure to work-related factors with sickness absence alone were not significant among men, whereas

Table 2 Prospective associations between work-related factors in 2013 and sickness presenteeism in 2016: results from weighted Hurdle models (each factor studied separately) adjusted for covariates

| | Men | | Women | |
|--|--|---|--|---|
| | At least 1 day of sickness presenteeism (logistic model) | Number of days of sickness presenteeism among those with at least 1 day (negative binomial model) | At least 1 day of sickness presenteeism (logistic model) | Number of days of sickness presenteeism among those with at least 1 day (negative binomial model) |
| | OR (95% CI) | RR (95% CI) | OR (95% CI) | RR (95% CI) |
| Psychosocial work factors | | | | |
| Demands at work | | | | |
| High quantitative demands | 1.86 (1.58 to 2.20)*** | 1.29 (1.00 to 1.65) | 2.30 (1.98 to 2.67)*** | 1.47 (1.13 to 1.92)** |
| High cognitive demands | 1.67 (1.42 to 1.96)*** | 1.14 (0.88 to 1.47) | 2.09 (1.80 to 2.42)*** | 1.58 (1.24 to 2.03)*** |
| High emotional demands | 1.58 (1.34 to 1.87)*** | 1.13 (0.86 to 1.48) | 1.52 (1.31 to 1.76)*** | 1.48 (1.15 to 1.90)** |
| High demands for hiding emotions | 1.81 (1.53 to 2.13)*** | 1.54 (1.21 to 1.97)*** | 1.99 (1.70 to 2.32)*** | 1.06 (0.79 to 1.43) |
| Work organisation and job content | | | | |
| Low influence | 1.11 (0.94 to 1.30) | 0.99 (0.77 to 1.27) | 1.05 (0.91 to 1.21) | 1.08 (0.83 to 1.41) |
| Low degree of freedom | 1.47 (1.25 to 1.72)*** | 1.14 (0.89 to 1.45) | 1.46 (1.26 to 1.69)*** | 1.05 (0.81 to 1.36) |
| Low possibilities for development | 1.57 (1.34 to 1.86)*** | 1.02 (0.78 to 1.33) | 1.55 (1.34 to 1.79)*** | 1.19 (0.89 to 1.59) |
| Low meaning of work | 1.33 (1.14 to 1.55)*** | 1.05 (0.83 to 1.33) | 1.38 (1.20 to 1.59)*** | 1.37 (1.07 to 1.75)* |
| Interpersonal relations | | | | |
| Low predictability | 1.06 (0.90 to 1.25) | <i>0.66 (0.50 to 0.86)**</i> | 1.16 (1.00 to 1.34)* | 1.00 (0.78 to 1.28) |
| Low role clarity | 1.65 (1.36 to 2.00)*** | 1.03 (0.80 to 1.33) | 1.80 (1.51 to 2.14)*** | 1.72 (1.30 to 2.27)*** |
| High role conflict | 1.81 (1.54 to 2.13)*** | 1.23 (0.96 to 1.59) | 1.90 (1.64 to 2.20)*** | 1.86 (1.47 to 2.35)*** |
| Low social support | 1.72 (1.47 to 2.02)*** | 1.11 (0.86 to 1.42) | 1.65 (1.43 to 1.90)*** | 1.29 (1.00 to 1.66) |
| Low sense of community | 1.30 (1.11 to 1.53)** | 1.28 (1.00 to 1.62)* | 1.39 (1.20 to 1.60)*** | 1.35 (1.04 to 1.75)* |
| Work–individual interface | | | | |
| Low job satisfaction | 1.61 (1.37 to 1.89)*** | 1.35 (1.07 to 1.70)* | 1.98 (1.71 to 2.29)*** | 1.85 (1.46 to 2.34)*** |
| Work–family conflict | 1.50 (1.27 to 1.78)*** | 0.94 (0.70 to 1.28) | 1.66 (1.43 to 1.93)*** | 1.19 (0.88 to 1.61) |
| Job insecurity | 1.60 (1.33 to 1.94)*** | 1.18 (0.90 to 1.53) | 1.31 (1.10 to 1.57)** | 1.28 (0.95 to 1.73) |
| High changes at work | 1.98 (1.69 to 2.33)*** | 0.97 (0.76 to 1.24) | 1.88 (1.62 to 2.17)*** | 1.34 (1.03 to 1.73)* |
| Temporary employment | 1.18 (0.88 to 1.59) | 1.03 (0.66 to 1.61) | <i>0.71 (0.57 to 0.90)**</i> | <i>0.48 (0.37 to 0.64)***</i> |
| Workplace violence | | | | |
| High internal violence | 1.71 (1.46 to 2.01)*** | 1.20 (0.96 to 1.51) | 1.75 (1.51 to 2.02)*** | 1.77 (1.39 to 2.24)*** |
| High external violence | 2.07 (1.75 to 2.44)*** | 1.08 (0.84 to 1.39) | 1.79 (1.55 to 2.08)*** | 1.44 (1.13 to 1.85)** |
| Working time/hours factors | | | | |
| Long working hours (>48 hours/week) | 0.98 (0.75 to 1.27) | 1.08 (0.75 to 1.57) | 1.47 (1.06 to 2.03)* | 1.37 (0.94 to 1.99) |
| Shift work | 1.23 (0.94 to 1.59) | <i>0.66 (0.48 to 0.91)*</i> | 1.05 (0.81 to 1.35) | 1.03 (0.65 to 1.62) |
| Weekend work | 1.03 (0.82 to 1.28) | 0.92 (0.68 to 1.25) | 1.16 (0.96 to 1.41) | 0.97 (0.68 to 1.37) |
| Night work | 1.08 (0.81 to 1.43) | 0.93 (0.61 to 1.40) | 1.30 (0.90 to 1.88) | 0.80 (0.48 to 1.35) |
| Physical work factors | | | | |
| Biomechanical exposure | 1.86 (1.55 to 2.24)*** | 1.35 (1.00 to 1.82) | 1.38 (1.18 to 1.60)*** | 1.03 (0.78 to 1.36) |
| Fumes/dust | 1.46 (1.23 to 1.75)*** | 1.20 (0.93 to 1.56) | 1.50 (1.24 to 1.81)*** | 1.56 (1.13 to 2.16)** |
| Toxic/dangerous products | 1.38 (1.17 to 1.63)*** | 0.99 (0.76 to 1.30) | 1.18 (1.00 to 1.39)* | 1.20 (0.88 to 1.62) |
| Noise | 1.48 (1.22 to 1.80)*** | 1.13 (0.87 to 1.48) | 1.40 (1.12 to 1.76)** | 1.77 (1.18 to 2.67)** |

Employees were classified into no/low or high exposure groups using the initial coding for the factors based on one item (emotional demands, role clarity, work–family conflict, job insecurity, temporary employment, and all working time/hours factors and physical work factors, except biomechanical exposure) and using the median of the distribution in the total sample as cut-off for the factors based on more than one item.
OR and RR adjusted for age, marital status, occupation and economic activity in 2013.
OR and RR in bold were significant at p<0.05 (risk factors), *p<0.05, **p<0.01, ***p<0.001.
RR, rate ratio.

there were significant associations among women, except for work–individual interface and physical work factors.

Some little changes in the results were observed for the associations between work-related factors and sickness presenteeism duration in the sensitivity analysis after the exclusion of employees who changed jobs between 2013 and 2016 (some factors borderline significant became non-significant and vice versa). The results were unchanged in the other sensitivity analyses.

DISCUSSION

Main results

The study showed that sickness presenteeism was a widespread phenomenon in the French working population of employees, especially among women. Most psychosocial and physical work factors, and their multiple exposures, were predictive of at least 1 day of sickness presenteeism. The associations were more seldom between work-related factors and the duration of sickness presenteeism, especially among men. The study of

Table 3 Prospective associations between multiple exposures to work-related factors in 2013 and sickness presenteeism in 2016: results from weighted Hurdle models adjusted for covariates

| | Men | | Women | |
|--|--|---|--|---|
| | At least 1 day of sickness presenteeism (logistic model) | Number of days of sickness presenteeism among those with at least 1 day (negative binomial model) | At least 1 day of sickness presenteeism (logistic model) | Number of days of sickness presenteeism among those with at least 1 day (negative binomial model) |
| | OR (95% CI) | RR (95% CI) | OR (95% CI) | RR (95% CI) |
| Number of exposures for each domain of psychosocial work factors or quintiles of the total number of exposures | | | | |
| Demands at work (number of exposures) | | | | |
| 0 | Ref. | Ref. | Ref. | Ref. |
| 1 | 1.71 (1.31 to 2.25)*** | 1.12 (0.67 to 1.87) | 1.51 (1.13 to 2.01)** | 1.46 (0.92 to 2.31) |
| 2 | 2.25 (1.72 to 2.96)*** | 1.08 (0.70 to 1.65) | 2.23 (1.68 to 2.94)*** | 2.23 (1.32 to 3.77)** |
| 3 | 3.34 (2.51 to 4.44)*** | 1.54 (0.97 to 2.45) | 3.28 (2.48 to 4.34)*** | 2.31 (1.47 to 3.63)*** |
| 4 | 4.62 (3.36 to 6.34)*** | 1.74 (1.08 to 2.80)* | 5.21 (3.88 to 6.98)*** | 2.65 (1.65 to 4.27)*** |
| <i>P for linear trend</i> | <0.001 | 0.006 | <0.001 | <0.001 |
| Work organisation and job content (number of exposures) | | | | |
| 0 | Ref. | Ref. | Ref. | Ref. |
| 1 | 1.23 (0.92 to 1.66) | 0.86 (0.47 to 1.59) | 1.27 (0.95 to 1.70) | 1.32 (0.81 to 2.17) |
| 2 | 1.40 (1.06 to 1.86)* | 1.24 (0.71 to 2.16) | 1.60 (1.22 to 2.10)** | 1.60 (0.96 to 2.65) |
| 3 | 1.74 (1.30 to 2.34)*** | 0.92 (0.52 to 1.60) | 2.16 (1.62 to 2.87)*** | 1.46 (0.89 to 2.38) |
| 4 | 2.45 (1.75 to 3.44)*** | 1.17 (0.66 to 2.07) | 2.34 (1.70 to 3.22)*** | 2.07 (1.19 to 3.60)* |
| <i>P for linear trend</i> | <0.001 | 0.529 | <0.001 | 0.009 |
| Interpersonal relations (number of exposures) | | | | |
| 0 | Ref. | Ref. | Ref. | Ref. |
| 1 | 1.01 (0.68 to 1.51) | 1.01 (0.42 to 2.45) | 1.25 (0.96 to 1.64) | 1.07 (0.63 to 1.81) |
| 2 | 1.35 (0.91 to 1.99) | 0.79 (0.33 to 1.90) | 1.79 (1.37 to 2.33)*** | 1.23 (0.83 to 1.84) |
| 3 | 1.74 (1.18 to 2.55)** | 1.18 (0.50 to 2.76) | 2.08 (1.58 to 2.74)*** | 1.77 (1.17 to 2.69)** |
| 4 or 5 | 2.44 (1.65 to 3.60)*** | 0.94 (0.40 to 2.18) | 3.19 (2.42 to 4.22)*** | 2.01 (1.32 to 3.06)** |
| <i>P for linear trend</i> | <0.001 | 0.974 | <0.001 | <0.001 |
| Work-individual interface (number of exposures) | | | | |
| 0 | Ref. | Ref. | Ref. | Ref. |
| 1 | 1.36 (0.98 to 1.89) | 0.86 (0.41 to 1.78) | 1.89 (1.40 to 2.54)*** | 1.36 (0.78 to 2.40) |
| 2 | 1.93 (1.41 to 2.64)*** | 0.90 (0.44 to 1.84) | 2.72 (2.03 to 3.64)*** | 1.35 (0.89 to 2.06) |
| 3 | 2.95 (2.13 to 4.08)*** | 0.97 (0.48 to 1.97) | 4.20 (3.14 to 5.62)*** | 1.64 (1.06 to 2.54)* |
| 4 or 5 | 3.78 (2.63 to 5.42)*** | 1.21 (0.59 to 2.49) | 3.67 (2.56 to 5.25)*** | 2.43 (1.41 to 4.17)** |
| <i>P for linear trend</i> | <0.001 | 0.504 | <0.001 | <0.001 |
| Workplace violence (number of exposures) | | | | |
| 0 | Ref. | Ref. | Ref. | Ref. |
| 1 | 1.95 (1.61 to 2.36)*** | 1.05 (0.79 to 1.40) | 1.58 (1.34 to 1.88)*** | 1.18 (0.92 to 1.51) |
| 2 | 2.76 (2.24 to 3.40)*** | 1.25 (0.90 to 1.72) | 2.51 (2.06 to 3.05)*** | 2.02 (1.45 to 2.79)*** |
| <i>P for linear trend</i> | <0.001 | 0.179 | <0.001 | <0.001 |
| All psychosocial work factors (quintiles of the total number of exposures) | | | | |
| Q1 | Ref. | Ref. | Ref. | Ref. |
| Q2 | 1.36 (1.04 to 1.78)* | 1.32 (0.80 to 2.18) | 1.45 (1.14 to 1.83)** | 1.74 (0.98 to 3.11) |
| Q3 | 1.85 (1.46 to 2.34)*** | 1.11 (0.73 to 1.70) | 2.46 (2.00 to 3.02)*** | 1.60 (1.15 to 2.23)** |
| Q4 | 3.41 (2.58 to 4.53)*** | 1.44 (0.92 to 2.26) | 2.99 (2.31 to 3.86)*** | 1.94 (1.34 to 2.82)*** |
| Q5 | 3.99 (3.04 to 5.23)*** | 1.55 (1.02 to 2.35)* | 4.40 (3.49 to 5.54)*** | 2.66 (1.86 to 3.81)*** |
| <i>P for linear trend</i> | <0.001 | 0.039 | <0.001 | <0.001 |
| Number of exposures to working time/hours factors | | | | |
| 0 | Ref. | Ref. | Ref. | Ref. |
| 1 | 1.20 (1.00 to 1.45)* | 0.92 (0.71 to 1.20) | 1.10 (0.92 to 1.31) | 0.81 (0.62 to 1.06) |
| 2 | 1.18 (0.86 to 1.62) | 0.82 (0.49 to 1.37) | 1.36 (0.98 to 1.86) | 1.36 (0.84 to 2.18) |
| 3 or 4 | 0.78 (0.43 to 1.40) | 0.76 (0.50 to 1.16) | 1.04 (0.50 to 2.18) | 1.46 (0.67 to 3.21) |
| <i>P for linear trend</i> | 0.399 | 0.188 | 0.765 | 0.178 |
| Number of exposures to physical work factors | | | | |
| 0 | Ref. | Ref. | Ref. | Ref. |
| 1 | 1.32 (1.05 to 1.67)* | 1.64 (1.12 to 2.40)* | 1.28 (1.07 to 1.52)** | 1.11 (0.81 to 1.52) |
| 2 | 1.90 (1.48 to 2.43)*** | 1.21 (0.85 to 1.70) | 1.25 (1.02 to 1.54)* | 1.17 (0.79 to 1.73) |

continued

Table 3 continued

| | Men | | Women | |
|---------------------------|--|---|--|---|
| | At least 1 day of sickness presenteeism (logistic model) | Number of days of sickness presenteeism among those with at least 1 day (negative binomial model) | At least 1 day of sickness presenteeism (logistic model) | Number of days of sickness presenteeism among those with at least 1 day (negative binomial model) |
| | OR (95% CI) | RR (95% CI) | OR (95% CI) | RR (95% CI) |
| 3 | 2.23 (1.73 to 2.87)*** | 1.41 (0.98 to 2.04) | 2.04 (1.59 to 2.62)*** | 1.44 (0.94 to 2.20) |
| 4 | 2.48 (1.80 to 3.41)*** | 1.64 (1.10 to 2.44)* | 2.57 (1.60 to 4.14)*** | 3.39 (1.31 to 8.73)* |
| <i>P</i> for linear trend | <0.001 | 0.082 | <0.001 | 0.007 |

OR and RR adjusted for age, marital status, occupation and economic activity in 2013.
OR and RR in bold were significant at $p < 0.05$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.
RR, rate ratio.

sickness presenteeism combined with sickness absence showed that psychosocial and physical work factors were predictive of sickness presenteeism alone and both sickness presenteeism and sickness absence and were less frequently predictive of sickness absence alone.

Comparison with the literature

The comparison with the literature was difficult as there were almost no previous prospective studies on the associations between work-related factors and sickness presenteeism. The review by Mori *et al*⁶ found three prospective studies exploring presenteeism. Among them, only one explored work-related factors, especially job stressors, in association with presenteeism.¹² This study showed that low job control, low reward and procedural and interactional injustice were associated with presenteeism as defined by reduced productivity at work, which corroborated our results between low degree of freedom and low possibilities for development and sickness presenteeism. We found three additional prospective studies. The study by Conway *et al*¹³ showed an association between workplace bullying and sickness presenteeism using a definition of the outcome similar to ours, but this prospective association became non-significant after adjustment for baseline sickness presenteeism. The study by Goto *et al*¹⁴ showed that job demands was associated with presenteeism as defined by reduced productivity, in line with our results. The study by Mori *et al*¹⁵ showed that low supervisor support was associated with presenteeism, in agreement with our results.

Consequently, the very few prospective studies explored a very limited number of work-related factors and the definition of the outcome was not always the same. Our study may thus be one of the first prospective studies to explore such a large number of work-related factors in association with sickness presenteeism. Furthermore, to our knowledge, there was no previous prospective study exploring these factors in association with sickness presenteeism and sickness absence combined. Our study may thus be the first one of its kind. In addition, the already published cross-sectional studies exploring both sickness presenteeism and sickness absence did not combine the two outcomes but explored them separately, making the interpretation of the results difficult. Some work-related factors were found to be associated with sickness presenteeism and/or sickness absence in these cross-sectional studies. Interestingly, some of these studies^{16–18} showed that some work-related factors, including various job stress items, non-standard employment and job insecurity, were more associated with sickness presenteeism than with sickness absence, in agreement with our results. The study by Elstad *et al*¹⁶ also provided a cross-sectional dose-response association of a job stress measure which was of larger

magnitude for sickness presenteeism than for sickness absence, echoing our prospective dose-response association between multiple exposure to psychosocial work factors and sickness presenteeism alone and the absence of association with sickness absence alone.

Strengths and limitations of the study

The following strengths of the study should be underlined. The study was based on prospective data, that is, with a clear temporal sequence between exposures and outcome, and a large national representative sample of employees with satisfactory response and follow-up rates. The statistical analyses were done using weighted data to control for non-response and attrition and to make sure that the results could be extrapolated to the target population. Gender differences were explored in terms of differences in the distribution of the variables and in the exposure-outcome associations. We studied a large number of work-related factors and multiple exposures. We studied each factor and multiple exposure separately, that is, one by one, to reduce the risk of overadjustment. Sickness presenteeism was defined by a well-known definition used by many authors.¹ Sickness presenteeism was studied using two items and using Hurdle models to study both the presence of at least one day of sickness presenteeism and its duration, more seldom studied.⁸ We also took sickness absence into account, which was recommended previously,⁸ and combined sickness presenteeism and sickness absence to disentangle the effects on each outcome and their combination. We excluded employees with sickness absence during the week preceding the survey in 2013 in the main analyses and with 8 days or more of sickness presenteeism within the last 12 months in 2013 in the sensitivity analysis, to make the temporality between exposures and outcome clearer. We adjusted for various covariates and performed sensitivity analyses.

Some limitations should deserve to be mentioned. Although all statistical analyses were performed using weighted data, a response bias and an attrition bias could not be completely excluded. However, these two biases were likely to be small given the high response and follow-up rates (95.3% and 74.9%, respectively). The chosen definition of sickness presenteeism did not measure productivity loss at work, but this was not the objective of the study to explore this topic. Sickness presenteeism was assessed within the last 12 months, which may have led to a potential recall bias. The measurement of work-related factors, although inspired from the COPSOQ questionnaire, was not based on validated instruments. Some seldom factors may be missing such as leadership quality or organisational injustice. We studied multiple exposures to work-related factors using the number of exposures or quintiles, allowing to study

all exposures together. However, we did not perform models including all individual exposures simultaneously, as such models may lead to overadjustment and may make the interpretation of the results difficult (exposures may be causes or consequences of other exposures).¹⁹ Our results may thus at least partially be impacted by a residual confounding bias or underadjustment, although we performed a sensitivity analysis with additional adjustment for working time/hours and physical work factors for the study of psychosocial work factors. Work-related factors and the outcomes of sickness presenteeism and sickness absence were self-reported, which may have led to a reporting bias and an overestimation of the associations, although the prospective design of the study may reduce this bias. As work-related factors and sickness presenteeism (within the last 12 months) were measured 3 years apart, changes in these factors could not be assessed and may have led to misclassification and an underestimation of the associations. However, the exclusion of employees who changed job between 2013 and 2016 did not change the results substantially in the sensitivity analysis. Furthermore, the number of these employees was low (n=2131, that is, 13.2%), supporting the hypothesis of the stability of jobs and exposures. In addition, the pathways between work-related factors and sickness presenteeism may be through mediating variables related to health status, such as mental health outcomes, making the delay of 2–3 years between exposure and outcome consistent with the effects of chronic exposures on health. A healthy worker effect could not be excluded totally leading also to an underestimation of the associations. For example, temporary employment and night work were not associated with sickness presenteeism, and this might be explained by a selection of healthier and/or younger people either at the time of hire or at the time of employment.

CONCLUSIONS

This study based on a large national representative sample of employees provided information on the prospective associations between a large number of work-related factors and sickness presenteeism. Almost all psychosocial and physical work factors were found to predict sickness presenteeism, but few of them predicted the duration of sickness presenteeism. Prospective dose–response associations were found, reinforcing the potential role of these factors on sickness presenteeism. The study of sickness presenteeism combined with sickness absence suggested that psychosocial and physical work factors were more associated with sickness presenteeism alone or combined with sickness absence than with sickness absence alone. These results may be informative for the study of sickness absence as the effects of work-related factors observed on sickness absence might be due more to sickness presenteeism combined with sickness absence rather than to sickness absence alone.¹⁰ Given the complex associations between sickness presenteeism and sickness absence,³ our study underlined the need to consider sickness presenteeism and sickness absence combined, in order to assess the actual impact of working conditions on health through these indicators, which are particularly relevant to companies. More research is needed on this topic, especially high-quality prospective studies. Preventive actions towards psychosocial and physical work factors of all types would be beneficial to reduce the occurrence of sickness presenteeism and sickness absence. Multiple exposures would deserve particular attention.

Acknowledgements The authors thank the members of DARES (French ministry of labour) and all the participants to the French Working Conditions survey, who made this study possible.

Contributors IN conceived and designed the study, performed the literature review, contributed to the statistical analyses, interpreted the results, drafted and revised the manuscript. EP and SB performed the statistical analyses, contributed to the interpretation of the results and the revision of the manuscript. IN is responsible for the overall content as guarantor.

Funding The study was supported by DARES of the French ministry of labour (grant number: 2018/037).

Competing interests None declared.

Patient consent for publication Not applicable.

Ethics approval This study involves human participants and was approved by French ethics committees (CNIL no 2015-079 and CNIS no 2015X073TV). Participants gave informed consent to participate in the study before taking part.

Provenance and peer review Not commissioned; internally peer reviewed.

Data availability statement Data are available upon reasonable request.

Supplemental material This content has been supplied by the author(s). It has not been vetted by BMJ Publishing Group Limited (BMJ) and may not have been peer-reviewed. Any opinions or recommendations discussed are solely those of the author(s) and are not endorsed by BMJ. BMJ disclaims all liability and responsibility arising from any reliance placed on the content. Where the content includes any translated material, BMJ does not warrant the accuracy and reliability of the translations (including but not limited to local regulations, clinical guidelines, terminology, drug names and drug dosages), and is not responsible for any error and/or omissions arising from translation and adaptation or otherwise.

Open access This is an open access article distributed in accordance with the Creative Commons Attribution Non Commercial (CC BY-NC 4.0) license, which permits others to distribute, remix, adapt, build upon this work non-commercially, and license their derivative works on different terms, provided the original work is properly cited, appropriate credit is given, any changes made indicated, and the use is non-commercial. See: <http://creativecommons.org/licenses/by-nc/4.0/>.

ORCID iDs

Isabelle Niedhammer <http://orcid.org/0000-0002-8042-8925>
Sandrine Bertrais <http://orcid.org/0000-0001-7388-0916>

REFERENCES

- Aronsson G, Gustafsson K, Dallner M. Sick but yet at work. An empirical study of sickness presenteeism. *J Epidemiol Community Health* 2000;54:502–9.
- Ospina MB, Dennett L, Wayne A, et al. A systematic review of measurement properties of instruments assessing presenteeism. *Am J Manag Care* 2015;21:e171–85.
- Leineweber C, Westerlund H, Hagberg J, et al. Sickness presenteeism is more than an alternative to sickness absence: results from the population-based SLOSH study. *Int Arch Occup Environ Health* 2012;85:905–14.
- Skagen K, Collins AM. The consequences of sickness presenteeism on health and wellbeing over time: A systematic review. *Soc Sci Med* 2016;161:169–77.
- Collins JJ, Baase CM, Sharda CE, et al. The assessment of chronic health conditions on work performance, absence, and total economic impact for employers. *J Occup Environ Med* 2005;47:547–57.
- Mori K, Nagata M, Nagata T. Work-Related Factors Affecting the Occurrence of Presenteeism – Recent Research Trends and Future Directions. *J UOEH* 2021;43:61–73.
- Niedhammer I, Bertrais S, Witt K. Psychosocial work exposures and health outcomes: a meta-review of 72 literature reviews with meta-analysis. *Scand J Work Environ Health* 2021;47:489–508.
- Navarro A, Salas-Nicás S, Llorens C, et al. Sickness presenteeism: Are we sure about what we are studying? A research based on a literature review and an empirical illustration. *Am J Ind Med* 2019;62:580–9.
- HILL AB. THE ENVIRONMENT AND DISEASE: ASSOCIATION OR CAUSATION? *Proc R Soc Med* 1965;58:295–300.
- Bertrais S, Pineau E, Niedhammer I. Prospective associations of psychosocial work factors with sickness absence spells and duration: Results from the French national working conditions survey. *Am J Ind Med* 2023;66:938–51.
- Kristensen TS, Hannerz H, Høgh A, et al. The Copenhagen Psychosocial Questionnaire – a tool for the assessment and improvement of the psychosocial work environment. *Scand J Work Environ Health* 2005;31:438–49.
- Oshio T, Tsutsumi A, Inoue A, et al. The reciprocal relationship between sickness presenteeism and psychological distress in response to job stressors: evidence from a three-wave cohort study. *J Occup Health* 2017;59:552–61.
- Conway PM, Clausen T, Hansen ÅM, et al. Workplace bullying and sickness presenteeism: cross-sectional and prospective associations in a 2-year follow-up study. *Int Arch Occup Environ Health* 2016;89:103–14.
- Goto E, Ishikawa H, Okuhara T, et al. Associations between job and workplace factors, health and physical factors, personal factors, and presenteeism among general employees in Japan: A longitudinal study. *J Occup Health* 2022;64:e12344.

- 15 Mori T, Nagata T, Nagata M, *et al.* Perceived Supervisor Support for Health Affects Presenteeism: A Prospective Cohort Study. *J Occup Environ Med* 2023;65:16–21.
- 16 Elstad JI, Vabø M. Job stress, sickness absence and sickness presenteeism in Nordic elderly care. *Scand J Public Health* 2008;36:467–74.
- 17 Kim JY, Lee J, Muntaner C, *et al.* Who is working while sick? Nonstandard employment and its association with absenteeism and presenteeism in South Korea. *Int Arch Occup Environ Health* 2016;89:1095–101.
- 18 Kim J-H, Yoon J, Bahk J, *et al.* Job insecurity is associated with presenteeism, but not with absenteeism: A study of 19 720 full-time waged workers in South Korea. *J Occup Health* 2020;62:e12143.
- 19 Rugulies R, Aust B, Pejtersen JH. Do psychosocial work environment factors measured with scales from the Copenhagen Psychosocial Questionnaire predict register-based sickness absence of 3 weeks or more in Denmark? *Scand J Public Health* 2010;38:42–50.