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The Relation between Presenteeism and Different Types of Future Sickness Absence

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Abstract: The Relation between Presenteeism and Different Types of Future Sickness Absence: Heidi Janssens, *et al*. Department of Public Health, Ghent University, Belgium—Objectives: The aim of this study was to examine the relation between sickness presenteeism and different types of future sickness absence in 2,983 Belgian middle-aged workers. **Methods:** Data were collected from 1,372 male and 1,611 female workers. Presenteeism was assessed by a single question, evaluating the frequency of occasions of going at work, despite illness, during the preceding year. Prospective, registered sickness absence data were collected during 12 months of follow-up. Multivariate logistic regression models were used to investigate the relationship between presenteeism and short/long spells of absenteeism and high sickness absence frequency. **Results:** High rates (>5 times) of presenteeism at baseline were significantly and independently associated with both long spells of sickness absence (at least 15 consecutive sick leave days) (men, OR=2.73, 95% CI=1.24−6.03; women, OR=2.40, 95%CI=1.31−4.40) and short spells of sickness absence (sick leave between 1 and 3 days) (men, OR=2.38, 95%CI=1.25−4.51; women, OR=1.90, 95%CI=1.17−3.11) in both genders during one year follow-up. Moderate rates (2−5 times) of presenteeism were significantly associated with long spells of sickness absence only in the male group (OR=1.90, 95%CI= 1.21−2.97). With regard to high sickness frequency (at least 3 sick leave episodes), a significant and positive association with high rates of presenteeism was demonstrated only in the female workers (OR=2.38, 95%CI=1.40−4.04). **Conclusions:** These results suggest that presenteeism was related to different types of future sickness absence.
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Key words: Longitudinal study, Organization of work, Presenteeism, Sickness absence

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Recently, sickness presenteeism is gaining growing attention from several researchers. Sickness presenteeism refers to the phenomenon in which an employee goes to work despite feeling so ill that sick leave would have been appropriate[1]. The prevalence of presenteeism varied from 27 to 88% in several studies, depending on the type of questionnaire. In spite of this broad range of prevalence figures, it can be concluded that presenteeism is rather common among employees[2–4].

Research has mainly put emphasis on work-related determinants and personal factors increasing the risk for presenteeism. Work-related factors associated with higher rates of presenteeism are low replaceability[2], lack of work resources, time pressure[5, 6], job stress and insecurity[7] and mismatch between desired and actual working hours[8]. When focusing on the individual determinants, several factors have been investigated. It is apparent that having a health problem is one of the individual factors that increases the risk for presenteeism[2, 9, 10]. Health conditions such as arthritis, allergies, fatigue and depressive symptoms, overweight and obesity have been associated with higher presenteeism[10, 11]. Additionally, overcommitment, financial problems, lower educational level and younger age are also individual determinants for presenteeism[2, 12].

The economic consequences of presenteeism have been a subject of investigation as well. Presenteeism implies that the worker cannot reach his full capacity and thus implicates a productivity loss for the employer. Several researchers tried to estimate the costs of presenteeism, and some have suggested that these even exceed the costs associated with sickness absence[13, 14]. Besides the expenditures for the employer, the consequences of presenteeism for the individual worker have been studied. Since sickness presenteeism inhibits the recuperation from illness, it possibly harms the health of the employee. Kivimäki *et al*. revealed that the incidence of coronary heart disease was twice as high in the group of unhealthy workers that never took sickness absence in compari-

son with unhealthy employees with moderate levels of sickness absence[15]. A follow-up study demonstrated that sickness presenteeism seems to be an independent risk factor for future poor general health[16].

Only a few studies have investigated the association between presenteeism and sickness absence. Aronsson *et al*. demonstrated in a cross-sectional study of 3,891 Swedish employees an association between high presenteeism and high sickness absence[2]. These findings were supported by Hansen *et al*., who revealed a strong correlation between presenteeism and self-reported sickness absence frequency[12]. A recent study of Bergström *et al*. with several enhanced methodological features in comparison with the former studies revealed that sickness presenteeism of more than five times during the baseline year was a significant risk for future sick leave of more than 30 days during the follow-up period[17]. However, this study only evaluated the total amount of sickness absence, ignoring the duration of sick leave per spell or the frequency of the sickness spells. Previous findings suggested that differences between sickness absence duration and sickness absence frequency reflect variations in the underlying processes. Short-term sickness absence and high absence frequency are assumed to be more related to attitude, while long-term sickness absence is suggested to be particularly related to ill health and inability to perform work tasks[18, 19].

The goal of this longitudinal study was to investigate whether there is a relation between sickness presenteeism and different measures of sickness absence among a group of Belgian workers. Presenteeism was examined in relation to both short and long spells of sickness absence and to high frequent sickness absence during one year of follow-up.

Subjects and Methods

Study population

The relation of presenteeism with different measures of future sickness absence was investigated within the Belstress III study, a Belgian follow-up study aiming to identify the risk factors for sick leave at work[20].

The workers, aged 30 to 55 years, from seven Belgian companies (comprising public administration, health care and social work sectors and a manufacturing company) were invited to participate in the study. The response rate was 30.4%, representing a total of 2,983 participants, and was lower in the lower occupational groups. Analysis of the nonrespondent characteristics revealed no difference with respect to gender or age. The study population consisted of 1,372 men and 1,611 women, and the majority (72%) was employed full-time.

The Belstress III study was approved by the ethics committees of the Ghent University Hospital and the Faculty of Medicine of the Free University of Brussels.

Data collection

1) Questionnaire data

All participants completed a self-administered questionnaire including standardized measures for individual and sociodemographic variables, health behaviors and characteristics of the psychosocial work environment.

The measure of presenteeism was based on a single question assessing how often employees came working despite being ill during the last year. There were 4 response categories: “never”, “one time”, “2 to 5 times”, “more than 5 times”, which referred to the frequency of occasions of presenteeism. This question has been applied in earlier research on presenteeism[2, 5, 16, 17]. In the analyses, three categories were used: 0–1 times, 2–5 times (moderate rates of presenteeism), >5 times (high rates of presenteeism). The respondents were questioned about their sickness absence, namely: the total number of sick leave days, the total number of sick leave episodes and the episodes of longer sick leave (>15 days) within the previous 12 months. This variables were entered as dichotomous variables (yes/no) in the analyses. Low educational level was defined as completing primary school and the first 3 years of the secondary school level; medium educational level was defined as completing the secondary school level; and high educational level was defined as completing high school or university. Occupations were defined according to the International Standard Classification of Occupations[21] and grouped into executives, white-collars and blue-collars. Age was used as a continuous variable.

Respondents were asked about a number of health indicators and lifestyle behaviors, such as current smoking habits (yes/no), alcohol use and physical activity. Excessive alcohol consumption was defined as an average of more than 3 units per day for men and more than 2 units per day for women. Physically active persons were considered to exercise or to do strenuous physical activities for at least 20 minutes at least two times a week. Body mass index (BMI) was calculated as the self-reported body weight (in kg) divided by the square of the reported height (in m) and was entered as a continuous variable in the analyses. Self-rated health was evaluated by the following question, which had 5 response categories: “How do you generally assess your health?”. The variable was dichotomized as very good or good versus average, bad or very bad. For the measurement of symptoms of depression, the short Iowa scale of the Center

for Epidemiological Studies Depression scale was applied[22]. This scale consists of 11 items, and after calculating the sum score (range: 11–33), a cut-off value higher than 19 was used to identify those with symptoms of depression.

The psychosocial work environment was assessed with the Job Content Questionnaire, based on the Job-Demand-Control (-Support) model of Karasek[23]. Dichotomous variables were created for demands, support and control based on the median values. To evaluate the amount of stress outside work, a scale based on eight items regarding problems in private life was used[24]. The upper quartile of the sample was considered to have high levels of stress outside work. The workers were asked about the flexibility toward the start and ending of their working day. This variable was entered as a dichotomous variable.

2) Outcome variables: sickness absence data

The objective sickness absence data were collected prospectively during 12 months of follow-up, starting from the day on which the questionnaire was filled out. All the sick leave days were registered by the personnel administration departments of the participating companies. Since in Belgium a medical certificate for absences of more than one day is required to benefit from guaranteed salary and medical insurance, we expected that this sickness absence registration would be highly accurate. Complete sickness absence data could be gathered for 2,876 participants; 107 were lost during follow-up, mainly due to resignation or dismissal. A long spell of sickness absence was defined as at least 15 consecutive days of sickness absence during the follow-up period, while a short spell of sickness absence was defined as a spell between 1 and 3 days. High sickness absence frequency was defined as a minimum of 3 sick leave episodes during follow-up; this corresponded to the upper quintile of the sample.

Statistical analysis

The relation of presenteeism with the different measures of sickness absence was assessed through logistic regression analysis. Presenteeism was entered as a categorical variable in the analysis: the odds ratios for the employees reporting moderate rates and high rates were calculated, with the category of no or one time of presenteeism as a reference.

First, chi^2 and *t*-tests were performed, in order to explore whether presenteeism and the possible confounding variables were associated with the three outcome variables. Second, covariates whose univariate test had a *p*-value <0.25 were retained as potential confounders and entered in the multivariate logistic regression model to prevent potentially important variables from being rejected[25].

The factors included as covariates were considered to be potential risk factors for sickness absence[26] and could therefore act as confounders of the relation between presenteeism and sickness absence. Finally, a fully adjusted model including all covariates was reduced by backward elimination of nonsignificant covariates. The resulting models were controlled by reintroducing each of the eliminated covariates one by one, and if significant, the covariate was retained in the model. Since the participants were recruited from 7 different companies with probable diverse policies toward sickness absence, this variable, "company", was regarded as an essential confounder. Since there were some missing values for several variables, both the crude and adjusted models were restricted to those cases with complete data for all variables entered in the fully adjusted models. To check for collinearity, the variance inflation factors were calculated.

As previous research demonstrated a gender difference in sickness absence[26], the analyses were done separately for men and women. In addition, preliminary analysis revealed a significant interaction effect between gender and presenteeism in the relation with long sickness absence. All multivariate models were evaluated at the 95% significance level ($p<0.05$). The analyses were conducted using the PASW 18.0 software.

Results

Table 1 demonstrates that the majority of the sample was white collar or executive and that only 20% of the total study population was lower educated. The percentage of lower educated workers and blue-collar workers was significantly higher in the male group. The proportion of workers with average/bad/very bad self-rated health and with depressive symptoms was significantly higher in women.

Table 2 summarizes presenteeism, and short/long spells of sickness absence and high sickness frequency in the study population. A significant gender difference could be observed, indicating that the female group had higher sick leave and higher presenteeism figures.

In the crude model, moderate and high rates of presenteeism at baseline were positively and significantly associated with long spells of sickness absence and high sickness frequency during the follow-up period of 1 year, in both males and females. The results suggest a dose-response relationship for long spells and high frequent sickness absence (Tables 3 and 4). For short spells of sickness absence, a significant association in both genders only could be demonstrated for the high rates of presenteeism (Table 5).

During conduct of the statistical analyses, several groupings of confounders that reached the explained

Table 1. Descriptive sociodemographic, life style, health- and work-related variables in the total study population

Variable	Total study sample (n=2,983)	Men (n=1,372)	Women (n=1,611)	Gender difference p[a]
Sociodemographic variables:				
Age (years): mean (SD) (n=2,983)	43.3 (6.74)	43.5 (6.67)	43.1 (6.80)	0.12
Educational level: n (%)[b] (n=2,971)				
Low educated	617 (20.8)	353 (25.8)	264 (16.4)	<0.001
Medium educated	1,031 (34.7)	467 (34.2)	564 (35.2)	
High educated	1,323 (44.5)	547 (40.0)	776 (48.4)	
Occupation: n (%)[b] (n=2,850)				
Executive	719 (25.2)	439 (33.4)	280 (18.2)	<0.001
White collar	1,826 (64.1)	678 (51.5)	1,148 (74.8)	
Blue collar	305 (10.7)	198 (15.1)	107 (7.0)	
Lifestyle variables:				
Body mass index (kg/m^2): mean (SD) (n=2,927)	25.1 (4.08)	25.9 (3.50)	24.5 (4.43)	<0.001
Smoking: n (%)[b] (n=2,962)	816 (27.5)	380 (27.8)	436 (27.3)	0.769
Excessive alcohol use: n (%)[b] (n=2,936)	619 (21.1)	332 (24.5)	287 (18.2)	<0.001
Low physical activity: n (%)[b] (n=2,943)	2,002 (68.0)	802 (58.9)	1,200 (75.9)	<0.001
Health-related variables:				
Depressive symptoms: n (%)[b] (n=2,948)	773 (26.2)	270 (19.8)	503 (31.7)	<0.001
Poor self-rated health: n (%)[b] (n=2,938)	943 (32.1)	401 (29.6)	542 (34.2)	0.007
Work-related variables:				
High job demands: n (%)[b] (n=2,959)	1,506 (50.9)	635 (46.6)	871 (54.5)	<0.001
Low job control: n (%)[b] (n=2,955)	1,475 (49.9)	596 (43.7)	879 (55.2)	<0.001
Low social support: n (%)[b] (n=2,945)	1,510 (51.3)	706 (51.8)	804 (50.8)	0.621
High stress outside work: n (%)[b] (n=2,892)	785 (27.1)	336 (25.0)	449 (29.0)	0.018
Flexible working hours: n (%)[b] (n=2,953)	968 (32.8)	547 (40.3)	421 (26.4)	<0.001

[a] Result of t test or χ^2 test. [b] Calculated according to the percentage of the valid count.

criteria were studied together with presenteeism. The covariate "company" was considered as an a priori confounder (results for this separate covariate are not shown). The other selected confounders used in the fully adjusted models for the several outcome variables are listed in the tables. After adjustment, the relationship in the female workers between moderate rates of presenteeism and long spells of sickness absence disappeared. The adjustments did not substantially change the significance of the positive relation between high sickness presenteeism and short sickness absence. When regarding the high frequency sickness absence outcome, only in the female workers did the relationship between high rates of presenteeism and high sickness frequency remain significant. The Nagelkerke R^2 values of the models were considerably higher for long sickness absence and high frequency of absence in comparison with those for

Table 2. Presenteeism and absenteeism in the total study population

Variable	Total study sample (n=2,983)	Men (n=1,372)	Women (n=1,611)	Gender difference p[a]
Presenteeism: n (%)[b] (n=2,933)				
0–1 time	1,448 (49.4)	746 (54.9)	702 (44.6)	<0.001
2–5 times	1,246 (42.5)	537 (39.6)	709 (45.0)	
>5 times	239 (8.1)	75 (5.5)	164 (10.4)	
Long spells (>15 days) of absence: n (%)[b] (n=2,876)	522 (18.2)	199 (15.1)	323 (20.7)	<0.001
Short spells (1–3 days) of absence: n (%)[b] (n=2,875)	1,069 (37.2)	453 (34.4)	616 (39.5)	0.005
High frequency of sickness absence: n (%)[b] (n=2,875)	568 (19.8)	231 (17.6)	337 (21.6)	0.007

[a] Result of χ^2 test. [b] Calculated according to the percentage of the valid count.

Table 3. Independent odds ratios (OR) for presenteeism and confounding variables for long spells of absence

	Long spells of absence (>15 days)			
	Men (n=935)		Women (n=867)	
	Crude OR (95% CI)	Adjusted OR (95% CI)[a]	Crude OR (95% CI)	Adjusted OR (95% CI)[a]
Baseline presenteeism				
0–1 time	1	1	1	1
2–5 times	2.26 (1.50–3.40)***	1.90 (1.21–2.97)**	1.60 (1.10–2.34)*	1.37 (0.91–2.06)
>5 times	4.81 (2.38–9.72)***	2.73 (1.24–6.03)*	3.67 (2.15–6.28)***	2.40 (1.31–4.40)**
Occupation				
Executives	1	1	1	1
White collars	1.63 (1.04–2.57)*	1.18 (0.72–1.96)	1.95 (1.15–3.30)*	1.24 (0.71–2.18)
Blue collars	2.92 (1.63–5.22)***	2.26 (1.16–4.38)*	4.66 (2.15–10.10)***	3.46 (1.47–8.14)**
Depressive symptoms				
No	1	1	1	1
Yes	2.54 (1.67–3.86)***	1.54 (0.94–2.52)	2.05 (1.44–2.92)***	1.40 (0.93–2.09)
Sick leave during previous year				
No	1	1	1	1
Yes	4.12 (2.77–6.15)***	2.59 (1.67–4.01)***	1.86 (1.30–2.65)**	1.53 (1.04–2.25)*
Self-rated health				
Good/very good	1	1	1	1
Average/bad/very bad	2.84 (1.93–4.18)***	1.73 (1.10–2.73)*	2.41 (1.71–3.41)***	1.54 (1.04–2.29)*
Job demands				
High	1	1	1	1
Low	1.25 (0.85–1.83)	1.20 (0.73–1.72)	1.39 (0.99–1.95)	1.60 (1.07–2.38)*
Body mass index	1.06 (1.00–1.11)*	1.01 (0.96–1.07)	1.08 (1.04–1.12)***	1.06 (1.02–1.10)**

***p<0.001, **p<0.01, *p<0.05. [a] Odds ratios are adjusted for the covariates as listed in the table and additionally adjusted for "company". 95% CI=95% confidence interval.

Table 4. Independent odds ratios (OR) for baseline presenteeism and confounders for frequent sickness absence

	High absence frequency (>3 occasions)			
	Men (n=1,130)		Women (n=1,251)	
	Crude OR (95% CI)	Adjusted OR (95% CI)[a]	Crude OR (95% CI)	Adjusted OR (95% CI)[a]
Baseline presenteeism				
0–1 time	1	1	1	1
2–5 times	1.50 (1.07–2.08)*	1.13 (0.77–1.65)	1.51 (1.11–2.05)**	1.22 (0.86–1.72)
>5 times	3.71 (2.07–6.65)***	1.70 (0.84–3.44)	3.21 (2.05–5.01)***	2.38 (1.40–4.04)**
Occupation				
Executives	1	1	1	1
White collars	3.17 (2.05–4.90)***	2.47 (1.53–4.01)***	2.20 (1.40–3.45)***	1.73 (1.05–2.83)*
Blue collars	4.57 (2.71–7.73)***	2.66 (1.47–4.84)**	3.78 (1.99–7.17)***	2.31 (1.14–4.69)*
Depressive symptoms				
No	1	1	1	1
Yes	1.96 (1.36–2.82)***	1.04 (0.66–1.64)	1.54 (1.15–2.06)**	1.42 (0.99–2.03)
Sick leave during previous year				
No	1	1	1	1
Yes	6.80 (4.77–9.69)***	4.99 (3.36–7.40)***	3.32 (2.46–4.49)***	2.65 (1.90–3.71)***
Self-rated health				
Good/very good	1	1	1	1
Average/bad/very bad	2.89 (2.09–3.99)***	2.07 (1.39–3.10)***	2.46 (1.84–3.27)***	1.74 (1.24–2.46)**
Job demands				
High	1	1	1	1
Low	1.30 (0.95–1.79)	1.02 (0.70–1.50)	1.63 (1.23–2.16)**	1.54 (1.10–2.16)*
Social support at work				
High	1	1	1	1
Low	1.65 (1.20–2.28)**	1.61 (1.11–2.33)*	1.19 (0.90–1.58)	1.13 (0.82–1.56)
Body mass index	1.05 (1.01–1.10)*	1.00 (0.95–1.05)	1.05 (1.02–1.09)*	1.05 (1.02–1.09)**
Physical active				
Yes	1	1	1	1
No	1.31 (0.95–1.82)	1.14(0.79–1.66)	0.77 (0.56–1.05)	0.60 (0.42–0.86)**

***$p<0.001$, **$p<0.01$, *$p<0.05$. [a] Odds ratios are adjusted for the covariates as listed in the table and additionally adjusted for "company". 95% CI = 95% confidence interval.

short spells of sickness absence (Table 6).

Discussion

This longitudinal study demonstrated that presenteeism is related to several detailed measures of absenteeism in a Belgian working population.

This study adds evidence to the scarcely existing literature, investigating the relation between presenteeism and sickness absence. A few cross-sectional studies supported the finding that high presenteeism is associated with high sickness absence[2, 12]. To our knowledge, only one study has examined the relation between presenteeism and sickness absence duration in a prospective way and concluded that high rates of presenteeism at baseline were a significant risk for future sick leave. However, this study by Bergström[17] was restricted to the total amount of absence days without considering the length or incidence of separate periods of absence. However, since it is suggested that long spells of sickness absence are more related to the health status of the employee, while working conditions are considered to effect shorter spells of sickness absence[18], it is important to evaluate the relation of presenteeism with both types of sickness absence. Presenteeism is suggested to cause poor health status. The worker who is attending work despite illness cannot take the required recuperation period, which may lead to an exacerbation of illness symptoms and subsequently reduce the capacity to remain at work in the long term[15, 16]. Therefore, it is likely that presenteeism would be related to future long spells of sickness absence, which is confirmed by

Table 5. Independent odds ratios (OR) for baseline presenteeism and confounders for short spells of absence

	Short spells of absence (1–3 days)			
	Men (n=1,026)		Women (n=1,044)	
	Crude OR (95% CI)	Adjusted OR (95% CI)[a]	Crude OR (95%CI)	Adjusted OR (95% CI)[a]
Baseline presenteeism				
0–1 time	1	1	1	1
2–5 times	1.15 (0.88–1.51)	1.06 (0.79–1.42)	1.05 (0.81–1.37)	1.06 (0.80–1.41)
>5 times	2.75 (1.53–4.93)**	2.38 (1.25–4.51)**	1.71 (1.10–2.65)*	1.90 (1.17–3.11)*
Occupation				
Executives	1	1	1	1
White collars	1.70 (1.26–2.28)***	1.57 (1.13–2.17)**	0.96 (0.70–1.33)	0.87 (0.62–1.24)
Blue collars	2.11 (1.39–3.20)***	1.60 (1.02–2.50)*	1.38 (0.78–2.45)	0.99 (0.53–1.82)
Sick leave during previous year				
No	1	1	1	1
Yes	1.32 (0.98–1.77)	1.42 (1.04–1.94)*	1.50 (1.13–1.99)**	1.41 (1.04–1.91)*
Self-rated health				
Good/very good	1	1	1	1
Average/bad/very bad	1.83 (1.38–2.42)***	1.73 (1.26–2.37)**	1.25 (0.96–1.63)	1.20 (0.88–1.62)
Job demands				
High	1	1	1	1
Low	1.22 (0.94–1.58)	1.10 (0.83–1.47)	1.56 (1.21–2.01)**	1.38 (1.04–1.84)*
Age	0.99 (0.97–1.01)	0.99 (0.97–1.01)	0.98 (0.96–1.00)*	0.98 (0.96–1.00)*
Body mass index	1.01 (0.98–1.05)	1.00 (0.96–1.04)	1.01 (0.98–1.04)	1.03 (1.00–1.06)
Smoking				
No	1	1	1	1
Yes	1.50 (1.13–1.99)**	1.30 (0.96–1.76)	1.07 (0.80–1.43)	0.99 (0.73–1.35)
Problems outside work				
No	1	1	1	1
Yes	1.41 (1.05–1.89)*	1.41 (1.02–1.96)*	1.05 (0.80–1.39)	1.17 (0.86–1.60)

***p<0.001, **p<0.01, *p<0.05. [a] Odds ratios are adjusted for the covariates as listed in the table and additionally adjusted for "company". 95% CI = 95% confidence interval.

our results. However, high rates of presenteeism were related to short spells of sickness absence in both men and women and frequent sickness leave in women, as well. Still other aspects, such as the situation of the labor market with economic insecurity, changes in management strategies toward sickness absence, workplace culture and sense of duty of the individual worker, can be factors in the complex mutual interplay between absenteeism and presenteeism. These factors were possibly not fully captured by the confounding variables and could have varied during the follow-up period, forcing someone more into presenteeism or sickness absence. The rather low Nagelkerke R^2 of the fully adjusted model for the short spells of sickness absence confirms this concern regarding lacking covariates. In contrast, the R^2 of the models for long spells of absence and high frequency of sickness absence were considerably higher, which suggests that these models contained important covariates for explaining the outcome.

Another notable finding is that a dose-response relationship could be demonstrated: high rates of presenteeism were linked with higher odds for long spells of sickness absence, which provides additive confirmation for the relation of presenteeism with long spells of future sickness absence. With respect to the short spells of sickness absence, only high rates of presenteeism were significantly associated with this sickness absence measure, indicating that a minimum frequency of 5 times of presenteeism at baseline is needed to be related with short spells of sickness absence. Presenteeism of more than 5 times was significantly related to high sickness absence frequency in female workers only. These results underline the suggestion of Bergström[17], that the frequency of occasions of sickness presenteeism is of substantial importance

Table 6. Nagelkerke R^2 for the crude associations between presenteeism and sickness absence and for the fully adjusted models

	Long sickness absence		High frequency of absence		Short sickness absence	
	Men	Women	Men	Women	Men	Women
Presenteeism crude model	0.051	0.041	0.029	0.032	0.016	0.008
Fully adjusted model	0.191	0.171	0.264	0.236	0.110	0.119

for the risk of future sickness leave. Besides the frequency, it is possible that also the length of presenteeism may play an important role. Since the applied presenteeism measure did not contain the duration of presenteeism, no information about the impact of the length of presenteeism on sickness absence could be provided.

Since important gender differences regarding sickness absence have been revealed in the literature, the relation of presenteeism with sickness absence was studied separately for both genders[26]. Moreover, a significant interaction effect between gender and presenteeism with regard to long spells of sickness absence was observed (results not shown). Concerning short spells and high frequency of sickness absence, no significant interaction effect between gender and presenteeism could be revealed. This is in contrast with Bergström's conclusion that his results would be generally applicable to both men and women[17].

Concerning the other covariates, self-rated health status, previous sickness absence and occupation were related to the several measures of absenteeism, which was also demonstrated in previous research[27]. In female workers, body mass index was associated with long spells and frequent sickness absence, which is in line with earlier research highlighting the association between obesity and sick leave[28]. Low social support was not consistently related to the sickness absence measures, which is in accordance with previous findings, indicating that social support was of less importance as a predictor for sickness absence[29]. Low social support was associated with frequent absences in men only. The same relationship between high levels of support and lesser sickness absence spells was observed only in the male group of the Gazel cohort[30]. High job demands were independently related to a reduced risk for the three sickness absence measures only in the female group. This is in contrast with some previous studies stating an association of high demands with absenteeism[31, 32]. However, the association of high demands with lower sickness absence figures was also demonstrated in a sample from the Whitehall II cohort[33]. A possible explanation is that selection of ambitious workers occurred in this predominantly white-collar sample. These individuals possibly consider these high demands jobs as a challenge and are therefore likely to have less sickness absence. Remarkably, job control was not retained in any of the models, which is in contrast with most of the research that identified low job control as an important psychosocial risk factor for sick leave[30].

To the authors' knowledge, this is the first study investigating the relation of presenteeism with different measures of future sickness absenteeism.

However, there are some limitations that have to be mentioned. First, presenteeism, measured with a single item, could be effected by recall bias. To assess presenteeism, several questionnaires are available, but in general, the validity of these presenteeism measures is difficult to establish, given the nature of the data being collected. Since a decline in productivity is one of the possible consequences of presenteeism, theoretically this productivity loss can be an objective measurement of presenteeism. However, for most jobs, especially for knowledge-based jobs, there is no true account for assessing worker productivity. Nevertheless, this single question was applied previously by several researchers, and their studies suggested similar presenteeism rates (38–61%)[4, 6, 7, 16, 17].

The fairly low response rate is another restriction, which can lead to a selection bias in the population. Unfortunately, we were not able to examine whether non-respondents differed from respondents with respect to sickness absence levels or presenteeism. Although no important differences in age and gender were revealed, caution should be made in generalization of the results. Another selection bias could possibly have been caused by the dropout of 107 workers during the follow-up period. However, analysis of the presenteeism rates showed no significant difference between this group with missing data and the included workers. In addition, it should be noted that participants of the Belstress III study were not recruited from a representative sample of the Belgian working population. Nevertheless, this is of little value in analytical studies like this one, where possible causal relationships are examined[34].

Since the empirical knowledge and the theoretical insights in the relationship between the concept of presenteeism and sickness absence are limited,

the selection of the co-variables that may act as confounders is a challenging task. Although several potential confounders were tested in the models, it is possible that the addition of other variables would result in modified odds ratios. Another limitation is related to the statistical analyses used in this study. In multiple logistic regression analysis, sufficient events per covariate are needed in order to obtain a reliable estimate of the regression coefficients. This may be a problem for high presenteeism, which is a relatively infrequent event in both genders. However, the criterion that at least 10 events per variable should be achieved was met for all separate covariates[35]. Therefore, the models were adjusted for baseline sickness absence, instead of conducting the analysis on a subgroup of participants without sickness absence at baseline. Nevertheless, an additional analysis was conducted on this subgroup, which demonstrated quite similar results, although, for some presenteeism groups, the odds ratios were not significant or were only borderline significant, due to reduced statistical power.

Unfortunately, it was not possible to investigate the impact of presenteeism on diagnosis-specific sickness absence, which possibly could provide more information about the particular effect of presenteeism on the health status of the individual worker. Finally, it is worth mentioning that the follow-up period of one year is rather short for evaluation of the full effect of presenteeism on the sickness absence measurements.

A major strength of this study is that results were based on registered, objective sickness absence measurements, which is clearly a more reliable evaluation in comparison with self-reported sickness absence. Moreover, the accurate registration of sickness absence data enabled us to analyze the association between presenteeism and both long/short spells of sickness absence and sickness frequency. In addition, the longitudinal design of this 12 month follow-up study permitted us to assess the prospective association between presenteeism and sickness absence. Furthermore, the data allowed adjusting for previous sickness absence and other potential confounding variables.

In conclusion, we demonstrated that presenteeism was related to several measures of future sickness absence, especially long sickness absence. Some recommendations for further research can be made. Longitudinal studies that not only record the incidence and duration of sickness absence, but additionally assess the health status, diagnosis-specific sickness absence and the presenteeism behavior during a longer follow-up period would allow a more profound exploration of the interplay between presenteeism and absenteeism. The main implication for practice is that management strategies dealing with absenteeism, also have to take into account the concept of presenteeism. Employers have to be aware of the possible consequences of high rates of presenteeism on their absence figures.

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References

1) McKevitt C, Morgan M, Dundas R, Holland WW. Sickness absence and 'working through' illness: a comparison of two professional groups. J Public Health Med 1997; 19: 295–300.
2) 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.
3) Bernaards CM, Proper KI, Hildebrandt VH. Physical activity, cardiorespiratory fitness, and body mass index in relationship to work productivity and sickness absence in computer workers with preexisting neck and upper limb symptoms. J Occup Environ Med 2007; 49: 633–40.
4) Boles M, Pelletier B, Lynch W. The relationship between health risk and work productivity. J Occup Environ Med 2004; 46: 737–45.
5) Aronsson G, Gustafsson K. Sickness presenteeism: prevalence, attendance-pressure factors, and an outline of a model for research. J Occup Environ Med 2005; 47: 958–66.
6) Elstad JI, Vabo M. Job stress, sickness absence and sickness presenteeism in the Nordic elderly care. Scand J Public Health 2008; 36: 467–74.
7) Heponiemi T, Elovaionio M, Pentti J, et al. Association of contractual and subjective job insecurity with sickness presenteeism among public sector employees. J Occup Environ Med 2010; 52: 830–5.
8) Böckerman P, Laukkanen E. What makes you work while you are sick? Evidence from a survey of workers. Eur J Public Health 2010; 20: 43–6.
9) van den Heuvel SG, Geuskens GA, Hooftman WE, Koppes LL, van den Bossche SN. Productivity loss at work; health-related and work-related factors. J Occup Rehabil 2010; 20: 331–9.

10) Schultz AB, Edington DW. Employee Health and presenteeism: a systematic review. J Occup Rehabil 2007; 17: 547–79.
11) Harvey SB, Glozier N, Henderson M, et al. Depression and work performance: an ecological study using web-based screening. Occup Med 2011; 61: 209–21.
12) Hansen CD, Andersen JH. Going ill to work—What personal circumstances, attitudes and work-related factors are associated with sickness presenteeism? Soc Sci Med 2008; 67: 956–64.
13) Goetzel RZ, Long SR, Ozminkowski RJ, Hawkins K, Wang S, Lynch W. Health, absence, disability, and presenteeism cost estimates of certain physical and mental health conditions affecting U.S. employers. J Occup Environ Med 2004; 46: 398–412.
14) Stewart WF, Ricci JA, Chee E, Morganstein D. Lost productive work time costs from health conditions in the United States: results from the American Productivity Audit. J Occup Environ Med 2003; 45: 1234–46.
15) Kivimäki M, Head J, Ferrie JE, et al. Working while ill as a risk factor for serious coronary events: The Whitehall II Study. Am J Public Health 2005; 95: 98–102.
16) Bergström G, Bodin L, Haghberg J, Lindh T, Aronsson G, Josephson M. Does sickness presenteeism have an impact on future general health? Int Arch Occup Environ Health 2009; 82: 1179–90.
17) Bergström G, Bodin L, Haghberg J, Aronsson G, Josephson M. Sickness presenteeism today, sickness absenteeism tomorrow? A prospective study on sickness presenteeism and future sickness absenteeism. J Occup Environ Med 2009; 51: 629–38.
18) Marmot M, Feeney A, Shipley M, North F, Syme SL. Sickness absence as a measure of health status and functioning: from the UK Whitehall II study. J Epidemiol Community Health 1995; 49: 124–30.
19) Bakker AB, Demerouti E, de Boer E, Schaufeli WB. Job demands and job resources as predictors of absence duration and frequency. J Vocat Behav 2003; 62: 341–56.
20) Clays E, Kittel F, Godin I, Bacquer DD, Backer GD. Measures of work-family conflict predict sickness absence from work. J Occup Environ Med 2009; 51: 879–86.
21) International Standard Classification of Occupations: ISCO-88. Geneva (Switzerland): International Labour Office; 1990.
22) Radloff L. The CES-D Scale: a self-report depression scale for research in the general population. Applied Psychology Measure 1997; 1: 385–401.
23) Karasek R, Brisson C, Kawakami N, Houtman I, Bongers P, Amick B. The Job Content Questionnaire (JCQ): an instrument for internationally comparative assessments of psychosocial job characteristics. J Occup Health Psychol 1986; 3: 322–55.
24) Klitzman S, House JS, Israel BA, Mero RP. Work stress, nonwork stress, and health. J Behav Med 1990; 13: 221–43.
25) Hosmer D, Lemeshow A. Applied Logistic Regression, 2nd ed. New York: Wiley; 2000.
26) Allebeck P, Mastekaasa A. Swedish Council on Technology Assessment in Health Care. Chapter 5. Risk factors for sick leave- general studies. Scand J Public Health Suppl 2004; 32: 49–108.
27) Beemsterboer W, Stewart R, Groothoff J, Nijhuis F. A literature review on sick leave determinants. Int J Occup Med Environ Health 2009; 22: 169–79.
28) van Duijvenbode DC, Hoozemans MJ, van Poppel MN, Proper KI. The relationship between overweight and obesity, and sick leave: a systematic review. Int J Obes (Lond) 2009; 33: 807–16.
29) Andrea H, Beurskens AJHM, Metsemakers JFM, van Amelsvoort LGPM. Health problems and psychosocial work environment as predictors of long term sickness absence in employees who visited the occupational physician and/or general practitioner in relation to work: a prospective study. Occup Environ Med 2003; 60: 295–300.
30) Niedhammer I, Bugel I, Goldberg M, Leclerc A, Guéguen A. Psychosocial factors at work and sickness absence in the Gazel cohort: a prospective study. Occup Environ Med 1998; 55: 735–41.
31) Van Yperen NW, Snijders TA. A multilevel analysis of the demands-control model: is stress at work determined by factors of the group level or the individual level? J Occup Health Psychol 2000; 5: 182–90.
32) Gimeno D, Benavides FG, Amick BC, Benach J, Martinez JM. Psychosocial factors and work related sickness absence among permanent and non-permanent employees. J Epidemiol Community Health 2004; 58: 870–6.
33) Rehkopf DH, Kuper H, Marmot MG. Discrepancy between objective and subjective measures of job stress and sickness absence. Scan J Work Environ Health 2010; 36: 449–57.
34) Kristensen T. The demand-control-support model: methodological challenges for future research. Stress Med 1995; 11: 17–26.
35) Peduzzi P, Concato J, Kemper E, Holford TR, Feinstein AR. A simulation study of the number of events per variable in logistic regression analysis. J Clin Epidemiol 1996; 49: 1373–9.