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Job characteristics, physical and psychological symptoms, and social support as antecedents of sickness absence among men and women in the private industrial sector

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Abstract

Most longitudinal studies on the relationship between psychosocial health resources and risks, and the employees' subsequent sickness absences have been conducted in the public sector. The purpose of this study was to find out psychosocial antecedents of sickness absenteeism in the private industrial sector. The effects of job characteristics (job autonomy and job complexity), physical and psychological symptoms, and social support (from coworkers and supervisors) on sickness absenteeism were investigated. The number of long (4-21 days) and very long (>21 days) sickness absence episodes of 3895 persons (76% men and 24% women, mean age 44 years) was obtained from the health registers of a multinational forest industry corporation in 1995–1998. A questionnaire survey on the working conditions and health of the workers was carried out in 1996. The follow-up time of the sickness absences was 1-year 9-month. Job autonomy was found to be associated with long and very long episodes in men (rate ratio (RR) in the lowest autonomy group approximately 2 times higher than the highest autonomy group), and with very long episodes of absence in women (2-3 times higher RR between the low vs. the high category). Low job complexity predicted men's very long absences (RR 1.4). Long and very long episodes were associated with physical and psychological symptoms (RR 1.2-1.7) among men and women. Lack of coworkers' support increased the frequency of very long sickness absence among men (RR 1.4), and lack of supervisor's support among women (RR 1.6). Also, some interaction effects of social support variables were observed among both genders. We conclude that the studied psychosocial factors are associated with subsequent sickness absence, and that the associations are partly gender-specific. The results showing which variables are related to employees' sickness absenteeism in the private industrial sector can be applied in human resource management and health service planning.

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Introduction

Sickness absences have increasingly been a focus of research since the 1970s. The psychosocial literature on absenteeism involves a commonly accepted view that sickness absences are closely related to stressful

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characteristics of work (e.g. Schechter, Green, Olsen, Kruse, & Cargo, 1997). Some researchers have even estimated that about 60–70% of all sickness absences are associated with stress-related illness (e.g. Kearns, 1986). According to other estimates, an average employee is on sick leave for about 18 months during his/her life solely because of stress-related illnesses (Long, 1991). Furthermore, it has been purported that the work environment can be a better predictor of absenteeism than demographic factors or the psychological characteristics of a person (Farrell & Stamm, 1988). Several studies have concluded that stressful work increases the risk of diseases, e.g., of cardiovascular diseases (Belcastro, Gold, & Grand, 1982; Karasek & Theorell, 1990).

The relation between psychosocial factors of work, physical and psychological distress, and sickness absenteeism (used as an objective measurement of health) has been investigated in large-scale longitudinal studies (e.g. Kivimäki et al., 1997; Kivimäki, Vahtera, Koskenvuo, Uutela, & Pentti, 1998; Kivimäki, Vahtera, Pentti, & Ferrie, 2000; Niedhammer, Bugel, Goldberg, Leclerc, Guéguen, 1998; North et al., 1993; North, Syme, Feeney, Shipley, & Marmot, 1996; Stansfeld, Fuhrer, Head, Ferrie, & Shipley, 1997; Smulders & Nijhuis, 1999; Vahtera, Kivimäki & Pentti, 1997; Vahtera, Kivimäki, Pentti, & Theorell, 2000). The majority of the psychosocially oriented studies on sickness absenteeism have, however, been carried out in the public sector, and only a few have been conducted in the private sector (e.g. Donaldson, Sussman, Dent, Severson, & Stoddard, 1999; Kristensen, 1991). Furthermore, none of the largescale prospective studies have focused on the private industrial sector, even though it is estimated that stress-related health disorders cause huge individual, social and economic losses in all sectors of work life (Kearns, 1997; Martocchio, 1992). Recent cross-sectional findings indicate that the psychosocial work environment affects absenteeism more strongly than, for example, traditional indicators of health behavior (sleep pattern, regular exercise, etc.) among the private industrial employees (Donaldson et al., 1999). Maes, Verhoeven, Kittel, and Scholten (1998) found in their worksite health program that when decision latitude increased, absenteeism decreased simultaneously in a private industrial enterprise.

The private industrial sector may have unique psychosocial determinants of employee health. For instance, unlike public organizations, private firms more actively encourage their clients to become consumers and more clearly seek a profit. This can heighten employees' work stress. Furthermore, the psychosocial work environments may differ in that private enterprises place greater emphasis on participation in decision making and obligation towards others while working, and their human resource management practices utilize more aspects such as autonomy, task significance and supervisory control. Moreover, the service sectors and other sectors may differ concerning the psychosocial predictors of objectively measured health (Luz & Green, 1997; North et al., 1996; Smulders & Nijhuis, 1999). For instance, social support did not predict sickness absence among employees working mostly in the service sector (Kivimäki et al., 1997), but it did predict sickness absence among employees mainly in technical and administrative occupations of an electricity company (Niedhammer et al., 1998). Finally, recent theoretical models for health promotion in industry have started to stress the role of the psychosocial work environment in the reduction of absenteeism (Donaldson & Klien, 1997), but large-scale prospective studies are lacking.

In the present study, we first assumed that there are stress-producing risks and stress-protecting resources at work, as well as antecedent indicators of deteriorating health, which are associated with sickness in the course of time. Secondly, we assumed that medically certified absences reflect adequately the health of the employees (Jenkins, 1985; Marmot, Feeney, Shipley, North, & Syme, 1995). Our aim was to investigate whether psychosocial work variables and potential antecedent symptoms of ill health predict subsequent sickness absenteeism in the private industrial sector. In the following we review what is known about the impact of job characteristics, symptoms, work-related social support, and gender based on studies mostly from the public sector, due to lack of information on private industrial enterprises. We will present separately findings from the literature for each psychosocial predictor to corroborate research questions and hypotheses (Fig. 1).

Job characteristics

Acute unpleasant life events and chronic psychosocial difficulties have usually been linked with stress (Jenkins, 1991). Different empirical results and theories about occupational stress have regarded *job autonomy* to be crucial for the health of employees, mainly because greater autonomy is associated with more opportunities to cope with stressful situations (see Jenkins, 1991; Lazarus, 1966). In our study job autonomy means, on the one hand, independence from other workers while carrying out tasks, and on the other, decision latitude concerning one's work pace and phases. In the recent studies on absenteeism, this dimension of work has often been called job control due to the strong influence of Karasek's (1979) work stress model.

Prior research has shown that weak control/autonomy over one's work associates with psychological stress and, if long-lasting, causes health problems (see Ganster & Schaubroeck, 1991; Karasek & Theorell, 1990) and relates to such health indicators as long medically certified sick leaves (North et al., 1993; see also



Fig. 1. A psychosocial model for predicting work-related sickness absences.

Houtman, Bongers, Smulders, & Kompier, 1994). Recently, many prospective absenteeism studies in the public sector have brought out the importance of job control/autonomy/decision latitude on future health (Kivimäki et al., 1997; Peiró, González-Romá, Lloret, Bravo, & Zurriaga, 1999; Smulders & Nijhuis, 1999, Vahtera et al., 2000).

If we assume that work is one of the central sources of stress and well-being in one's life (Buunk & Ybema, 1997), it is important to study how demanding tasks occurring in today's work life are associated with health. Therefore, *job complexity*, indicating the level of challenges and variety of tasks at work, was chosen as the second job-related characteristic. Job complexity has some similarities with concepts such as skill requirements and intellectual discretion that have been used to capture the nature of cognitively demanding work (see Houtman et al., 1994; Stansfeld et al., 1997). It can mean interesting opportunities for the worker, and can lead to increasing commitment, higher job satisfaction and fewer intentions to leave the organization (see Björvell & Brodin, 1992).

Job complexity has not been studied in previous studies of absenteeism. However, a positive connection has been found between job complexity and type A behavior related to future cardiovascular health (Schaubroeck, Ganster, & Kemmerer, 1994). In the study made by Melamed, Ben Avi, Luz, and Green (1995) psychological stress was related to task monotony and increased absenteeism in the industrial sector. A high level of, and increase in, skill discretion protected against various types of sickness absences among public service employees (Kivimäki, Vahtera, Ferrie, Hemingway, & Pentti, 2001; Stansfeld et al., 1997). Thus the first research question addressed job characteristics: What is the role of job autonomy and job complexity in sickness absenteeism in the private industrial sector? Our hypothesis was that low job autonomy and low job complexity predict sickness absenteeism.

Psychological and physical symptoms

For a long time, studies on stress have shown the relationship between a stressful life situation and ill health (e.g. Kessler, 1997). The response model of stress suggests that stress first causes various minor physical and psychological symptoms, later more serious physiological and mental responses, and finally illnesses (Skelton & Pennebaker, 1982). Still, usually only subjective reports of symptoms have been used as indicators of health status rather than objective indicators such as sickness absence. Some studies have shown that mental symptoms and emotional distress are related to ill health, indicated by sickness absenteeism (Borgquist, Hansson, Nettelbladt, Nordstrom, & Lindelöw, 1993; Grossi, Soares, Angesleva, & Perski, 1999). Leaning on these theories and results, we expected that physical and psychological symptoms would be associated with sickness absence (see also Rees & Smith, 1991).

In the present study, we investigated the predictive power of *psychological and physical symptoms* on sickness absences longitudinally. We also wanted to study prospectively the potential deteriorating effect of these symptoms on subsequent health, because in welfare societies, the number of people permitted to retire because of diagnoses associated with psychological and physical symptoms is increasing (Social Insurance Institution, Finland, Statistics, 1997). To our knowledge, only in Whitehall Study II (e.g. North et al., 1996) among civil servants in London, and in a Finnish study (e.g. Kivimäki et al., 1997; Vahtera, Pentti, & Uutela, 1996) among municipal employees, has the relation between these symptoms and sickness absence been investigated prospectively using absence record data as an indicator of more serious illness. These studies have shown positive relations between psychological and physical symptoms and sickness absence. Thus our second research question was: Do psychological and physical symptoms predict sickness absenteeism? The hypothesis was that physical and psychological symptoms increase sickness absences.

Supervisor's and coworkers' support

Previous investigations of sickness absence point out that studies should focus on social interaction within the work group and the organization (see Anderson, 1991). Normally this aspect of work life has been studied using the concept of *social support*. Social support predicted absenteeism in the Whitehall Study II (North et al., 1993, 1996), in a Swedish Study (Unden, 1996), and in a Finnish Study (Vahtera et al., 1996, 2000). Stansfeld et al. (1997) found that social support inversely predicted short and longer psychiatric absence episodes. However, social support may sometimes be associated with increased absenteeism (Rael, Stansfeld, Shipley, & Head, 1995).

Although the research results on social support are partly contradictory, they mostly show negative relations with sickness absence. It is striking, however, that the operationalization of social support normally includes all sources of support under the same concept, although the type of support (Unden, 1996) and from whom it comes (Dean, Kolody, & Wood, 1990) can be a critical factor in absenteeism. In the present study, we included belonging support, instrumental support and a supportive work atmosphere (see House, 1981) in our measure of social support, because of their potential relevance to health (Unden, 1996). We used two social support sources, *coworkers' support* and *supervisor's support*, as separate predictors of sickness absence.

We treated the support factors also as moderators, because several studies suggest that the effect of social support on health is not direct, but is interactive with stress and job characteristics (e.g. Karasek & Theorell, 1990; Vahtera et al., 1996). The stress-buffering hypothesis states that social support protects employees from the pathological consequences of stressful experiences (Cohen & Wills, 1985). Numerous studies have supported this view (House, Umberson, & Landis, 1988; Parkes, Mendham, & Von Rabenau, 1994; Ulleberg & Rundmo, 1997). Roberts, Cox, Shannon, and Wells (1994) have suggested that different sources of support can moderate the effects of stress on well-being in a different manner. However, only a few combined effects have so far been studied in prospective absence studies. They have shown that the highest risk of sick leave is found with the combined effects of poor job control, and negative changes in job control and low social support (Vahtera et al., 2000). Thus the third research question was: Does support from the supervisor and coworkers have a direct effect on sickness absence? Our hypothesis was that low levels of social support are associated with sickness absence. A related research question was: Do sources of support moderate the effect of job characteristics and of symptoms on sickness absenteeism? Our hypothesis was that high levels of social support buffer the negative effects of job characteristics and symptoms on sickness absenteeism.

Gender

During the past two decades, the interest in factors related to women's health has grown. Studies have shown that women usually have poorer self-rated health than men, as measured by the number of reported symptoms (Krantz & Östergren, 2000). Interestingly, the sources of stress seem to vary between women and men (Hendrix, Spencer, & Gibson, 1994). Women seem to have less coping resources in stressful situations due to their various role demands (see Jenkins, 1991; Kushnir & Kasan, 1992/93), and this seems to affect their health (Dixon, Dixon, & Spinner, 1991). Some researchers have suggested that there are basic structural differences underlying health differences between the genders, and that they are partly psychosocial (Van den Heuvel & Wooden, 1995). Separate models for both genders should therefore be created, or the genders should be investigated separately, in order to study the psychosocial construction of health adequately (Hendrix et al., 1994: Luz & Green, 1997).

The gender-specific approach has been adopted when investigating the effects of psychosocial factors on absenteeism in a few large-scale follow-up studies in the public sector (e.g., Kivimäki et al., 1997; Niedhammer et al., 1998; North et al., 1993, 1996; Vahtera et al., 1996). The findings on gender differences have nevertheless been partly contradictory (North et al., 1993; Vahtera et al., 1996). In the Whitehall Study II among civil servants in London, a low level of work control, work demands and social support was associated with higher rates of long sick leaves, especially among men (North et al., 1993; Rael et al., 1995). In line with these results, a French study showed that a low level of coworkers' support increased the number of sick leaves only in men (Niedhammer et al., 1998). It has also been reported that supervisor's support is a strong protector mainly against women's absenteeism in some service sector occupations (Schokking-Siegrist, 1981). The results of the Finnish study (Vahtera et al., 1996) among municipal employees indicated that the connections were more complex, depending on the demand-control interaction, gender, and other psychosocial factors at work. Finally, many cross-sectional studies have pointed out that different sources of social support may moderate the association between stress and self-rated health differently in men and in women (Abdalla, 1991; Wolgemuth & Betz, 1991). These previous results have been contradictory to some extent, but particularly interesting from the point of view of our study. We therefore separated male and female employees in the analyses in order to find out common and genderspecific features in their predictors of sickness absence. Thus, the research question on gender was: Do the variables of interest affect sickness absence in men and in women? Our hypotheses was that psychosocial factors predict sickness absence in both genders, but some work-related predictors have a stronger effect on male employees, and the sources of social support may function differently in men and women.

Methods

Study design and collection of data

This was a prospective follow-up study on psychosocial predictors of sickness absence in an industrial corporation. It is based on a questionnaire survey on health and the work environment, and on sickness absence records.

Questionnaires were sent to the work units during the spring and summer of 1996, and distributed by the supervisors. All employees, domestic and non-domestic, were allowed to fill out the questionnaire at that time. At the same time, permission for collecting and using the sickness absence data was requested from the respondents working in Finland (units of this multi-national firm in other countries did not always have absence registers). The responses were mailed confidentially in the enclosed envelopes directly to the investigators. Each respondent had an identification code given by the occupational health service of the company. The code was marked in the questionnaire, and it was used only by the researchers of the Finnish Institute of Occupational Health to connect the survey data with absence register data, which had the same code. The representatives of the company did not have access to the questionnaire data at any phase of the study and the researchers could not identify a person from the code. Thus, the questionnaire data were combined with the longitudinal sickness absence data anonymously, and the procedure to safeguard anonymity was explained in detail to the respondents.

Data on sickness absences were collected from the company's occupational health registers between January 1995 and March 1998 (see time line in Fig. 2). The data were divided into two periods: a 1.5 year baseline absence rate, which included sickness absences 1-year 6-month before the questionnaire survey up until 30 June 1996. The follow-up period, 1-year 9-month, included sickness absences from 1 July 1996 to 31 March 1998, i.e. after the questionnaire survey. Only those who were employed during the whole period of 3 years and 3 month were included in the study. Non-domestic employees were not included in the absence follow-up (1995–1998) because of the unavailability of absence records from other countries.

Participants

The eligible population of this study was composed of domestic personnel working for a multinational forest industry enterprise. The response rate to the questionnaire was 63% (the total number of employees in the company was 15466). Of these 9705 persons, 5435 (56%) gave permission to use their sickness absence records. Of these employees, 1540 (28%) were excluded from the analyses for practical reasons. They were working in units that at the time were not linked to the central computer of the company, so their sickness absence data were not available directly from the database. Since there was no reason to assume that these people were different from the others who were included in the study, we decided not to collect their



Fig. 2. Collection of data.

	Eligible study population ($n = 15466$) Frequency or mean (M)	Survey Respondents ($n = 9705$) Frequency or mean (M)	Study participants ($n = 3895$) Frequency or mean (M)		
Age	44.0 (<i>M</i>)	43.7 (<i>M</i>)	44.3 (<i>M</i>)		
Gender		7494 men	2950 men		
		2211 women	945 women		
SES					
White-collar employees	4676	3680	1707		
Blue-collar employees	10 790	6025	2188		
Occupational category					
Upper managerial	1244	1004	511		
Lower managerial	1635	1393	618		
Technical & laboratory	451	294	155		
Office staff	1346	989	423		
Maintenance & production	10 790	6025	2188		

Table 1 Demographics of the private industrial employees in the three populations of the study

sickness absence information from their respective units. The final study population was composed of those 3895 employees (43% of the respondents to the questionnaire) who had responded to all questionnaire items in the present study, and whose absence data were available from the company control computer. 76% of them were men, and 24% women. Our study participants did not differ significantly in terms of studied job characteristics, physical or psychological symptoms, and social support from the original survey population (n = 9705), but some socio-demographic differences were found between the eligible study population, the survey respondents, and our study participants. Specifically, white-collar employees participated in the survey more often, and gave their consent to use their sickness absence data more frequently. A gender breakdown of the eligible population was not available (see Table 1).

Blue-collar employees (46% of the participants were male blue-collar employees, 14% female) were employed as factory workers (e.g., monitors, fork-lifters) or maintenance staff (e.g., cleaners, repairmen). White-collar employees (30% of the participants were male white-collar employees, 10% female) were employed in office tasks (e.g., as supervisors, secretaries) and expert occupations (e.g., technical designers, laboratory technicians, etc.). The enterprise has a long tradition in human resource development and it has long-term research & development cooperation with the research institute performing the present study (see Kalimo & Toppinen, 1999).

Measures

The sickness absence records included data on the beginning and end of each sick leave. Only medically certified sick leave episodes that had lasted four days or more were studied. In Finland and in the company under study, such sick leaves are prescribed only by the physician. For the study, all overlapping and consecutive episodes of sickness absence were combined.

The number of medically certified episodes of absence was selected as a unit of analysis. This kind of frequency measure has already been successfully used as an indicator of health in absenteeism research (Marmot et al., 1995). However, to predict sickness absenteeism in a more detailed way, we separated episodes of 4-21 days absence (long episodes) from episodes that had lasted over 21 days (very long episodes), because very long episodes may have partly different antecedents (Stansfeld et al., 1997). In the main effect models, variables were used as trichotomous measures. Finally, the interaction effects of social support variables were explored by calculating the risk ratio for low, moderate, and high levels of job characteristics and physical and psychological symptoms, at high and low levels of coworkers'/supervisor's support. Social support variables were used as dichotomous variables to maintain a minimum of 30 participants in each subcategory (the cut-off point was set at the median).

In the questionnaire, participants responded to items concerning their work and psychological and physical symptoms on a 5-point Likert scale. The results are presented as distributions of summed scores. The reliability of the scales was estimated with Cronbach's alpha. This was first done in the reporting phase of the survey in 1997–1998, using all responses (n=9705). All scales used in the study proved to be internally consistent. It was then done using our study population, and similar results were obtained.

Job characteristics were measured with a modified version of Hackman and Oldman's (1975) Job Diagnostic Survey, and the Occupational Stress Questionnaire (OSQ, (e.g. Elo, 1994; Elo, Leppänen, Lindström, & Roponen, 1992) constructed by the investigators. The latter is a survey questionnaire developed at the Finnish Institute of Occupational Health. Previously, the OSQ and these types of sum scores have been used in various studies on private industrial employees, and their validity is good (e.g. Kivimäki, Kalimo, & Toppinen, 1998; Toppinen-Tanner, Kalimo, & Mutanen, 2002).

Job autonomy (alpha=0.79) was measured by five items, such as, "Can you leave your work site without somebody taking over?" or "Can you plan your work by yourself?" Job complexity (alpha=0.80) was also measured by five items, such as, "Is your work monotonous or variable?" or "Does your work require thinking and weighing decisions?"

The items of physical and psychological symptoms were taken from the General Health Questionnaire, GHQ (Goldberg & Hillier, 1979) and OSQ (Elo et al., 1992) items. The Psychological symptoms (alpha = 0.78) scale included 10 questions on depression, strain, sleep disturbances, tension, etc. Physical symptoms (alpha=0.72) consisted of 5 items on somatic symptoms, such as "Does your heart beat too quickly or unevenly?" and "Do you have stomach aches?".

Coworkers' support (alpha = 0.74) was measured by four items, e.g. "What is cooperation like in your immediate work environment?" and "How do your workmates get along at your workplace?" Supervisor's support (alpha = 0.78) was assessed by five questions, such as, "Does your superior take into account your opinion concerning your work?" or "Does your superior provide support and help when needed?" (House, 1981; House et al., 1988).

Statistical analyses

The number of sick leaves among women and men was calculated and compared with a *t*-test. Bivariate correlations among independent variables were calculated for all participants in both gender groups.

A multiple Poisson regression analysis was performed to examine the extent to which the psychosocial factors and their interactions predicted sickness absenteeism. As in most research (see Baba, 1990), sick leaves were not normally distributed dependent variables: only a few employees had many sick leaves, and most had from 0 to 2. In the present study, analyses were performed on the number of long and very long episodes using the SAS statistical program package using the GENMOD procedure. In the Poisson regression analyses, all explanatory variables were categorical. Thus, selection of the type of analysis was not necessarily based on the data. We used a log link option in the analyses, implying a multiplicative model, and rate ratio (RR) as the effect measure.

In the Poisson analyses, each variable was first classified into three categories: high, medium, and low. The most positive category was used as a reference group (1.00). For example, the numbers of sick leaves in the low job autonomy group and the medium job autonomy group were compared with sick leaves in the high job autonomy group (reference group). The effect measure, rate ratio, used in predicting episodes of absence, illustrates the rate ratio of sickness absenteeism between the study group and the reference group during the follow-up. In order to study moderating effects, the interaction models were also fitted. From these models, adjusted rate ratios were calculated for six subgroups of employees (e.g. low/moderate vs. high autonomy, low vs. high coworkers' support). The results in Table 5 describe the rate ratio of sickness absenteeism between the low and high categories of the moderator. They are presented for low, moderate, and high categories of predictors to illustrate the interaction effect. All models were calculated separately for men and women.

Two kinds of adjusted models were used. In the first phase, age, SES, and previous absences were used as confounding variables. In the second phase, the effect of age, SES, previous absences, and all the other predictor variables were entered into the model (fully adjusted, see Tables 3–5). It was expected on the basis of previous studies that there would be unexplained variation over the Poisson regression in our models (Sturman, 1999). However, the overdispersion was not generally high in our models. In the case of very long episodes of absence, the over dispersion was not found, but in some models for 4-21 days episodes was it higher than the Poisson regression assumes (the deviance was about 1.0-1.6 times greater than the degrees of freedom). Thus, the over dispersion option was only used in analyzing 4-21 davs absences.

Results

Descriptive results

The total number of long sick leaves (4–21days) among men was 997, and of very long sick leaves (21 < days) 293, and among women 388 and 141, respectively. On average, men had 25 and women had 32 long and very long sick leaves per 100 person-years. On average male employees had 8 days of absence, and female employees 12 days of absence per year. Overall 60% of participants did not have sick leaves at all (63% of men and 54% of women) and only 11% had more than two sick leaves during the 1-year 9-month follow-up. The maximum was 16 long sickness absences.

Interrelations among the independent variables were examined with computing correlations (Table 2). In general, bivariate correlations among the predictors

Table 2 Means, standard deviations, and bivariate correlations between age, indicators of sickness absence, and studied psychosocial variables

Predictor	Men	!	Wom	en	1	2	3	4	5	6	7	8	9	10	11
	М	SD	М	SD											
1. Age	_	9.2		9.5		0.12	0.15	0.09	0.13	-0.15	-0.06	0.18	0.15	-0.14	-0.12
2. Prior episodes (4–21 days)	0.7	1.3	1.2	2.0	0.02		0.33	0.52	0.39	-0.17	-0.25	0.22	0.19	-0.12	-0.08
3. Prior episodes (>21 days)	0.1	0.4	0.2	0.6	-0.06	0.23		0.28	0.39	-0.09	-0.12	0.18	0.21	-0.09	-0.08
4. Long episodes (4-21 days)	0.7	1.3	0.8	1.5	-0.02	0.56	0.22		0.33	-0.11	-0.19	0.21	0.17	-0.13	-0.11
5. Very long episodes (>21 days)	0.1	0.4	0.2	0.5	0.08	0.28	0.24	0.22		-0.15	-0.15	0.12	0.19	-0.06	-0.10
8. Job autonomy	3.6	0.8	3.4	0.8	0.08	-0.22	-0.08	-0.21	-0.09		0.50	-0.12	-0.14	0.19	0.36
9. Job complexity	3.6	0.8	3.4	0.8	0.11	-0.19	-0.06	-0.17	-0.08	0.53		-0.17	-0.07	0.22	0.30
10. Physical symptoms	1.7	0.6	1.9	0.7	0.18	0.21	0.11	0.17	0.12	-0.15	-0.11		0.66	-0.27	-0.21
11. Psychological symptoms	2.1	0.6	2.2	0.7	0.16	0.13	0.08	0.09	0.08	-0.13	-0.07	0.65	—0	-0.34	-0.26
12. Coworkers' support	3.9	0.6	3.7	0.7	-0.09	-0.07	-0.05	-0.07	-0.08	0.23	0.24	-0.23	-0.33		0.45
13. Supervisor's support	3.5	0.7	3.4	0.8	-0.03	-0.09	-0.07	-0.07	-0.06	0.37	0.30	-0.19	-0.25	0.48	—

Correlations for men (N = 2865-2950) are on the lower diagonal where critical r = 0.07, p < 0.001; and correlations for women (n = 911-945) are on the upper diagonal, where critical r = 0.12 and p < 0.001.

were not very high, but two strong relations were observed in both men and women (rs more than 0.50): (1) job autonomy and job complexity, and (2) psychological and physical symptoms. In addition, support from supervisor and coworkers, job autonomy and supervisor's support (in men), and psychological symptoms and coworkers' support were somewhat interrelated in both genders (rs more than 0.30). All of the other correlations were lower than 0.30. Finally, most of the indicators of absenteeism correlated rather strongly with each other.

Direct effects of psychosocial factors on sickness absence

Job characteristics

The results showed that job autonomy strongly predicted sickness absenteeism. Among men, this effect was found for both long and very long episodes of absence (Table 3 and 4). Among women, job autonomy was associated only with very long episodes of sickness absence (over 2.5-fold risk in the lowest category, Table 4). Job complexity was somewhat associated with very long episodes of sickness absence in men. Employees in the lowest job complexity group had a 27% higher rate of these absences than those in the highest job complexity group (Table 4). However, this result did not remain significant after adjustment for all the other psychosocial and symptom-related predictors (fully adjusted model). The other associations between job complexity and sickness absence episodes were insignificant for both men and women.

Symptoms

Physical symptoms were associated positively with all indicators of sickness absence in men and in women. For example, the rate of episodes of sickness absence lasting 4–21 days was 1.5 times higher for women who had more physical symptoms than for women who had fewer symptoms (Table 3). In predicting very long episodes of absence, the effect of prior physical symptoms was very similar among female and male employees. It is noteworthy that this link to physical symptoms slightly decreased when all the predictors were entered into the model, but remained significant for long and very long episodes, except in women's very long episodes.

Psychological symptoms were related to future sickness absenteeism among both men and women. Those women who had fewer psychological symptoms had 30% fewer long episodes during the follow-up than women with more psychological symptoms (Table 2). Psychological symptoms predicted especially very long episodes of absence among both men and women. For instance, in the group reporting a high level of symptoms, there were on average 50% more very long episodes of absence, in both men and women, than among those who reported a low level of psychological symptoms. A similar pattern was found in the fully adjusted model (Table 3).

Social support

Weak coworkers' support was related to a 23–40% higher risk of long and very long episodes of sickness absence than medium or high levels of support in men. Among women, coworkers' support did not predict episodes of sickness absence at all. The multivariate analyses showed that controlling for demographics, previous episodes of sickness absence, and the other psychosocial variables also weakened the association significantly in men. However, the effect of strong coworkers' support still did predict very long episodes of sickness absence among them.

Table 3

		Men			Women			
Predictor	Ν	Age, SES, baseline adjusted RR (CI)	Fully adjusted ^a RR (CI)	N	Age, SES, baseline adjusted RR (CI)	Fully adjusted RR (CI)		
Job autonomy						n.s.		
Low	526	1.73 (1.41-2.13)	1.75 (1.40-2.20)	218	0.87 (0.66-1.14)	_		
Medium	1780	1.63 (1.35-1.96)	1.70 (1.40-2.07)	571	0.88 (0.69-1.14)	—		
High	605	1.00	1.00	137	1.00	_		
Job complexity			n.s.			n.s.		
Low	495	1.03 (0.90-1.18)	_	277	1.17 (0.83-1.65)	_		
Medium	1582	0.89 (0.77-1.02)	_	495	1.07 (0.78-1.49)	_		
High	862	1.00	_	167	1.00	_		
Physical symptoms								
High	341	1.29 (1.13-1.49)	1.20 (1.00-1.43)	165	1.54 (1.26-1.88)	1.32 (1.03-1.70)		
Medium	560	1.15 (1.01-1.30)	1.08 (0.95-1.24)	251	1.13 (0.92–1.39)	1.14 (0.89–1.38)		
Low	2028	1.00	1.00	521	1.00	1.00		
Psychological			n.s.			n.s.		
symptoms								
High	278	1.37 (1.18-1.59)	_	130	1.31 (1.04-1.64)	_		
Medium	696	1.12 (1.00-1.26)	_	264	1.36 (1.13-1.65)	_		
Low	1936	1.00	_	537	1.00	_		
Coworkers'			n.s.			n.s.		
support								
Low	504	1.23 (1.05-1.43)	_	269	1.09 (0.85-1.40)	_		
Medium	1702	0.99 (0.87-1.13)	_	474	0.94 (0.74-1.20)	_		
High	659	1.00	_	168	1.00	_		
Supervisor's			n.s.			n.s.		
support								
Low	493	1.03 (0.87-1.21)	_	214	1.40 (1.04-1.87)	_		
Medium	2016	0.85 (0.73-0.98)		578	1.16 (0.89–1.52)	_		
High	414	1.00	—	142	1.00			

The risk ratios (RR) and their confidence intervals (CI) for long medically certified sick leaves (4–21 days) in a private industry in Finland during the follow-up, by job characteristics, symptoms, and social support

^a 'Fully' adjusted means that the predictors are analyzed in the same regression model.

The effect of supervisor's support on sickness absence was significant only among women, both for long and very long episodes (about 1.5-fold risk between low vs. high support, Tables 3 and 4). Among men, supervisor's support was related to sickness absences only in one case: moderate support from the supervisor decreased episodes of absence lasting 4–21 days (15%), compared to the group in which the supervisor's support was strong. These results on the impact of the supervisor's support did not remain significant in the fully adjusted models.

Interaction effects of two sources of social support on sickness absence

Finally, the moderating role of support from the supervisor and coworkers in sickness absenteeism was studied separately with job autonomy, job complexity, and physical or psychological symptoms. Each interaction was tested in men and women.

Statistically significant interactions were found in 8 analyses, when the moderating effects were tested with all absence variables (Table 5). These interactions were found in the models adjusted for both age + SES + baseline and in the fully adjusted models. The supervisor's support moderated the effect of job autonomy on long sickness absences among men. Further, strong supervisor's support decreased considerably the effect of weak job complexity on the number of very long sickness episodes in men, whereas in women strong coworkers' support lowered the risk of long episodes of sickness absence when job complexity was high. Among women, strong coworkers' support also decreased long episodes of sickness absence when the level of physical symptoms was high. Among men, there was an interaction effect of coworkers' support and supervisor's support on very long sickness absences when predicting the effects of physical symptoms: when there was a low level of physical symptoms, social support from both sources decreased very long episodes of sickness absence, but a similar type of pattern was also observed when the Table 4

		Men			Women			
Predictor	Ν	Age, SES, andFully adjustedbaseline adjusted(RR, CI)(RR, CI)		N	Age, SES, and baseline adjusted (RR, CI)	Fully adjusted (RR, CI)		
Job autonomy								
Low	526	1.63 (1.22-2.17)	1.47 (1.07-2.02)	218	2.54 (1.62-3.97)	2.61 (1.56-4.36)		
Medium	1780	1.49 (1.15-1.92)	1.48 (1.13-1.93)	571	1.86 (1.19-2.89)	1.76 (1.09-2.84)		
High	605	1.00	1.00	137	1.00	1.00		
Job complexity			n.s.			n.s.		
Low	495	1.36 (1.07-1.74)	_	277	0.83 (0.54-1.28)	_		
Medium	1582	1.15 (0.93-1.41)	_	495	0.72 (0.48-1.08)	—		
High	862	1.00	—	167	1.00	_		
Physical symptoms						n.s.		
High	341	1.67 (1.36-2.04)	1.40 (1.08-1.82)	165	1.41 (1.06-1.87)	_		
Medium	560	1.58 (1.32-1.89)	1.50 (1.23-1.83)	251	1.30 (0.99-1.71)	_		
Low	2028	1.00	1.00	521	1.00	—		
Psychological symptoms								
High	278	1.68 (1.36-2.09)	1.31 (1.00-1.72)	130	1.66 (1.24-2.22)	1.49 (1.00-2.20)		
Medium	696	1.16 (0.87-1.39)	0.94 (0.76-1.15)	264	1.55 (1.18-2.02)	1.34 (0.99-1.83)		
Low	1936	1.00	1.00	537	1.00	1.00		
Coworkers' support						n.s.		
Low	504	1.40 (1.12-1.76)	1.36 (1.05-1.77)	269	1.05 (0.75-1.48)	_		
Medium	1702	1.08 (0.89-1.32)	1.12 (0.91-1.39)	474	0.94 (0.68-1.30)	_		
High	659	1.00	1.00	168	1.00	_		
Supervisor's support			n.s.			n.s.		
Low	493	1.01 (0.78-1.32)	_	214	1.64 (1.11-2.46)	—		
Medium	2016	0.90 (0.71-1.13)	—	578	1.24 (0.85-1.81)	—		
High	414	1.00	_	142	1.00	—		

The risk ratios (RR) and their confidence intervals (CI) for the very long medically certified sick leaves (22 days or more) in a private industry in Finland during the follow-up, by job characteristics, symptoms, and social support

physical symptoms were strong (an inverse U-shaped relation). Among men, coworkers' and supervisor's support lowered the risk of very long episodes of sickness absence 1.5–1.8-fold, when the level of psychological symptoms was high.

Discussion

In this study the predictive effects of psychosocial work characteristics, social support resources, and physical and psychological symptoms on subsequent sickness absenteeism were studied in a private industrial company. Comparison of women and men showed that women had more sick leaves as noted in previous studies (Alexanderson, Leijon, Åkerlind, Rydh, & Bjurulf, 1994; Hendrix et al., 1994; Jacobson, Aldana, Goetzel, & Vardell, 1996; North et al., 1996). Our results regarding the psychosocial antecedents of sickness absence were partly in line with previous observations made in the public sector, but there were also interesting genderspecific results, as well as some new findings, which need to be looked at from various angles. In the following, the results will be considered in more detail, and the role of gender in work life will be discussed in view of our findings.

Job characteristics

Job characteristics predicted sickness absence in both men and women. This corresponds with previous findings. Especially job autonomy/job control has been found to be closely related to sickness absenteeism in other longitudinal studies as well (Kivimäki et al., 2000; North et al., 1993; Peiró et al., 1999; Smulders & Nijhuis 1999; Vahtera et al., 2000). However, in Whitehall Study II on civil servants in London, this result was found only in men (North et al., 1996). We also found job autonomy to be especially associated with men's long sickness absence episodes. Many explanations can be given for this effect. Men have on average more influence within their job than women (e.g. Hochwarter, Table 5

The length of absence episode and predictor	Men				Women				
	Age, SES, and baseline adjusted Coworkers' support Low vs. high	Fully adjusted Coworkers' support Low vs. high	Age, SES, and baseline adjusted Supervisor's support Low vs. high	Fully adjusted Supervisor's support Low vs. high	Age, SES, and baseline adjusted Coworkers' support Low vs. high	Fully adjusted Coworkers' support Low vs. high	Age, SES, and baseline adjusted Supervisor's support Low vs. high	Fully adjusted Supervisor's support Low vs. high	
Long absence en	isodes	0	0		U	0	0	0	
Joh autonomy	ns	n s	n < 0.008	n < 015	n s	ns	ns	ns	
Low			1.34	1 29					
Moderate	_	_	0.93	0.91	_	_	_		
High			0.79	0.82	_				
Job complexity	n.s.	n.s.	n.s.	n.s.	p < .040	p < .060	n.s.	n.s.	
Low					1.15	1.09			
Moderate	_		_		0.78	0.74	_		
High	_		_		1.31	1.20	_		
Physical	n.s.	n.s.	n.s.	n.s.	p < .024	<i>p</i> < .027	n.s.	n.s.	
symptoms					1	1			
High					1.48	1.48			
Moderate	_	_	_	_	0.76	0.76	_		
Low	_	_	_	_	0.92	0.90	_		
			_			_	_		
Very long absend	ce episodes								
Job complexity	n.s.	n.s.	<i>p</i> < .012	<i>p</i> < .018	n.s.	n.s.	n.s.	n.s.	
Low			1.86	1.70					
Moderate			0.96	0.91					
High		—	1.07	0.99	—	_			
Physical	p<.001	<i>p</i> < . 002	p<.001	p <.001	n.s.	n.s.	n.s.	n.s.	
symptoms									
High	1.36	1.19	1.27	1.08					
Moderate	0.76	0.73	0.68	0.65	—	_	—		
Low	1.49	1.41	1.42	1.35					
Psychological	<i>p</i> < .045	<i>p</i> < .103	<i>p</i> < .003	<i>p</i> < .014	n.s.	n.s.	n.s.	n.s.	
symptoms									
High	1.81	1.60	1.77	1.54	_				
Moderate	0.95	0.92	0.77	0.75	_	—	_		
Low	1.20	1.15	1.19	1.12			_	_	

The moderating effects (RR, CI) of coworkers' support and supervisor's support on the relationship between job characteristics, symptoms, and sickness absenteeism during the follow-up

Statistically significant interactions for men and women after adjustment for age, SES and prior absence, and all the other psychosocial predictors studied. The rate ratios (RR) indicate the risk for sickness absenteeism of those who have a high level of support in contrast to a reference group of those who have a low level of support (RR = 1.00), split at the median. Thus, all RRs given in the table describe the risk of sickness absenteeism at the low level of social support.

Perrewe, & Dawkins, 1995). Moreover, in private industrial enterprises, conventionally male occupations may concentrate more on aspects of work autonomy, whereas in conventionally female occupations importance is given to taking care of one's own part of the work.

However, it seems that strong job autonomy plays a significant role also in women's absenteeism in the Finnish private industrial sector when predicting very long episodes of sickness absence. In fact, these associations were even stronger among women than among men. This difference between our results and British results among civil servants (North et at., 1996) may be due to a different absence measure, but may also reflect differences between these two societies (for instance, in contrast to the UK, in Finland women are widely represented in every sector of the labor market), because the findings from the public sector in Finland are more similar to our results (Kivimäki et al., 1997). Job autonomy perhaps plays a more important role in women's health in societies where women are more actively and broadly involved in work life, and in those areas of the private sector and public sector where independence is an expected and valued characteristic at work. It is plausible that a combination of high involvement of women on the labor market, and a work culture (e.g. management, coworkers) which expects autonomy from women, can lead to a situation where women's ill health can be prevented by strong job autonomy.

In the future, it would be interesting to study the role of job autonomy at various levels of the organizational hierarchy. Different samples could be used in the private and public sectors from diverse countries, because job autonomy may play a different role in different occupations and in different national cultures, and thus affect also sickness absenteeism differently.

Job complexity did not protect against sickness absences lasting 4–21 days for either gender. This finding was against our hypothesis and only partly agree with those of Stansfeld et al. (1997) and Houtman et al. (1994) who found that high skill requirements and high intellectual discretion are protective factors against episodes of psychiatric and musculoskeletal sickness absences (see also Melamed et al., 1995). However, men's very long sickness absences (over 21 days) seem to be related to this job characteristic to some extent. Challenging jobs that involve complex tasks have previously been associated negatively with sickness absenteeism in the public sector (North et al., 1996; Smulders & Nijhuis, 1999).

In general, our result can be explained partly by the self-image of men who have highly complex jobs in a private industrial enterprise: they may think that they are irreplaceable and invaluable, so they can not be ill for a long time (several weeks or even months). In the short run, this may be the case in some workplaces: essential tasks are concentrated in one person or very few persons, and these key persons may feel pressure to be on the job even when they have rather serious problems with their health (see Smulders & Nijhuis, 1999).

By looking at job complexity, we wanted to broaden the scope of the study toward one essential aspect of work in the information-intensive society. However, several other aspects related to new work environments and different cultures may be relevant in future studies such as multicultural interaction, and continuous changes. In some occupations white-collar work in particular has become more international, and alterations in tasks and positions have become more common among them (see Huuhtanen, Kalimo, & Lindström, 1999; Kivimäki et al., 2000; Schechter et al., 1997).

Physical and psychological symptoms

Physical symptoms predicted sickness absenteeism in men and women, as found in other studies (Kivimäki et al., 1997; North et al., 1993; Vahtera et al., 1996). From the longitudinal point of view, one possible interpretation of this relation is to see it as a chain reaction in which ill health progresses in time. For instance, first there is an unbearable situation at work or at home, and the person does not have the capacity to cope with the situation using his/her usual stressreducing behaviors (Lazarus, 1966). This causes symptoms, short absences from work, and in the long run, sick leaves prescribed by a physician. Our results can therefore be seen as an undesired result of a long process towards ill health, which may occur even during a fairly short time (1-year 9-month).

The findings showed that psychological symptoms were also significant predictors of sickness absences among both men and women. This is in line with other studies (Borgquist et al., 1993; Grossi et al., 1999; Kessler & Frank, 1997; Kivimäki et al., 1997; Rees & Smith, 1991).

The relationship between symptoms and sickness absenteeism may have many interpretations. It has been suggested that, in the long run, stressful experiences at work followed by active coping are more likely to be associated with physiological conditions, such as cardiovascular disease, whereas a chronically stressful job experience followed by passive coping is likely to be associated with depressive mood and withdrawal behavior, such as sickness absenteeism (Peter & Siegrist, 1997). Vasse, Nijhuis and Kok (1998) have proposed that sickness absence could reflect the medical problems of workers and/or a lack of skills in coping with stress. Hackett and Bycio (1996) have suggested more positively that absence from work may help to maintain physical and psychological states at manageable levels, even if they do not result in immediately noticeable improvements in the employee (see also Ulleberg & Rundmo, 1997). These explanations are fascinating, but they also entail a risk of overestimating psychological effects, especially in the case of physician-prescribed long sick leaves.

Recent findings suggest that many socioeconomic factors such as economic depression (e.g. Kivimäki et al., 2000; Vahtera et al., 1997) and socio-cultural factors, such as absence of norms in the work unit in different work cultures (e.g. Xie & Johns, 2000), affect health and/or illness behavior, and that in some contexts these factors may play a greater role in absenteeism than the type of personal coping, for instance. Specifically, at the beginning of an economic depression, sickness absences seem to decrease considerably, while at the end of a depression they seem to increase. Furthermore, in work cultures where an employee's absence is not noticeable,

and where there are loose norms of absenteeism in the work group, employees might have more absences than in work cultures and work groups with more strict norms. Also, sickness absence practices and social security benefits often vary between countries and enterprises. With respect to our results, however, the participating enterprise did not suffer from economic difficulties during our follow-up, and generally the Finnish work culture is based on rather strict norms of being present, and employees are entitled to total compensation for loss of salary due to sick leaves. However, work group norms regarding absenteeism may have varied between work units, and affected, for instance, the relationship between physical and psychological symptoms and sickness absence to some extent.

Social support

Support variables were significant predictors of sickness absence even after adjustments for demographics and prior absence. However, both coworkers' support and supervisor's support were associated with sickness absence rather differently in men and women (see also North et al., 1996; Vahtera et al., 2000). For men, coworkers' support was a focal social dimension at work in predicting absenteeism. This finding agrees with the results from a similar study in a national electricity company in France (Niedhammer et al., 1998) in which coworkers' support affected only men's absenteeism. This might reflect the nature and organization of work in a male-dominated forest industry plant where a lot of cooperation is needed to carry out the work process successfully, particularly among workers on the same hierarchical level. Prior results support this view. According to prospective research in the forest industry conducted by Kalimo and Toppinen (1999), teamwork demands have increased cooperation among people working in the same unit. For women, on the other hand, supervisor's support seems to function as an important resource. This is consistent with earlier research in some service sector occupations (Schokking-Siegrist, 1981). In our study, this is perhaps related to women's occupations and daily roles within the organization (e.g., laboratory assistants, technical assistants, office jobs, etc.). The supervisor's role may be more central in their social contacts, and in performing their work tasks.

However, social support variables did not predict absenteeism as much as job characteristics or prior symptoms in the present study, nor in many other studies from the public sector. There are at least three alternative interpretations of this result. Firstly, according to the 'medical explanation', medically certified sick leaves do not depend so much on the social factors of work, such as the role of the supervisor; they are the result of actual illness or poor working conditions (North et al., 1996). Secondly, according to the 'psychological explanation', social support tends to buffer the effects of emotional stress, whereas physical stress may burden an employee regardless of the amount of social support he or she receives (Ulleberg & Rundmo, 1997). Thirdly, according to the 'organizational explanation', the connection between social support and sickness absence may be mediated by complex organizational processes, such as social networks and organizational norms within an organization (Xie & Johns, 2000).

Despite these notions, it is apparent that job-related social factors such as coworkers' or supervisor's support do affect sickness absence. For example, if we assume that the relationship between coworkers' support and sickness absence remains the same during the course of time, male employees who receive strong support from their coworkers will have 23 fewer sick leaves (> 3 days) per 100 person years than those male employees with low coworkers' support. Correspondingly, women who receive strong support from their supervisor will have 27 fewer sick leaves per 100 person years than women with low supervisor's support. At the organizational level this is of vast importance, not only psychosocially but economically as well (see Kearns, 1997; Martocchio, 1992).

Many authors have suggested that support from different sources may moderate the effects of stress on well-being in different ways (e.g. Roberts et al., 1994; Vahtera et al., 1996). We hypothesized that two sources of support at work will moderate the relationship between work-related stressors or physical and psychological symptoms and subsequent health. In our study, interaction effects between social support and the other predictors of sickness absence were found in 8 cases (Table 5). As some previous cross-sectional studies on the moderating role of different sources of social support in the relation between stress and health have implied, the associations between job stressors or distress and subsequent health seem to be partly linked to gender (Abdalla, 1991; Ulleberg & Rundmo, 1997; Wolgemuth & Betz, 1991).

For men, supervisor's support buffered the effects of low job autonomy and complexity. In general, the findings on job characteristics seem to show that the supervisor can act as a protector against ill health, especially in situations where the work itself does not offer enough independence or challenges to the male worker. Secondly, among men the interactions between physical/psychological symptoms and coworkers'/supervisor's support were significant in predicting the number of very long episodes of absence. However, the moderating effect was not as we assumed, since an inverse U-shaped relationship was found: when the level of physical symptoms was low or high, low support from the coworkers and supervisor led to very long absences. Similarly when psychological symptoms were low or high, low support was associated with sickness absence.

In women, the relationship to social support was simpler. Although low supervisor support had a direct effect on increasing sickness absence, it was low coworker support that exacerbated sickness absence for those in high complexity jobs, and those with many physical symptoms. Otherwise, coworkers' support or supervisor's support had little moderating effect on their medically certified leaves.

Even though the direct relationship between social support and absenteeism was not particularly strong in our study, work-related social support appears to buffer some negative job characteristics and physical and psychological symptoms among men in particular.

Gender

In the present study women had higher levels of sickness absenteeism during the baseline and follow-up, and they had somewhat more physical and psychological symptoms. There is plenty of literature showing that women carry a heavier burden at home (e.g. Jenkins, 1991). High demands from various areas of life can be manifested at work as short absences (Kushnir & Kasan, 1992/93), but they can also lead to more severe health outcomes (Dixon et al., 1991). However, many social roles usually protect against health impairment among women, and only when the role demands are overwhelmingly health impairs (on lone mothers, see Bartley, Sacker, Firth, & Fitzpatrick, 1999). Further, research evidence shows that women, more likely than men, tend to resort to help-seeking behavior at the stage of recognizing health problems (Leaf & Livingstone-Bruce, 1987). Jenkins (1991) has pointed out that the social consequences of expressing symptoms may differ between the sexes. Illness can be more stigmatizing for men, and women are more willing to report symptoms than men. These notions can partly explain our results.

Our findings indicate that women have less job autonomy, job complexity, and social support in the private industrial sector. They are often employed in occupations involving repetitive tasks (e.g. secretaries) and/or involving duplication of the tasks related to housework (e.g. cleaners). In addition, women in managerial tasks usually work at the lower level of the management. Inevitably, a number of structural and organizational restrictions limit women's tasks and career advancement in numerous private enterprises (Morrison & Von Glinow, 1990). Additionally, as Niedhammer et al. (1998) have suggested, women may also be more socially isolated in the male-dominated industrial sector, and have less important social contacts at work compared to men. These processes can mean that women's skills are often under-utilized, they have less rewarding social contacts, and their work-related

well-being and health behavior is affected more by supervisor's consideration (Silverstone & Towler, 1984).

However, there were similarities in antecedents between men and women. In particular, job autonomy and symptoms predicted sickness absence in both gender groups. As regards the prospective connection between symptoms and objective ill health this confirms earlier findings received from the public sector (Kivimäki et al., 1997; North et al., 1996; Vahtera et al., 1996). Interestingly, job autonomy's strong protective role against very long medically certified sickness absences among women is a new finding and has not been found before. We conclude that future research should also investigate other male- and female-dominated, and gender-balanced sectors, involving also other occupational and educational groups. It is noteworthy that our study population is not atypical in terms of occupations and roles between men and women in the similar private industrial organizations in general.

Methodological and practical considerations

One limitation of the study was the 56% consent rate to use absentee records. Upper-level employees were more likely to participate than blue-collar workers. Furthermore, it is possible that people with ill health were less willing to participate, or left the company during the follow-up period. The turnover rate, however, was very low (2%) in the company during the follow-up. Thus, it seems that the healthy worker effect regarding our findings is probable, but not very substantial. The high dropout rate is nevertheless a shortcoming of the study, and this should be remembered when looking at our findings. Finally, job categories of male and female non-manual and manual workers differ partly due to gender-segregated working sectors within the industry, and this might create differences in the psychosocial antecedents of absenteeism.

The meaning of sickness absence and its reflection of ill health needs to be considered. It is impossible to know at what stage in the process of the worker's ill health the information for this study has been collected. The disease or illness may, or may not, have lasted already several years, and caused absence episodes in the past. First, this means that it is difficult to distinguish between the effect of earlier absence and the effect of ill health in our study. This relation must be recognized when using previous sick leaves as confounders in hierarchic regression models. Second, the prediction of illness behavior by the same illness behavior partly nullifies (overcontrols) the effect of predictor variables, such as psychosocial factors. Presumably, the effects of psychosocial factors in the models adjusted for age, SES, and baseline absence and fully adjusted models indicate how

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much a person's health had deteriorated during this short period.

The studied sick leaves are only one phase of a multidimensional process of health that can be studied from several angles (e.g. Geurts, Buunk, & Schaufeli, 1994; Léonard, Dolan, & Arsenault, 1990; North et al., 1996; Vahtera et al., 1997; Virtanen, Vahtera, Kivimäki, & Pentti, 1999). Methodologically speaking, for instance, it should be noted that the relationship between the variables may be of a circular nature (Ulleberg & Rundmo, 1997). Direct causal models, such as ours, do not specify these effects, such as between job autonomy and symptoms, or between sickness absences and social support. We need repeated measures to study them. In addition, the psychosocial scales used to measure work and symptoms vary in different surveys, and may cause some variation in the research results. For instance, our measures of coworkers' support may accentuate a cooperative atmosphere and emotional attachment with one's colleagues more than tangible support.

In addition, the choice of our absence measure is reflected in our results. In our analyses we found that 40% of all participants had one or more absence episodes, and only 11% had over two episodes. However, when the days of absence were investigated, the result was different. Again, the majority of the participants did not have any absences, but a very large proportion of the total days of absence in our study population concentrated among a small minority of persons. This led us to believe that an analysis of the duration measure would have identified the predictors of ill health for those few persons who have mainly severe injuries or chronic health problems. This would have given a biased overall picture of the predictors of sickness absence among the employees as a whole. We believe that our analysis of episodes-long and very long episodes of absence-is preferable in identifying the risks for incidents of sickness absence in the normal population of industrial employees.

In summary, we first point out that some of the psychosocial predictors of sickness absenteeism found in the present study in a private industrial enterprise are similar to those found to be important for the health of employees in the public sector. However, some findings, especially concerning the effects of job autonomy and supervisor's support on sickness absences in women, the impact of symptoms on sickness absences in both genders, and the moderating role of social support resources in men's very long absences are new and need to be tested in other study populations. Several conclusions can be drawn. First, one should pay attention to stress-creating job characteristics before they lead to deteriorated health. Second, self-reported physical and psychological symptoms seem to be early warning signals of future sick leaves. Third, the role of social support among men and women should be examined more closely. Fourth, although sickness absences of different length seemed to have partly different psychosocial antecedents, in many cases the antecedents display similar patterns. Fifth, among men, predictors of health such as job autonomy are similar in public and private sectors, whereas other predictors may be related to male- or female-related work tasks, occupations, and social roles. These results can be applied to the company policy of health service planning, job redesign and human resource management, as precepts for improving the health of both men and women.

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References

- Abdalla, I. A. (1991). Social support and gender responses to job stress in Arab culture. *Journal of Social Behavior and Personality*, 6, 273–288.
- Alexanderson, K., Leijon, M., Åkerlind, I., Rydh, H., & Bjurulf, P. (1994). Epidemiology of sickness absence in a Swedish county in 1985, 1986, 1987. Scandinavian Journal of Social Medicine, 22, 27–34.
- Anderson, J. (1991). Stress and burnout among nurses: A social network approach. *Journal of Social Behavior and Personality*, 6, 251–272.
- Baba, V. (1990). Methodological issues in modeling absence: A comparison of least squares and tobit analyses. *Journal of Applied Psychology*, 75, 428–432.
- Bartley, M., Sacker, A., Firth, D., & Fitzpatrick, R. (1999). Social position, social roles, and women's health in England: Changing relationships 1984–1993. Social Science & Medicine, 48, 99–115.
- Belcastro, P. A., Gold, R. S., & Grand, J. (1982). Stress and burnout: Physiologic effects on correctional teachers. *Criminal Justice and Behaviour*, 9, 387–395.
- Björvell, H., & Brodin, B. (1992). Hospital staff members are satisfied with their jobs. *Scandinavian Journal of Caring Sciences*, 6, 9–16.
- Borgquist, L., Hansson, L., Nettelbladt, P., Nordstrom, G., & Lindelöw, G. (1993). Perceived health and high consumers of care: A study of mental health problems in a Swedish primary health care district. *Psychological Medicine*, 23, 763–770.
- Buunk, B. P., & Ybema, J. F. (1997). Social comparisons and occupational stress: The identification-contrast model. In B. P. Buunk, & F. X., Gibbons (Eds.), *Health, coping,* and well-being: Perspectives from social comparison theory (pp. 359–388). Mahwah, NJ: Lawrence Erlbaum Associates, Inc.

- Cohen, S., & Wills, T. A. (1985). Stress, social support, and the buffering hypothesis. *Psychological Bulletin*, 98, 310–350.
- Dean, A., Kolody, B., & Wood, P. (1990). Effects of social support from various sources on depression in elderly persons. *Journal of Health and Social Behavior*, 31, 148–161.
- Dixon, J. P., Dixon, J. P., & Spinner, J. P. (1991). Tensions between career and interpersonal commitments as a risk factor for cardiovascular disease among women. *Women's Health*, 17, 33–57.
- Donaldson, S. I., & Klien, D. (1997). Creating healthful work environments for ethnically diverse employees working in small and medium-sized businesses: A non-profit industry/ community/university collaboration model. *Employee* Assistance Quarterly, 13, 17–32.
- Donaldson, S. I., Sussman, S., Dent, C. W., Severson, H. H., & Stoddard, J. L. (1999). Health behavior, quality of work life, and organizational effectiveness in the lumber industry. *Health Education Behavior*, 26, 579–591.
- Elo, A.-L. (1994). Assessment of mental stress factors at work. In: C. Zent, O. B. Dickerson, & E. P. Howarth (Eds.) Occupational medicine (3rd ed.) (pp. 945–959). Baltimore: Mosby.
- Elo, A.-L., Leppänen, A., Lindström, K., & Roponen, T. (1992). Occupational stress questionnaire: User's instructions. Helsinki: Reviews. Finnish Institute of Occupational Health.
- Farrell, D., & Stamm, C. L. (1988). Meta-analysis of the correlates of employee absence. *Human Relations*, 41, 211–227.
- Ganster, D. C., & Schaubroeck, J. (1991). Work stress and employee health. *Journal of Management*, 17, 235–271.
- Geurts, S. A., Buunk, B. P., & Schaufeli, W. B. (1994). Social comparisons and absenteeism: A structural modeling approach. *Journal of Applied Social Psychology*, 24, 1871–1890.
- Goldberg, D. P., & Hillier, V. F. (1979). A scaled version of a General Health Questionnaire. *Psychological Medicine*, 9, 139–145.
- Grossi, G., Soares, J. J., Angesleva, J., & Perski, A. (1999). Psychosocial correlates of long-term sick-leave among patients with musculoskeletal pain. *Pain*, 80, 607–619.
- Hackett, R. D., & Bycio, P. (1996). An evaluation of employee absenteeism as coping mechanism among hospital nurses. *Journal of Occupational and Organizational Psychology*, 69, 327–338.
- Hendrix, W. H., Spencer, B. A., & Gibson, G. S. (1994). Organizational and extraorganizational factors affecting stress, employee well-being, and absenteeism for males and females. *Journal of Business and Psychology*, 9, 103–128.
- Hochwarter, W. A., Perrewe, P. L., & Dawkins, M. C. (1995).Gender differences in perceptions of stress-related variables:Do the people make the place or does the place make the people? *Journal of Managerial Issues*, 7, 62–74.
- House, J. S. (1981). Work, stress, and social support. Reading, MA: Addison-Wesley.
- House, J. S., Umberson, D., & Landis, K. R. (1988). Structures and processes of social support. *Annual Review of Sociology*, 14, 293–318.

- Houtman, I. L. D., Bongers, P. M., Smulders, P. G. W., & Kompier, M. A. J. (1994). Psychosocial stressors at work and musculoskeletal problems. *Scandinavian Journal of Work, Environment and Health*, 20, 139–145.
- Huuhtanen, P., Kalimo, R., & Lindström, K. (1999). Ageing workers and changing working life. Helsinki: Ministry of Labor—Finnish Institute of Occupational Health.
- Jacobson, B. H., Aldana, S. G., Goetzel, R. Z., & Vardell, K. D. (1996). The relationship between perceived stress and self-reported illness-related absenteeism. *American Journal* of Health Promotion, 11, 54–61.
- Jenkins, R. (1985). Minor psychiatric morbidity in employed young men and women and its contribution to sickness absence. *British Journal of Industrial Medicine*, 42, 147–154.
- Jenkins, R. (1991). Demographic aspects of stress. In C. L. Cooper, & R. Payne (Eds.), *Personality and stress: individual* differences in the stress process (pp. 107–132). New York: Wiley.
- Kalimo, R., & Toppinen, S. (1999). Finland: Organizational well-being: Ten years of research and development: in a forest industry corporation. In M. Kompier, & C. Cooper (Eds.), *Preventing stress, improving productivity: European case studies in the workplace* (pp. 52–85). London: Routledge.
- Karasek, R. (1979). Job demands, job decision latitude and mental strain: Implications for job redesign. *Administrative Science Quarterly*, 24, 285–308.
- Karasek, R. A., & Theorell, T. (1990). Healthy work, stress, productivity and the reconstruction of work life. New York: Basic Books.
- Kearns, J. (1986). Stress at work: The challenge of change. Englewood Cliffs, NJ: Prentice-Hall.
- Kearns, W. L. (1997). Cash benefits for short-term sickness, 1970-94. Social Security Bulletin, 60, 49–53.
- Kessler, R. (1997). The effects of stressful life events on depression. Annual Review of Psychology, 48, 191–214.
- Kessler, R., & Frank, R. (1997). The impact of psychiatric disorders on work loss days. *Psychological Medicine*, 27, 861–873.
- Kivimäki, M., Kalimo, R., & Toppinen, S. (1998). Sense of coherence as modifier of occupational stress exposure, stress perception, and experienced strain: A study of industrial managers. *Psychological Reports*, 83, 971–981.
- Kivimäki, M., Vahtera, J., Pentti, J., Thomson, L., Griffiths, A., & Cox, T. (1997). Psychosocial factors predicting employee sickness absence during economic decline. *Journal* of Applied Psychology, 82, 858–872.
- Kivimäki, M., Vahtera, J., Koskenvuo, M., Uutela, A., & Pentti, J. (1998). Response of hostile individuals to stressful change in their working lives: Test of a psychosocial vulnerability model. *Psychological Medicine*, 28, 903–913.
- Kivimäki, M., Vahtera, J., Pentti, J., & Ferrie, J. E. (2000). Factors underlying the effect of organizational downsizing on health of employees: Longitudinal cohort study. *British Medical Journal*, 320, 971–975.
- Kivimäki, M., Vahtera, J., Ferrie, J. E., Hemingway, H., & Pentti J, . (2001). Organisational downsizing and musculoskeletal problems in employees: A prospective study. *Occupational and Environmental Medicine*, 58, 811–817.

- Krantz, G., & Östergren, P. O. (2000). Common symptoms in middle aged women: Their relation to employment status, psychosocial work conditions and social support in a Swedish setting. *Journal of Epidemiology and Community Health*, 54, 192–199.
- Kristensen, T. S. (1991). Sickness absence and work strain among Danish slaughterhouse workers: An analysis of absence from work regarded as coping behavior. *Social Science & Medicine*, 32, 15–27.
- Kushnir, T., & Kasan, R. (1992/93). Major sources of stress among women managers, clerical workers, and working single mothers: Demands vs. resources. *Public Health Review*, 20, 215–229.
- Lazarus, R. S. (1966). Psychological stress and the coping process. New York: McGraw-Hill.
- Leaf, P. L., & Livingstone-Bruce, M. (1987). Gender differences in the use of mental health-related services: A re-examination. *Journal of Health and Social Behavior*, 28, 171–183.
- Léonard, C., Dolan, S. L., & Arsenault, A. (1990). Longitudinal examination of the stability and variability of two common measures of absence. *Journal of Occupational Psychology*, 63, 309–316.
- Long, J. (1991). Let the trained take the strain. *The Health* Service Journal, 18, 16–17.
- Luz, J., & Green, M. S. (1997). Sickness absenteeism from work—A critical review of the literature. *Public Health Review*, 25, 89–122.
- Maes, S., Verhoeven, C., Kittel, F., & Scholten, H. (1998). Effects of a Dutch work-site wellness-health program: The Brabantia Project. *American Journal of Public Health*, 88, 1037–1041.
- Marmot, M., Feeney, A., Shipley, M., North, F., & Syme, S. L. (1995). Sickness absence as a measure of health status and functioning: From the UK Whitehall II study. *Journal of Epidemiology and Community Health*, 49, 124–130.
- Martocchio, J. J. (1992). The financial costs of absence decisions. Journal of Management, 18, 133–152.
- Melamed, S., Ben Avi, I., Luz, J., & Green, M. S. (1995). Objective and subjective work monotony: Effects on job satisfaction, psychological distress, and absenteeism in blue-collar workers. *Journal of Applied Psychology*, 80, 29–42.
- Morrison, A. M., & Von Glinow, M. A. (1990). Women and minorities in management. *American Psychologist*, 45, 200–208.
- Niedhammer, I., Bugel, I., Goldberg, M., Leclerc, A., & Guéguen, A. (1998). Psychosocial factors at work and sickness absence in the Gazel cohort: A prospective study. *Occupational and Environmental Medicine*, 55, 735–741.
- North, F., Syme S, I., Feeney, A., Head, J., Shipley, M. J., & Marmot, M. G. (1993). Explaining socioeconomic differences in sickness absence: The Whitehall II study. *British Medical Journal*, 306, 361–366.
- North, F. M., Syme, S. L. F, Feeney, A., Shipley, M., & Marmot, M. (1996). Psychosocial work environment and sickness absence among British civil servants: The Whitehall II study. *American Journal of Public Health*, 86, 332–340.
- Parkes, K. R., Mendham, C. A., & Von Rabenau, C. (1994). Social support and the demand-discretion model of job

stress: Tests of additive and interactive effects in two samples. *Journal of Vocational Behavior*, 44, 91–113.

- Peiró, M. J., González-Romá, V., Lloret, S., Bravo, M. J., & Zurriaga, R. (1999). Predictors of absenteeism among public health services employees. In P. Le Blanc, M. C. W. Peters, A. Büssing, & W. B. Schaufeli (Eds.), Organizational psychology and health care. European contributions (pp. 153–169). München & Merling: Rainer Hampp Verlag.
- Peter, R., & Siegrist, J. (1997). Chronic work stress, sickness absence and hypertension in middle managers: General or specific sociological explanations? *Social Science & Medicine*, 45, 1111–1120.
- Rael, E. G. S., Stansfeld, S. A., Shipley, M., & Head, J. (1995). Sickness absence in the Whitehall II study, London: The role of social support and material problems. *Journal of Epidemiology and Community Health*, 49, 474–481.
- Rees, D. W., & Smith, S. D. (1991). Work stress in occupational therapists assessed by the occupational stress indicator. *British Journal of Occupational Therapy*, 54, 289–294.
- Roberts, C., Cox, C. E., Shannon, V. J., & Wells, V. J. (1994). A closer look at social support as a moderator of stress in breast cancer. *Health and Social Work*, 3, 157–164.
- Schaubroeck, J., Ganster, D. C., & Kemmerer, B. E. (1994). Job complexity, "type A" behavior, and cardiovascular disorder: A prospective study. *Academy of Management Journal*, 37, 426–439.
- Schechter, J., Green, L. W., Olsen, L., Kruse, K., & Cargo, M. (1997). Application of Karasek's demand/control model in a Canadian occupational setting including shift workers during a period of reorganization and downsizing. *American Journal of Health Promotion*, 11, 394–399.
- Schokking-Siegrist, S. (1981). Work absence among women. In Absenteeism and social security: Studies and research No. 16. Geneva: International Social Security Association.
- Silverstone, R., & Towler, R. (1984). Secretary at work. Ergonomics, 27, 557–564.
- Skelton, J. A., Pennebaker, J. W. (1982). The psychology of physical symptoms and sensations. In G. S. Sanders, & J. Suls (Eds.), *Social psychology of health and illness*. Hillsdale: Lawrence Erlbaum Associates.
- Smulders, F., & Nijhuis, F. (1999). The job demands/Job control model and absence behaviour: Results of a 3-year longitudinal study. *Work and Stress*, 13, 115–131.
- Social Insurance Institution, Finland. (1997). Kansaneläkelaitoksen tilastollinen vuosikiria [Statistical Yearbook of Social Insurance Institution, Finland 1997] Helsinki [in Finnish].
- Stansfeld, S., Fuhrer, R., Head, J., Ferrie, J., & Shipley, M. (1997). Work and psychiatric disorders in the Whitehall II Study. *Journal of Psychosomatic Research*, 43, 73–81.
- Sturman, M. C. (1999). Multiple approaches to analyzing count data in studies of individual differences: The propensity for type I errors, illustrated with the case of absenteeism prediction. *Educational and Psychological Measurement*, 59, 414–430.
- Toppinen-Tanner, S., Kalimo, R., & Mutanen, P. (2002). The process of burnout in white-collar and blue-collar jobs:

Eight-year prospective study of exhaustion. Journal of Organizational Behavior, 23, 555-570.

- Ulleberg, P., & Rundmo, T. (1997). Job stress, social support, job satisfaction and absenteeism among offshore oil personnel. Work and Stress, 11, 215–228.
- Unden, A.-L. (1996). Social support at work and its relationship to absenteeism. *Work and Stress*, 10, 46–61.
- Vahtera, J., Pentti, J., & Uutela, A. (1996). The effect of objective job demands on registered sickness absence spells: Do personal, social and job-related resources act as moderators? *Work and Stress*, 10, 286–308.
- Vahtera, J., Kivimäki, M., & Pentti, J. (1997). Effect of organizational downsizing on health of employees. *The Lancet*, 350, 1124–1128.
- Vahtera, J., Kivimäki, M., Pentti, J., & Theorell, T. (2000). Effect of change in the psychosocial work environment on sickness absence: A 7 year follow-up of initially healthy employees. *Journal of Epidemiological and Community Health*, 54, 484–493.

- van den Heuvel, A., & Wooden, M. (1995). Do explanations of absenteeism differ for men and women? *Human Relations*, 48, 1309–1329.
- Vasse, R. M., Nijhuis, F. J. N., & Kok, G. (1998). Associations between work stress, alcohol consumption and sickness absence. *Addiction*, 93, 231–241.
- Virtanen, P., Vahtera, J., Kivimäki, M., & Pentti, J. (1999). Workplace as an origin of health inequalities. *Journal of Epidemiology and Community Health*, 53, 399–407.
- Wolgemuth, E., & Betz, N. E. (1991). Gender as moderator of the relationship of stress and social support to physical health in college students. *Journal of Counseling Psychology*, 38, 367–374.
- Xie, J. L., & Johns, G. (2000). Interactive effects of absence culture salience and group cohesiveness: A multi-level and cross-level analysis of work absenteeism in the Chinese context. *Journal of Occupational and Organizational Psychology*, 73, 31–52.