Psychosocial Work Environment and Sickness Absence among British Civil Servants: The Whitehall II Study

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ABSTRACT

Objectives. This study sought to examine the association between the psychosocial work environment and subsequent rates of sickness absence.

Methods. The analyses were based on a cohort of male and female British civil servants (n = 9072). Rates of short spells (≤ 7 days) and long spells (>7 days) of sickness absence were calculated for different aspects of the psychosocial work environment, as measured by self-reports and personnel managers' ratings (external assessments).

Results. Low levels of work demands, control, and support were associated with higher rates of short and long spells of absence in men and, to a lesser extent, in women. The differences were similar for the self-reports and external assessments. After adjustment for grade of employment, the differences were diminished but generally remained significant for short spells. The combination of high demands and low control was only associated with higher rates of short spells in the lower grades.

Conclusions. The psychosocial work environment predicts rates of sickness absence. Increased levels of control and support at work could have beneficial effects in terms of both improving the health and well-being of employees and increasing productivity. (*Am J Public Health.* 1996;86:332–340)

Introduction

Over the past 30 years, numerous studies have suggested that job stress, defined in different ways, is associated with an increased risk of adverse health and behavioral outcomes.[1–7] Earlier studies of coronary heart disease and hypertension defined job stress in terms of excessive workload and pressures.[8–10] In contrast, studies of job satisfaction, work performance, and sickness absence have focused on different work characteristics, such as autonomy, variety, skill use, and responsibility for completing tasks.[11–15] In 1979, Karasek proposed the "job strain model," which integrated these two approaches.[16]

A number of studies have provided empirical support for the job strain model by suggesting that individuals in occupations with high work demands and low control are at an increased risk for physical and psychological symptoms, coronary heart disease and its concomitant risk factors, sickness absence, job and life dissatisfaction, and medication use.[16–23] Johnson and Hall modified the job strain model by suggesting that lack of support at work combines with high work demands and low control to increase strain and adverse health outcomes.[24,25]

In this paper, we address three issues raised by recent research. The first relates to how the work environment has been measured. Some studies have used employees' reports of their work, which may relate as much to personal factors as to the work environment itself; others have used some form of external assessment that may overlook the importance of the employees' perception of their work environment. Second, most studies have been restricted to men, predominantly those in production, distribution, and service occupations. It is therefore not clear whether the job strain model also applies to women or to office and professional occupations. Third, most studies have taken inadequate account of the role of socioeconomic status (SES). However, the relationship between SES, the work environment, and health is likely to be complex. Adjusting for SES may result in an underestimation of the effect of the work environment if the latter were to partially mediate between SES and health. Alternatively, not adjusting for SES may result in an overestimation of the effect of work on health. Finally, if inadequate measures of SES are used, any adjustment would be incomplete.

In the ongoing Whitehall II study of British civil servants, we examine the relationship between the psychosocial work environment and a general measure of health: sickness absence. Employees and personnel managers provide ratings of the work environment; the study population includes both men and women in office and professional occupations; and the potential confounding effect of SES is examined by adjusting for both grade of employment and separately

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Editor's Note. See related editorial by Fine (p 301) in this issue.

TABLE 1—Short Spells of Sickness Absence (≤7 Days) among British Civil Servants, by Self-Reported Work Characteristics

Work Characteristic	Rate[a]	No. Events	Age		Age, Grade		Age, Other SES Indicators[b]	
			Adjusted RR	95% CI	Adjusted RR	95% CI	Adjusted RR	95% CI
Men								
Work demands (n = 4753)								
Low	166.5	3329	1.0		1.0		1.0	
Medium	131.5	3178	0.79	0.73, 0.85	0.94	0.87, 1.01	0.81	0.75, 0.87
High	119.1	2797	0.71	0.66, 0.77	0.98	0.91, 1.06	0.75	0.69, 0.80
Control at work (n = 4760)								
Low	204.8	3319	1.0		1.0		1.0	
Medium	131.5	3171	0.60	0.60, 0.69	0.87	0.80, 0.97	0.66	0.62, 0.72
High	103.5	2840	0.50	0.47, 0.54	0.78	0.72, 0.85	0.53	0.49, 0.57
Support at work (n = 4764)								
Low	157.9	3611	1.0		1.0		1.0	
Medium	130.1	2903	0.83	0.77, 0.89	0.88	0.82, 0.95	0.83	0.78, 0.90
High	124.7	2828	0.79	0.74, 0.85	0.84	0.78, 0.91	0.81	0.75, 0.87
Women								
Work demands (n = 2066)								
Low	228.1	3279	1.0		1.0		1.0	
Medium	224.7	1994	0.98	0.90, 1.07	1.08	0.98, 1.18	1.00	0.91, 1.09
High	212.1	1316	0.92	0.83, 1.02	1.10	0.99, 1.22	0.93	0.84, 1.03
Control at work (n = 2070)								
Low	249.9	3674	1.0		1.0		1.0	
Medium	205.5	1857	0.81	0.74, 0.89	0.88	0.80, 0.96	0.82	0.75, 0.90
High	185.5	1071	0.73	0.66, 0.81	0.88	0.79, 0.99	0.74	0.66, 0.83
Support at work (n = 2085)								
Low	235.5	2671	1.0		1.0		1.0	
Medium	212.6	1917	0.90	0.82, 0.99	0.93	0.84, 1.02	0.92	0.83, 1.01
High	222.0	2093	0.94	0.86, 1.03	0.94	0.85, 1.02	0.93	0.85, 1.02

Note: RR = rate ratio; CI = confidence interval; SES = socioeconomic status.
[a]Rates of sickness absence per 100 person-years.
[b]Other indicators of socioeconomic status are years of education, housing tenure, access to a car.

other indicators of SES, and by stratifying for grade.

Methods

Study Population

All nonindustrial civil servants aged 35 to 55 years working in the London offices of 20 departments were invited to participate in this study. The overall response rate was 73% (74% for men, 71% for women). The true response rate would probably have been higher, however, because about 4% of the civil servants on the lists provided by the civil service had moved before the study and were therefore not eligible for inclusion. As previously reported, response rates differed by grade of employment, with lower response rates in the lower grades.[26] Six participants attended the examination twice and have therefore been deleted from the original sample. In total, 10 308 civil servants participated, of whom 67% (6895) were men and 33% (3413) were women. Most participants (94%) gave consent for follow-up based on their sickness absence records. Of these, a small proportion of records (5%) could not be identified. Complete sickness absence records of 9072 participants (88% of the total sample) were available for a mean period of 20 months (range = 0.3 to 39.6 months).

Information on grade of employment was obtained by asking participants to describe their civil service grade at the time of the baseline survey. Changes in grade during the follow-up period were not analyzed in this paper. In this analysis, administrative grades were condensed into six categories; in order of decreasing salary, this consisted of unified grades 1 through 6 (permanent secretary through senior principal); unified grade 7 (principal); senior executive officer; higher executive officer; executive officer; and clerical officer, clerical assistant, and office support staff. Professional and technical staff were classified with administrative grades with equivalent salaries. There was a steep increment in salaries between grade categories, from an annual salary in 1987 of £3060 to £6790 for those in clerical and office support grades to £18 020 to £27 065 for most participants in unified grades 1 through 6. There were also marked differences in other socioeconomic indicators (highest level of education, housing tenure, access to a car, and father's occupation) by grade of employment; these have been described elsewhere.[26]

Baseline Survey

Between November 1985 and March 1988, participants completed questionnaires and attended a screening examination. The questionnaire, which provided the baseline information for this analysis, included (1) social and demographic characteristics (age, sex, current grade of employment, marital status, years of full-

TABLE 2—Long Spells of Sickness Absence (>7 Days), by Self-Reported Work Characteristics

Work Characteristic	Rate[a]	No. Events	Age		Age, Grade		Age, Other SES Indicators[b]	
			Adjusted RR	95% CI	Adjusted RR	95% CI	Adjusted RR	95% CI
Men								
Work demands (n = 4753)								
Low	14.5	290	1.0		1.0		1.0	
Medium	11.8	284	0.82	0.69, 0.96	1.02	0.87, 1.21	0.86	0.73, 1.02
High	9.9	232	0.69	0.58, 0.82	1.03	0.86, 1.24	0.76	0.64, 0.90
Control at work (n = 4760)								
Low	17.0	275	1.0		1.0		1.0	
Medium	11.2	271	0.67	0.57, 0.79	1.03	0.86, 1.24	0.74	0.62, 0.88
High	9.7	265	0.57	0.48, 0.67	1.05	0.87, 1.26	0.66	0.55, 0.78
Support at work (n = 4764)								
Low	12.8	293	1.0		1.0		1.0	
Medium	12.1	270	0.94	0.79, 1.10	1.02	0.86, 1.20	0.95	0.81, 1.12
High	10.9	247	0.84	0.71, 1.00	0.91	0.77, 1.08	0.87	0.73, 1.03
Women								
Work demands (n = 2066)								
Low	31.9	458	1.0		1.0		1.0	
Medium	29.4	261	0.94	0.81, 1.10	1.10	0.94, 1.29	1.01	0.87, 1.18
High	30.6	190	1.00	0.85, 1.19	1.34	1.12, 1.60	1.08	0.91, 1.29
Control at work (n = 2070)								
Low	38.6	516	1.0		1.0		1.0	
Medium	23.2	196	0.62	0.53, 0.73	0.71	0.60, 0.83	0.65	0.55, 0.76
High	24.5	134	0.66	0.55, 0.80	0.91	0.75, 1.10	0.73	0.61, 0.89
Support at work (n = 2085)								
Low	34.5	391	1.0		1.0		1.0	
Medium	26.3	237	0.77	0.65, 0.90	0.80	0.68, 0.94	0.78	0.67, 0.92
High	32.6	307	0.95	0.82, 1.10	0.94	0.81, 1.09	0.91	0.79, 1.06

Note: RR = rate ratio; CI = confidence interval; SES = socioeconomic status.
[a]Rates of sickness absence per 100 person-years.
[b]Other indicators of SES are years of education, housing tenure, access to a car.

time education, highest level of education, partner's and father's occupation, housing tenure, and access to a car); (2) health measures (self-rated health status over the past 12 months, the presence of long-standing illness and recurring health problems based on questions used in the General Household Survey,[27] and the likelihood of minor psychiatric disorder based on the 30-item General Health Questionnaire[28]); (3) health-related behaviors (current smoking habits, usual frequency of alcohol consumption over the past 12 months, and amount of alcohol consumed in the past 7 days); (4) psychosocial work environment based on questionnaires used in national surveys in Sweden and the United States (e.g., the Quality of Employment Surveys); (5) social circumstances outside work (number of dependent children, social contact with relatives and friends, and personal difficulties such as financial problems); and (6) amount and type of social support from the closest person.

The Participants' Psychosocial Work Environments

Two methods were used to assess the work environment: participants' reports about their own work (self-reports) and personnel managers' ratings of participants' jobs (external assessments). The latter could be considered a more objective measure of the work environment in that it was made irrespective of participants' perceptions of their job or abilities to cope with their work.

Principal component analysis provided empirical support for four a priori work indices: work demands, variety and skill use, control, and support at work.[29] Each work index was calculated by adding the responses to selected questions (available from the authors); the resultant scores were classified into low, medium, and high categories based on tertiles for the whole sample. In the analysis of the job strain model, each work index was classified into low and high categories around the median. Self-reported variety and skill use was excluded from this analysis as the differences in sickness absence were very similar to those observed for level of control. In addition, variety and skill use was not externally assessed.

In a test–retest reliability study, 58 participants completed the questionnaire about their work twice within 6 months. There was fair to moderate agreement between responses on the two occasions, with weighted kappa estimates between 0.31 and 0.44.[30,31]

In 18 of the 20 departments, 140 personnel managers assessed each job for the level of control and work demands inherent in the job. Personnel managers recruit and supervise staff in a number of jobs in different grades. They are therefore familiar with a relatively wide range of jobs, albeit less directly than the grade managers who provide daily supervision for a smaller number of jobs. The exter-

TABLE 3—Short Spells of Sickness Absence (≤7 Days), by Self-Reported Work Demands, Control at Work, and Support at Work, for Different Grades of Employment

Work Characteristic	Grade of Employment: Unified Grades 1–7 RR[a]	95% CI	Senior EO, Higher EO, EO RR[a]	95% CI	Clerical/Office Support RR[a]	95% CI	Test for Interaction[b] (*P*)
Men							
Work demands							
Low	1.0		1.0		1.0		
Medium	0.79	0.68, 0.92	0.97	0.90, 1.06	0.98	0.85, 1.12	$P < .001$
High	0.76	0.66, 0.88	1.06	0.98, 1.15	1.22	1.03, 1.46	
Control at work							
Low	1.0		1.0		1.0		
Medium	0.87	0.74, 1.03	0.99	0.91, 1.07	1.00	0.86, 1.18	$P = .004$
High	0.66	0.56, 0.78	0.83	0.76, 0.90	0.96	0.80, 1.16	
Support at work							
Low	1.0		1.0		1.0		
Medium	1.10	0.28, 4.39	0.92	0.85, 0.99	0.87	0.76, 1.01	$P > .1$
High	0.93	0.24, 3.66	0.86	0.79, 0.93	0.77	0.67, 0.91	
Women							
Work demands							
Low	1.0		1.0		1.0		
Medium	0.66	0.43, 1.00	0.98	0.87, 1.11	1.05	0.96, 1.16	$P = .19$
High	0.90	0.62, 1.32	0.97	0.86, 1.11	1.02	0.89, 1.18	
Control at work							
Low	1.0		1.0		1.0		
Medium	0.61	0.42, 0.89	0.94	0.83, 1.06	0.93	0.84, 1.03	$P = .07$
High	0.56	0.38, 0.81	1.01	0.88, 1.15	1.02	0.89, 1.17	
Support at work							
Low	1.0		1.0		1.0		
Medium	1.06	0.76, 1.49	0.76	0.68, 0.86	1.04	0.94, 1.15	$P < .01$
High	0.84	0.58, 1.21	0.77	0.68, 0.87	1.02	0.93, 1.13	

Note. EO = executive officer; RR = rate ratio; CI = confidence interval.
[a]Adjusted for age.
[b]Test for interaction gives the *P* value for the significance test of whether the effect of the work characteristics are the same for each employment grade.

nally assessed work indices were classified into low, medium, and high categories as described for the self-reported indices.

A random sample of 710 jobs was rated independently by two personnel managers. There was moderate agreement between the external assessments of the same jobs, with weighted kappa estimates of between 0.49 and 0.51.

Sickness Absence Records

Computerized sickness absence records to the end of March 1988 were obtained annually from the civil service pay centers. These records included the first and last dates of all spells of absence and the reason for absence. For spells of 7 calendar days or less (short spells), civil servants were able to complete their own certificate explaining their absence. For spells of more than 7 calendar days (long spells), a medical certificate was required.

The total number of short spells was 13 208 and 9921 for men and women, respectively. On average, men had 127 and women had 209 short spells per 100 person-years. For men and women, the total number of long spells was 1233 and 1436, respectively, averaging 12 and 30 long spells per 100 person-years, respectively.

Statistical Analysis

Risk factors for sickness absence (or the size of their effect) may differ for spells of different duration. Short spells and long spells of sickness absence were therefore analyzed separately. For each individual, the number of short and long spells of sickness absence was computed and the follow-up period was measured in person-years. Rates of sickness absence are expressed per 100 person-years.

Adjusted rate ratios and the 95% confidence intervals were calculated for men and women separately using Poisson regression.[32,33] Full details of the statistical methods have been previously reported.[34] Briefly, it was assumed that for each participant, the occurrence of short and long spells followed a Poisson distribution. For short spells, there was considerable residual variation in excess of the Poisson distribution.[35] This has no effect on the estimates of the rate ratios, but adjustment for it increased the width of the 95% confidence intervals by about 50%. For long spells, no excess residual variation was detected.

Participants with incomplete data were excluded from the analyses, which used the missing variables. Comparison of age-adjusted and fully adjusted rate ratios was based only on subjects with no missing values.

The regression models were fitted with the statistical package GLIM,[36] and all other analyses were performed with the statistical package SAS.[37]

TABLE 4—Short Spells (≤7 Days) and Long Spells (>7 Days) of Sickness Absence, by Externally Assessed Work Characteristics

Work Characteristic	Short Spells						Long Spells					
			Age		Age, Grade				Age		Age, Grade	
	Rate[a]	No. Events	Adjusted RR	95% CI	Adjusted RR	95% CI	Rate[a]	No. Events	Adjusted RR	95% CI	Adjusted RR	95% CI
Men												
Work demands (n = 5401)												
Low	183.6	5456	1.0		1.0		15.1	449	1.0		1.0	
Medium	113.9	3066	0.62	0.58, 0.66	0.77	0.72, 0.83	11.0	296	0.74	0.64, 0.85	0.99	0.85, 1.15
High	96.1	3118	0.52	0.49, 0.55	0.74	0.69, 0.80	9.3	303	0.63	0.55, 0.73	0.95	0.82, 1.11
Control at work (n = 5397)												
Low	193.0	4026	1.0		1.0		17.5	366	1.0		1.0	
Medium	126.9	4896	0.66	0.62, 0.70	0.92	0.86, 0.99	11.4	439	0.66	0.57, 0.76	1.04	0.89, 1.22
High	90.2	2665	0.47	0.43, 0.50	0.80	0.73, 0.83	8.2	241	0.47	0.40, 0.55	0.91	0.75, 1.10
Women												
Work demands (n = 2475)												
Low	243.5	4583	1.0		1.0		39.1	735	1.0		1.0	
Medium	200.0	2111	0.82	0.75, 0.89	0.87	0.80, 0.95	25.9	273	0.68	0.59, 0.78	0.78	0.68, 0.90
High	149.7	1728	0.61	0.56, 0.67	0.68	0.62, 0.75	21.0	242	0.57	0.49, 0.66	0.70	0.60, 0.81
Control at work (n = 2474)												
Low	238.5	4546	1.0		1.0		36.6	698	1.0		1.0	
Medium	199.0	2674	0.83	0.77, 0.90	0.94	0.87, 1.03	27.8	374	0.78	0.69, 0.89	1.04	0.91, 1.18
High	140.7	1180	0.59	0.53, 0.65	0.73	0.66, 0.82	20.6	173	0.59	0.50, 0.70	0.89	0.75, 1.06

Note. RR = rate ratio; CI = confidence interval.
[a]Rate of sickness absence per 100 person-years.

Results

Self-Reported Work Characteristics and Sickness Absence

Self-reported work characteristics predicted rates of both short and long spells of sickness absence. Men who reported high levels of work demands, control, or support at work had 20% to 50% lower age-adjusted rates of both short and long spells than those who reported low levels of these work characteristics (Tables 1 and 2). For women, the differences were similar but less marked.

Potential Confounding Effect of SES

SES, as measured by grade of employment, is a strong predictor of rates of sickness absence,[34] and there are striking stepwise grade differences in the psychosocial work environment.[26] Employees in the lower grades were up to six times more likely than those in the higher grades to report low levels of work demands, control, or support at work. For example, the percentage of men reporting low control over their work was 11.5% for unified grades 1 through 7, 26.4% for executive grades (senior executive officer/higher executive officer/executive officer), and 66.4% for clerical and office support grades.

In general, adjusting for age and grade weakened the effects for short spells, but the effects were still significant. Men who reported high levels of control or support at work still had about 20% lower rates of short spells than those who reported low levels, but after adjusting for age and grade, work demands were not related to rates of short spells (Table 1). For women, these differences were similar but of a smaller magnitude. After adjusting for age and grade, the differences in rates of long spells were no longer significant for either men or women (Table 2).

In contrast, adjusting for other indicators of SES, such as years of education, housing tenure, and access to a car, had minimal effect on the rate ratios for either short or long spells (Tables 1, 2). This suggests that education and material circumstances are unlikely to be important confounders in the association between the psychosocial work environment and sickness absence.

In an exploratory analysis, we examined the association between the psychosocial work environment and sickness absence after stratifying by grade (Table 3). For men, high levels of work demands were associated with lower rates of short spells among top administrators but with higher rates of short spells among clerical and office support staff. For women, work demands were not related to rates of short spells. For men and women, high levels of control were more strongly associated with lower rates of short spells among top administrators.

Externally Assessed Work Characteristics and Sickness Absence

There were also marked stepwise differences by grade in the externally assessed psychosocial work environment. For example, the percentage of men with low externally assessed control was 7.6% for unified grades 1 through 7, 26.6% for executive grades, and 77.5% for clerical and office support grades. Despite similar grade differences in the self-reports and

external assessments, the two measures were poorly correlated at the level of individuals: work demands, $P = 0.20$ in men, 0.19 in women; control, $P = 0.33$ in men, 0.32 in women. The correlation coefficients were more than halved after adjusting for grade.

Externally assessed work demands and levels of control predicted rates of both short and long spells of sickness absence to a greater extent than the self-reports, particularly for women (Table 4). After adjusting for age and grade, both men and women in jobs with high levels of externally assessed work demands or control had 20% to 30% lower rates of short spells and 5% to 30% lower rates of long spells than those in jobs with low levels of work demands or control.

TABLE 5—Long Spells of Sickness Absence (>7 Days), by Self-Reported and Externally Assessed Work Demands and Control at Work, Adjusted for Confounding Factors[a]

Work Characteristic	Self-Reports			External Assessments		
	No.	Adjusted RR[a]	95% CI	No.	Adjusted RR[a]	95% CI
Men						
Work demands	4585			4186		
Low		1.0			1.0	
Medium		0.84	0.70, 0.99		0.83	0.70, 1.00
High		0.73	0.61, 0.87		0.67	0.55, 0.80
Control at work	4593			4185		
Low		1.0			1.0	
Medium		0.82	0.68, 0.98		0.80	0.67, 0.95
High		0.77	0.64, 0.93		0.61	0.50, 0.76
Women						
Work demands	1962			1800		
Low		1.0			1.0	
Medium		1.03	0.88, 1.21		0.76	0.64, 0.92
High		1.20	1.01, 1.44		0.74	0.61, 0.86
Control at work	1962			1797		
Low		1.0			1.0	
Medium		0.69	0.58, 0.81		0.92	0.78, 1.09
High		0.82	0.67, 0.99		0.86	0.70, 1.10

Note. RR = rate ratio; CI = confidence interval.
[a]Confounding factors: age, socioeconomic status (years of education, housing tenure, access to a car), ethnicity, health related behaviours (smoking status, frequency of alcohol consumption, physical activity), and social circumstances outside work (difficulty paying bills, negative aspects of support).

Other Potential Confounding Effects

The relationship between the psychosocial work environment and sickness absence did not change after adjusting for previously identified risk factors for sickness absence[34] (ethnicity; health-related behaviors such as smoking, alcohol consumption, and physical activity; social circumstances outside work such as financial problems and negative aspects of support) and for the indicators of SES (years of education, housing tenure, access to a car) (Table 5).

Job Strain and Sickness Absence

There was partial support for the job strain model after adjusting for grade. Men who reported high levels of work demands and low levels of control had 10% to 20% higher rates of short spells than those in other jobs. For women, the job strain model predicted rates of short spells in a similar way, but the differences were generally not significant. The job strain model did not predict rates of long spells for either men or women.

In view of the differing independent effects of work demand and control by grade (Table 3), we also examined the job strain model stratified by grade (Table 6). This analysis was restricted to men because the majority of women were in the lower grades. Men in unified grades 1 through 7 with high control and high work demands had 40% lower rates of short spells than their colleagues with low work demands and low control; on the other hand, executive and clerical/office support grades with high work demands and low control had 10% to 20% higher rates of short spells than their colleagues.

Finally, we examined whether support at work modified the combined effects of work demands and control. After stratifying by support at work, the job strain model predicted rates of short spells to a similar extent for those with both high and low levels of support at work (not shown). When support at work was substituted for control in the job strain model, the effects of support at work and work demands on rates of short spells were largely independent of each other (also not shown).

Discussion

The Psychosocial Work Environment and Sickness Absence

This study identified psychosocial aspects of work—work demands, control, and support at work—that predicted rates of short and long spells of sickness absence in men and, to a lesser extent, in women. These findings are consistent with earlier studies, which have reported an inverse association between control at work and sickness absence.[11–13,16,38–40] The relationship between the work characteristics and sickness absence was largely independent of potential confounders, including several socioeconomic indicators (years of education, housing tenure, and access to a car), health-related behaviors, and adverse social circumstances outside work.[34] Several studies have reported minimal change in the adverse effects of job strain after adjusting for education[21,23,41] or income.[20] However, we are not aware of other studies of the psychosocial work environment that have taken account of such a wide range of physical, psychological, behavioral, and social factors.

After adjusting for grade of employment, the association between the work characteristics and sickness absence was diminished but still significant for short spells. However, if these work characteristics partially mediate between grade and sickness absence, it is possible that the true association between the psychosocial work environment and sickness absence has been underestimated by adjusting for grade. Consequently, the true association is probably between the unadjusted and grade-adjusted rate ratios.

In an exploratory analysis, work demands and control had slightly different effects among employees in different grades. While not predicted in advance,

TABLE 6—Short Spells of Sickness Absence (≤7 Days), by Job Strain (Based on Self-Reported Work Demands and Control at Work) for Different Grades of Employment in Men

	Control at Work[a]			
	Low		High	
Work Demands[a]	RR[b]	95% CI	RR[b]	95% CI
Unified grades 1–7				
Low	1.0	...	0.81	0.67, 0.99
High	0.84	0.68, 1.04	0.64	0.53, 0.77
Senior executive officer, higher executive officer, executive officer				
Low	1.0	...	0.90	0.82, 1.00
High	1.08	0.99, 1.18	0.93	0.84, 1.02
Clerical/office support				
Low	1.0	...	0.99	0.83, 1.19
High	1.17	1.01, 1.37	0.84	0.65, 1.08

Note. RR = rate ratio; CI = confidence interval.
[a]Work characteristics have been summarized by separating participants into two categories: above and below the median.
[b]Adjusted for age.

these findings seem intuitively plausible when we consider differences between occupations. For example, higher status occupations tend to be characterized by high work demands and high control.[26] Individuals who find these work characteristics challenging tend to be selected into and promoted within these occupations. These individuals are also likely to have relatively low rates of sickness absence. In contrast, lower status occupations tend to be characterized by low control. Employees in these occupations have fewer ways of coping with high work demands, which are, therefore, more likely to be associated with high rates of sickness absence.

The differences in short spells of sickness absence by job strain were consistent with this interpretation. After adjusting for grade, there was minimal support for the job strain model in the whole study population, but within the lower grades there was stronger support for it, with jobs characterized by high work demands and low control predicting sickness absence. Most studies have reported a higher risk of coronary heart disease among employees with high work demands and low control,[17–21,24,25] rather than a protective effect against coronary heart disease for employees with high work demands and high control.[42] Our findings in the higher grades are consistent with one analysis of job strain and sickness absence.[16] Several studies have reported a weaker relationship between job strain and coronary heart disease in white-collar occupations compared with blue-collar occupations.[24,25] This may partly explain the relatively weak support for the job strain model in the study population who were predominantly in white-collar occupations. However, in contrast to these studies, support at work did not have an additional effect on the association between job strain and sickness absence.

In this study, women had higher rates of both short and long spells of sickness absence compared with men in the same grade category. Similar differences have been reported elsewhere.[43] While the psychosocial work environment was a weaker predictor of sickness absence for women, the reasons for the sex differences in sickness absence are poorly understood and are being investigated further.

Self-Reported vs Externally Assessed Work Characteristics

In the current study, both self-reported and externally assessed work characteristics predicted rates of sickness absence. Relatively few studies have examined the relationship between information about the work environment from different sources and adverse attitudinal, behavioral, or health outcomes.[39,44–47] In general, the self-reports of the work environment were more strongly related to job satisfaction and symptom-reporting than were reports by observers while neither measure was related to sickness absence.[39,44–47] The latter may be partly explained by the crude measures of sickness absence used in these studies.

In contrast to earlier studies,[12,13,16] there was poor agreement between self-reported and externally assessed work demands and control. However, this discrepancy could partly be explained by differences in the unit of analysis. The current analysis was undertaken at the level of individuals whereas earlier analyses were aggregated at the levels of jobs. This is supported by a recent meta-analysis that reported markedly higher correlation coefficients for aggregated analyses using the mean for jobs rather than analyses of individuals (control: 0.71 vs 0.30; skill and variety: 0.74 vs 0.46, respectively).[48]

Sickness Absence as a General Measure of Ill Health

This study uses sickness absence as a general measure of health. As previously reported, baseline health indicators (perceived health status, long-standing illness, health problems in the past year) predicted rates of both short and long spells of sickness absence, albeit to a lesser extent for short spells.[34,49] However, sickness absence is multifactorial and complex. Like other morbidity measures, it depends on the individual's perception of his or her behavior in response to illness. The decision to be absent is also likely to be influenced by a number of attitudinal and social factors (e.g., indispensability at work, potential risk of wage reduction, family responsibilities, and informal norms about acceptable levels of absence among colleagues).[40] While the potential contribution of these factors needs to be considered when interpreting our findings, the contribution of health should not be underestimated.

Other Methodological Issues

Several limitations of this study need to be discussed. The effects of potential sources of misclassification should be considered. First, the ratings of the work environment by both the employees and personnel managers will have been influenced by their attitudes and expectations.[50,51] Second, the external assessments were based on a relatively simple questionnaire rather than on the more detailed questionnaire completed by participants. While it would have been preferable to have used the same questionnaire, it was not feasible because the personnel managers had to undertake external assessments for a number of jobs. Third, psychosocial factors are inherently

difficult to measure. For example, observers have difficulty assessing certain work characteristics such as support or feedback from colleagues and supervisors.[48] Fourth, the work environment was assessed at one point in time and was assumed to be relatively stable; however, several participating departments were undergoing major organizational changes during the follow-up period. Adverse work characteristics over the long term are probably more important in relation to ill health than transient exposures. An earlier study reported that persistent job pressures were associated with three times the risk of coronary artery disease compared with transient job pressure.[10] These sources of misclassification are likely to be nondifferential so that the true relationship between the psychosocial work environment and sickness absence would have been underestimated. The Whitehall II study is ongoing, and the work environment has been reassessed 3 to 5 years after the baseline survey. These issues will therefore be examined in future analyses.

In contrast to many earlier studies, rates of sickness absence in this study were derived directly from sickness absence records obtained from payroll centers. Top administrators may occasionally not have recorded the occurrence of short spells. Since top administrators are likely to have jobs with high work demands and control, incomplete records could have exaggerated the observed association between these work characteristics and sickness absence, particularly for short spells. However, the effect of this misclassification was probably minimal. A minority of participants in the highest grade category would be affected, and it would not explain the association between the psychosocial work environment and sickness absence after stratifying by grade.

Our analyses may not have taken adequate account of the complex relationship between the large number of factors that influence sickness absence. Several studies have highlighted the complexity of different multivariate models of sickness absence using confirmatory path analysis.[52,53] Now that possible risk factors for sickness absence have been identified in the current study, further analyses to explore more complex multivariate models can be undertaken.

Can the Findings Be Generalized to Other Occupations?

The study population was representative of office-based employees in the public sector from top administrators to clerical staff. The response rate was acceptable, and there was minimal loss to follow-up.[26] Undertaking this study in the British civil service shows that a diverse group of administrative, professional, and technical occupations could be examined within a large organization that maintains the same sickness absence policy for all staff. It is unclear, however, how possible differences in the organizational culture of the public and private sectors might influence the relationship between the psychosocial work environment and sickness absence. Thus, further studies of the determinants of sickness absence in different occupational groups are needed.

Implications

Both the psychosocial work environment itself and how employees perceive it appear to determine subsequent rates of sickness absence. Since the psychosocial work environment can potentially be modified, the findings have important implications for prevention. Increasing the level of control could improve employees' health and well-being and, at the same time, could increase productivity and reduce the costs of sickness absence. A recent study found lower rates of sickness absence among white-collar employees who experienced changes to the work environment that included increased control compared with those whose work did not change.[54] Our findings suggest that an intervention that changes the psychosocial work environment is more likely to be successful than an intervention that encourages employees to cope with an adverse work environment. □

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