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The contribution of the psychosocial work environment to sickness absence in human service workers: Results of a 3-year follow-up study

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Abstract

We investigated to what extent psychosocial work characteristics predict sickness absence in a cohort of 890 human service professionals (84% women), followed-up for 3 years. We measured 16 different psychosocial work characteristics at baseline and analysed their associations with number of sickness absence days at follow-up using multivariate Poisson regression. In addition, we computed a psychosocial work environment index, summarizing eight psychosocial scales. Participants with exposure to violence and threats, high emotional demands, high demands for hiding emotions, low influence at work, low meaning of work, low quality of management, and role conflicts had an increased number of sickness absence days at follow-up, after adjustment for numerous confounders. Adjusting for sickness absence history caused little change in most effect estimates. Scoring in the most adverse quartile of the psychosocial work environment index was associated with a 71% increase in sickness absence days. Improving the psychosocial work environment index and eliminating exposure to violence and threats would have prevented 32% of all sickness absence days in the study population. In particular we found that exposure to violence was a strong predictor of absence. This study shows that a wide range of psychosocial work characteristics contribute to sickness absence in human service workers. Improving the psychosocial work environment might help to reduce sickness absence in this population.

Keywords: *Prospective study, longitudinal, work-related stress, psychological, sick leave, absenteeism, burnout, violence*

Introduction

Sickness absence is an important topic, with regard to both public and occupational health as well as economics. Studies have shown that it is a strong predictor for adverse health outcomes, including disability and mortality (Kivimäki et al., 2004; Kivimäki, Head, Ferrie, Shipley, Vahtera, & Marmot, 2003; Vahtera et al., 2004). The economic costs for sickness

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absence put a substantial strain on social welfare states, especially in the Nordic countries, where employees with sickness absence of more than 2–3 weeks usually receive sick-leave benefits from the municipalities or the state (Nordisk Ministerråd, 2005).

Although there is an increasing amount of research on the impact of the psychosocial work environment on risk of sickness absence, causal associations are still poorly understood. A recent state-of-the-art review (Allebeck & Mastekaasa, 2004) reported that most studies on psychosocial work environment and sickness absence are cross-sectional in design. Of the few prospective studies, most have relied on the demand-control support model (Karasek & Theorell, 1990; Theorell & Karasek, 1996) to define and measure the psychosocial work environment. However, that review found satisfactory scientific evidence only for exposure to low job control, and there was no clear evidence for a causal influence of high psychological demands and low social support at work on sickness absence.

Since the literature search for the state-of-the-art review (Allebeck & Mastekaasa, 2004) was completed in October 2002, several new longitudinal studies on psychosocial work environmental causes of sickness absence have been published. The French GAZEL study (France's national gas and electricity company; Melchior, Niedhammer, Berkman, & Goldberg, 2003) and the Danish IPAW study (Intervention Project on Absence and Well-being; Nielsen, Rugulies, Christensen, Smith-Hansen, Bjorner, & Kristensen, 2004) have shown that low job control is a risk factor of sickness absence in men and women. The IPAW study further showed that low predictability at work significantly increased the risk of sickness absence in men (Nielsen et al., 2004), that the effect sizes for both job control and predictability were particularly strong for absence spells of longer than 10 days (Nielsen, Rugulies, Christensen, Smith-Hansen, & Kristensen, 2006), and that an association between low job control and sickness absence days also existed, when job control was measured at the workplace level instead of the individual level (Christensen, Nielsen, Rugulies, Smith-Hansen, & Kristensen, 2005). Lund and colleagues found in a representative sample of the Danish workforce that long-term sickness absence (8 weeks or more) was predicted among men by high emotional demands and high demands for hiding emotions, and was predicted among women by role conflicts, low rewards, and poor management quality (Lund, Labriola, Christensen, Bültmann, Villadsen, & Burr, 2005).

Studies from Finland have shown that organizational downsizing (Vahtera et al., 2004), poor organizational climate, low organizational fairness and low role clarity (Vahtera, Kivimäki, Pentti, & Theorell, 2000), and lack of control over working time (Ala-Mursula, Vahtera, Linna, Pentti, & Kivimäki, 2005) were associated with subsequent sickness absence. In Sweden, Westerlund and colleagues reported that large-scale organizational changes (both downsizing and substantial expansions) predicted increase in sickness absence (Westerlund, Ferrie, Hagberg, Jeding, Oxenstierna, & Theorell, 2004). The findings from these recent longitudinal studies indicate that research on psychosocial work environment and sickness absence should not be restricted to the components of the demand-control-support model, but that instead a comprehensive approach into the definition and measurement of the psychosocial work environment is needed.

At the National Research Centre for the Working Environment (the former National Institute of Occupational Health) in Denmark, we have developed a theoretical approach to conceptualizing and measuring psychosocial work characteristics that have resulted in the design of the Copenhagen Psychosocial Questionnaire, version I (COPSOQ-I) and its revised version, the COPSOQ-II. The theoretical reasoning for the development of the COPSOQ and its use in the PUMA study has been discussed in detail elsewhere (Borritz,

Bültmann, Rugulies, Christensen, Villadsen, & Kristensen, 2005; Kristensen, Hannerz, Høgh, & Borg, 2005a; Kristensen, Bjorner, Christensen, & Borg, 2004). Briefly, these considerations can be summarized in the following way:

1. Psychosocial work characteristics should be conceptualized based on theoretical grounds, but should not be restricted to one specific theory.
2. In accordance with empirical findings from our research group and from others (de Jonge, Mulder, & Nijhuis, 1999; Kristensen et al., 2004), we theorize that psychological demands at work consist of different types of demands (e.g., amount of work, work pace, emotional demands) and that therefore different conceptualizations of demands are needed.
3. Psychosocial work characteristics should include work organizational aspects and work content (e.g., degree of influence the workers have, possibilities for development) as well as interpersonal relationships (e.g., social support from supervisors and colleagues).
4. Physical aspects of the work environment (e.g., noise or exposure to heat) do not constitute a psychosocial work characteristic and should be treated separately, even if these exposures have psychological or psycho-physiological effects.
5. Both adverse (e.g., role conflicts) as well as protective (e.g., doing meaningful work) aspects of work should be addressed.
6. Studies in human service work need to specifically address both positive and negative aspects of working with clients.

In this paper, we investigate the impact of 16 different psychosocial work characteristics on absence in a prospective sample of human service work employees from the Danish PUMA study (PUMA is a Danish acronym for Study on Burnout, Motivation and Job satisfaction). The 16 characteristics cover four theoretically defined areas of the psychosocial work environment of human service workers: (1) client-specific demands, (2) demands at work, (3) work organization and job content, and (4) interpersonal relations and leadership (Borritz, Rugulies, Bjorner, Villadsen, Mikkelsen, & Kristensen, 2006a; Kristensen et al., 2005a). Thirteen of the 16 characteristics were derived from the COPSOQ-I (Kristensen et al., 2005a), the other three characteristics were developed specifically for the PUMA study (for a detailed description see Borritz et al., 2006a).

Our main study goal is to identify those psychosocial work characteristics that predict sickness absence at follow-up. Secondary study goals are (1) to analyse the combined effects of psychosocial work characteristics by building a summary score (psychosocial work environment index), (2) to estimate the proportion of sickness absence (etiologic fraction) that is caused by exposure to adverse psychosocial work characteristics, and (3) to analyse if work-related burnout might be an intermediate step in a pathway that links exposure to adverse psychosocial work characteristics to high levels of sickness absence. This research aim is based on the theoretical assumption that burnout is a chronic stress response to adverse working conditions and that chronic stress responses increase the risk of illness (Steptoe & Ayers, 2004). A possible mediating role of burnout is partly supported by earlier findings from the PUMA study that showed that psychosocial work characteristics increased the risk of burnout (Borritz et al., 2005) and that burnout increased the risk of sickness absence (Borritz, Rugulies, Christensen, Villadsen, & Kristensen, 2006b).

Method

Study design and population

PUMA is a 5-year prospective study with human service workers in Denmark. A detailed description of the background, design, study population, and measurements of PUMA has been published elsewhere (Borritz et al., 2006a; Kristensen, Borritz, Villadsen, & Christensen, 2005b). Briefly, the study population was recruited from seven different organizations within the human service sector: (1) 10 social security offices in an urban area, (2) a state psychiatric prison, (3) 16 institutions for severely disabled adults in a county, (4) three somatic wards from two county hospitals, (5) one psychiatric ward from a psychiatric hospital, (6) one homecare service in a rural area, and (7) one homecare service in an urban area. All occupational groups in each organization were eligible for the study. The analyses for this paper use data collected at baseline (1999–2000) and at the first follow-up (2002–2003), with a mean follow-up period of 3 years (2½ to 4 years).

We sent the baseline and follow-up questionnaires, together with the study description and an invitation letter from the organizations, to the home address of all employees. Non-responders received two written reminders, the first after 2 weeks of non-response, and the second, including a new copy of the questionnaire, after another 3 weeks. The Danish Data Protection Agency (Datatilsynet) and Scientific Ethical Committees (Videnskabetiske Komitéer) in the respective counties have given approval of the study protocol.

At baseline, 1914 out of 2391 eligible employees participated in the survey (response rate 80%). Of the 1914 baseline responders, 679 had left the organizations under study during the 3-year follow-up period, resulting into 1235 eligible employees at follow-up. Of these, 1024 responded to the follow-up questionnaire (83% response rate). We further excluded 134 employees with missing values on either sickness absence or any of the potential confounders, resulting in a final study sample of 890 employees. Number of participants varied slightly in the analyses due to some missing values on the predictor variables.

Measurement of sickness absence

In Denmark, employees are entitled to sick-leave benefits for up to 52 weeks. The first 2 weeks (10 working days) are paid entirely by employers and employers usually do not require medical certification forms. For longer spells, a considerable part of the employers' costs are reimbursed by a tax-financed sickness benefit scheme with a fixed maximum amount. Most employers are obliged by collective agreements to pay the difference up to normal wages, especially for occupational groups of higher social status. However, because Denmark has weak employment protection laws, it is not uncommon that employees are laid off after several months of sick leave.

In the baseline and follow-up surveys, we asked the participants: "How many days of sickness absence did you have in the last 12 months?" This means, at baseline we assessed sickness absence for the 12 months period prior to the baseline survey. At the 3-year follow-up, we assessed sickness absence for the 12 months period prior to the follow-up survey. Several studies have shown that self-reported sickness absence is highly correlated with administrative information on sickness absence and have concluded that self-reported data are valid measures for assessing sickness absence (Ferrie, Kivimäki, Head, Shipley, Vahtera, & Marmot, 2005; Johns, 1994; Rees & Cooper, 1993; Voss, Stark, Alfredsson, Vingard, & Josephson, 2007).

Measurement of psychosocial work characteristics

We measured 16 different psychosocial work characteristics at baseline. Ten of these characteristics were measured by scales, five were measured with single items and one was measured with a proxy measure (see details below). The 16 characteristics covered four areas of the psychosocial work environment of human service workers: client-specific demands, demands at work, work organization and job content, and interpersonal relations and leadership.

Client-specific demands were measured with two scales, two single items and one proxy measure. Clients can be social service recipients, patients, elderly citizens, pupils, or inmates. The basic relation of the human service worker to the client is professional, and the employee is acting on behalf of society in order to bring about a change in the client (for example to become healthy or more educated) (Hasenfeld, 1993).

The two scales on client-specific demands measured emotional demands and demands for hiding emotions and were derived from the COPSOQ-I, which had been tested and validated in a representative sample of the Danish working population (Kristensen et al., 2005a). COPSOQ-I-scales used in the PUMA study are based on 2 to 4 items with five response categories (e.g., ranging from “to a very low degree” to “a very high degree”) and are coded from 0 to 100. More detailed descriptions of these scales, including sample items and analyses of internal consistency, have been published elsewhere (Borritz et al., 2005, 2006a). In addition to the COPSOQ scales, we developed two single items to assess specific aspects of working with clients (Borritz et al., 2006a). We asked the participants how frequently they had contact with clients and dichotomized the responses into “client contact more than half of the time” versus “less client contact.” We further asked the respondents if they had been exposed to violence and threats from clients during the last 12 months and dichotomized the responses into “no incidence of violence and threats” versus “at least one incidence of violence and threats.” Finally, we used the type of workplace as a proxy measure for differentiating between respondents with the main task to help clients (like in a somatic hospital and in home care) versus respondents who had the task to both help and control clients (like in the prison, in some departments of the social security offices, in the psychiatric hospital, and in some of the institutions of the severely disabled).

Demands at work were measured with the quantitative demand scale from the COPSOQ-I and with a dichotomous item from COPSOQ-I that indicated if a person had to work fast more than half of the working time.

Work organization and job content were measured with COPSOQ-I-scales on influence at work, meaning of work, and possibilities for development.

Interpersonal relations and leadership were measured with COPSOQ-I-scales on quality of management, predictability, role clarity, and role conflicts. We also used two single items to assess social support from colleagues and from supervisors. Respondents who answered that they “always” or “often” receive support were classified as having high co-worker support and having high supervisor support respectively.

Psychosocial work environment index. In order to assess the combined effect of the psychosocial work characteristics, we created a psychosocial work environment index. Only work characteristics measured by a scale, but not those characteristics measured by a single item, were eligible to be included in the index. Of the 10 psychosocial work characteristic scales, we finally used eight for the index. This included the scales on demands for hiding emotions (reversed), influence at work, meaning of work, possibilities for development, quality of management, predictability, role clarity, and role conflicts

(reversed). We added the values of each scale together, resulting in a possible score from 0 to 800, with a higher score indicating a more favourable psychosocial work environment. In the next step, we divided the score into quartiles, with the upper quartile (most favourable work environment) as the reference group.

The scales on quantitative demands and emotional demands were not included in the index because, in contrast to the other scales, we did not assume a priori that higher or lower scores on these two scales are in general more favourable. Instead, conceptually, quantitative and emotional demands should be “just right,” that is, they should fit the resources and coping abilities of the individual. For this reason, we analysed these two variables not only as continuous scales, but also as categorical variables (divided into quartiles) in order to identify possible curvilinear relationships.

Measurement of covariates

As potential confounders, we measured age, gender, type of organization the respondents were employed in, family status, children below the age of 7 years old living with the respondent, smoking, alcohol consumption, weekly leisure time physical activity, body-mass index (BMI), and socio-economic status (SES).

The variable “family status” included the categories: (1) cohabiting with children at home, (2) cohabiting without children at home, (3) being single with children at home, and (4) being single without children at home. Smoking habits were categorized into (1) non-smoker, (2) ex-smoker, (3) light smoker (less than 15 g tobacco per day), and (4) heavy smoker (15 g tobacco or more per day). Weekly leisure time physical activity was assessed in four groups: (1) light exercise for less than 2 hours, (2) light exercise for 2–4 hours, (3) light exercise for more than 4 hours, and (4) heavy exercise for more than 4 hours per week. Alcohol consumption was categorized into: (1) no alcohol consumption, (2) moderate consumption, and (3) heavy consumption. Heavy alcohol consumption was defined as three drinks or more per day for women and four drinks or more per day for men. We categorized BMI in four groups in accordance with the guidelines from the World Health Organization (2006): normal weight (BMI = 18.5–24.9), underweight (< 18.5), overweight (> 25–30), and obese (> 30). SES was categorized based on job function and education, resulting into three groups: (1) high SES for respondents with supervisory function for more than 50 subordinates and/or with advanced education (academics), (2) medium SES for respondents with supervisory function for less than 50 subordinates and/or with middle range education, and (3) low SES for respondents who were subordinates and/or had a short-term education.

In addition to these potential confounders, we also measured sickness absence history and work-related burnout. Sickness absence history refers to the number of sickness absence days in the 12 months prior to the baseline assessment. Work-related burnout was measured with the Copenhagen Burnout Inventory (CBI). The scale consists of seven items, assessing exhaustion attributed to work (e.g., “do you feel that every working hour is tiring for you?”), and is scored from 0 to 100 points, with higher scores indicating more burnout. Full details of the CBI, including its theoretical foundation, a description of the items, and analyses of the psychometric properties of the scales, have been published elsewhere (Borritz et al., 2006a; Kristensen et al., 2005b).

Data analysis

We analysed the impact of psychosocial work characteristics on sickness absence days with Poisson regression models with a scale parameter to account for over-dispersion. Poisson

distributions are natural choice for modelling count data and are the recommended method in research on sickness absence (Nielsen et al., 2004; Smulders & Nijhuis, 1999). For continuous predictors the effect estimates can be interpreted as the relative change in number of absence days (i.e. the Rate Ratio, RR), when moving one standard deviation on the dimension of the independent variable. For dichotomous predictors, the regression parameter is the RR between the exposed and the un-exposed (reference) group and indicates the percentage of increased absence days among the exposed.

In the analysis we calculated the RRs for the association between psychosocial work characteristics measured at baseline and sickness absence measured at follow-up, while adjusting for the potential confounders age, gender, organization, family status, children below the age of 7 years old, smoking, alcohol consumption, weekly leisure time physical activity, BMI, and SES (model 1). We also calculated RRs that were further adjusted for sickness absence history (model 2). Hence, in model 1 the outcome is number of sickness absence days at follow-up, whereas in model 2 the outcome is changes in number of sickness absence days from baseline to follow-up.

Because the variable "job involves controlling clients" was based on the type of workplace, we repeated the analyses of model 1 and model 2 for this variable without adjusting for organization. We also repeated model 1 and model 2 for quantitative demands and emotional demands as categorical variables, to analyse possible curvilinear effects.

Next, we analysed the effect of the psychosocial work environment index on number of sickness absence days. The analysis was adjusted for the potential confounders and for exposure to violence and threats, the only dichotomous variable with a statistically significant effect. Based on the risk ratios from these analyses we calculated three etiologic fractions using Miettinen's formulas for proportion of disease caused or prevented by a given exposure (Miettinen, 1974). The etiologic fractions express the proportion of sickness absence days that would be prevented, if (1) all study participants would be exposed to the most favourable quartile of the psychosocial work environment index, (2) no study participant would be exposed to violence and threats, and (3) for the combination of (1) and (2). We conducted these analyses with and without including sickness absence history.

Finally, we analysed the potential mediating effect of work-related burnout by following the four steps recommended by Baron and Kenny (1986; Kenny, 2006). The first step is to show that the initial variable Y (in this case psychosocial work characteristics) predicts the outcome X (in this case sickness absence). This is analysed with Poisson regression analyses in the present paper, as described above. The second step is to show that Y (psychosocial work characteristics) predicts the moderator M (in this case burnout), which we demonstrated in an earlier publication of this cohort (Borritz et al., 2005). The third step is to show that M (burnout) predicts X (sickness absence). We demonstrated this in another earlier publication (Borritz et al., 2006b) and repeated this analysis with additional adjustment for Y (psychosocial work characteristics) in the present paper. The fourth step is to show that the effect of Y (psychosocial work characteristics) on X (sickness absence) is attenuated after statistical adjustment for M (burnout). This is analysed with Poisson regression analyses, adjusted for burnout, in the present paper.

Results

Characteristics of the study sample

Table I shows the main characteristics of the study sample at baseline. The majority of participants were women (84%) and mean age of the sample was 44 years. The vast

Table I. Age, gender and psychosocial work characteristics at baseline, and sickness absence at baseline and follow-up of the study sample.

	Mean (SD)	Median (range)	Participants at baseline (%)
<i>Age</i>	43.9 (8.8)		
<i>Women</i>			83.8%
<i>Number of sickness absence days at baseline</i>		5.0 (0–120)	
<i>Number of sickness absence days at follow-up</i>		5.0 (0–185)	
<i>Client-specific demands</i>			
Contact with clients more than half the time			92.9%
Violence and threats from clients during last 12 months			19.5%
Job involves controlling clients			26.1%
Emotional demands ^a	54.2 (19.1)		
Demands for hiding emotions ^a	39.9 (19.1)		
<i>Demands at work</i>			
Quantitative demands ^a	53.3 (19.6)		
High work pace			64.7%
<i>Work organization and job content</i>			
Influence at work ^a	47.9 (19.4)		
Meaning of work ^a	77.1 (15.0)		
Possibilities for development ^a	68.2 (15.8)		
<i>Interpersonal relations and leadership</i>			
Quality of management ^a	48.2 (21.7)		
Predictability ^a	48.5 (21.0)		
Role clarity ^a	70.5 (15.8)		
Role conflicts ^a	42.3 (15.8)		
High support from colleagues			52.7%
High support from supervisors			30.7%

a = Scale scored from 0 to 100

majority (93%) had contact with clients more than half of the time and nearly every fifth participant had experienced violence or threats from clients during the last 12 months. Mean absence in the 12 months period before the baseline survey was 8.3 days with a median of 5.0 days and a range from 0 to 120 days. Mean number of absence in the 12 months period before the follow-up survey was 10.3 days with a median of 5.0 days and range from 0 to 185 days.

The strongest Spearman correlation coefficients between the 10 psychosocial work characteristic scales was found for predictability and quality of management (.58), meaning of work and possibilities for development (.58), and influence and possibilities for development (.41).

When we compared the participants of the study sample with those employees who had participated in the baseline survey, but were either no longer employed at the organizations under study or who did not fill out the follow-up questionnaire, we found that the study sample participants were older (44 vs. 40 years, $p < .001$), and had higher scores on the quantitative demands (53.3 vs. 51.0, $p = .01$), influence at work (47.9 vs. 45.5, $p = .01$), meaning of work (77.1 vs. 74.7, $p = .001$), and role clarity (70.5 vs. 67.6, $p < .001$) scales. Study participants also reported slightly more contact with clients (92.9% vs. 91.6%, $p < .001$) and that their jobs involved controlling clients (26.1% vs. 25.3%, $p = .05$). The two groups did not differ with regard to gender, sickness absence history, exposure to violence

Table II. Prospective associations between psychosocial work characteristics and sickness absence days in 877 to 890 human service workers.

	n	Model 1		Model 2	
		RR	95% CI	RR	95% CI
<i>Client-specific demands</i>					
High client contact	879	1.28	(0.88, 1.86)	1.19	(0.82, 1.71)
Violence and threats from clients	890	1.60	(1.31, 1.95)***	1.56	(1.29, 1.90)***
Job involves controlling clients	890	0.94	(0.70, 1.25)	0.93	(0.71, 1.23)
Emotional demands ^a	889	1.11	(1.01, 1.21)*	1.07	(0.98, 1.16)
Demands for hiding emotions ^a	890	1.19	(1.09, 1.30)***	1.17	(1.08, 1.27)***
<i>Demands at work</i>					
Quantitative demands ^a	890	1.05	(0.96, 1.15)	1.01	(0.92, 1.10)
High work pace	890	0.97	(0.81, 1.17)	0.95	(0.79, 1.13)
<i>Work organization and job content</i>					
Influence at work ^a	890	0.84	(0.77, 0.92)***	0.88	(0.81, 0.96)**
Meaning of work ^a	886	0.87	(0.80, 0.95)**	0.91	(0.84, 0.99)*
Possibilities for development ^a	890	0.93	(0.86, 1.02)	0.95	(0.88, 1.04)
<i>Interpersonal relations and leadership</i>					
Quality of management ^a	877	0.86	(0.79, 0.94)**	0.89	(0.82, 0.97)*
Predictability ^a	886	0.92	(0.84, 1.00)	0.93	(0.86, 1.01)
Role clarity ^a	883	0.93	(0.85, 1.01)	0.91	(0.84, 0.98)*
Role conflicts ^a	883	1.17	(1.07, 1.28)***	1.15	(1.06, 1.25)**
High support from colleagues	890	0.90	(0.76, 1.06)	0.94	(0.80, 1.10)
High support from supervisors	890	0.93	(0.77, 1.12)	0.95	(0.79, 1.14)

Model 1: Adjusted for age, gender, organization, family status, children below the age of seven at home, smoking, alcohol consumption, leisure time physical activity, body-mass index, socio-economic status.

Model 2: Model 1 plus adjustment for sickness absence days prior to baseline measurement.

a = The rate ratio (RR) shows the effect of an increase of one standard deviation on the scale.

* $p < .05$; ** $p < .01$; *** $p < .001$.

and threats, emotional demands, demands for hiding emotions, high work pace, possibilities for development, role clarity, predictability, management quality, support from colleagues, and support from supervisors.

Associations between psychosocial work characteristics at baseline and sickness absence at follow-up

Table II shows the prospective association of the 16 baseline psychosocial work characteristics with sickness absence at follow-up. Employees who had been exposed to violence and threats during the last 12 months had 60% more sickness absence days than employees who had not been exposed ($p < .001$), after adjustment for socio-demographic variables, organization, sickness absence history, health-related behaviours, and socio-economic status (model 1). A one standard deviation increase on the scales on emotional demands, on hiding emotions, and on role conflicts predicted 11% ($p = .02$), 19% ($p < .001$), and 17% ($p < .001$) more sickness absence days at follow-up respectively. A one standard deviation decrease on the scales on influence at work, meaning of work, quality of management, and predictability were associated with 16% ($p < .001$), 13% ($p = .001$), 14% ($p = .001$), and 8% ($p = .05$) less sickness absence days at follow-up respectively.

When we further adjusted for number of sickness absence days prior to baseline assessment, rate ratios were in general slightly attenuated, but only the effect estimate for emotional demands became statistically non-significant (model 2). Conversely, role clarity,

which was not statistically significant in model 1, became significant in model 2. Sickness absence at baseline itself was a significant predictor for sickness absence at follow-up (RR = 1.26, 95% CI = 1.20, 1.32, $p < .001$ for a one standard deviation increase, data not shown). The Spearman correlation between sickness absence at baseline and sickness absence at follow-up was .50.

We repeated the analyses for the variable “job involves controlling clients,” without adjusting for organizations. The rate ratio changed somewhat but remained statistically non-significant in both models (data not shown in table). We also repeated the analyses with the scales for “quantitative demands” and “emotional demands” divided into quartiles, in order to identify possible curvilinear effects. No statistically significant curvilinear effect was found in either model (data not shown).

Psychosocial work environment index

There was a clear trend that a worsening in the psychosocial work environment index predicted increases in sickness absence (Table III). Compared to employees with the most favourable psychosocial work environment (upper quartile of index), employees in the three next quartiles had 19% ($p = .21$), 39% ($p = .01$), and 71% ($p < .001$, lowest quartile) more sickness absence days after adjustment for all potential confounders and for exposure to violence and threats (model 1). Further adjustment for sickness absence history changed effect estimates only slightly (model 2).

Etiologic fraction

If all study participants had been exposed to the most favourable quartile of the psychosocial work environment index, sickness absence days would have been reduced by 24% (Table III). Elimination of exposure to violence and threats would have reduced sickness absence days by 10%. If all study participants had been in the most favourable quartile of the psychosocial work environment index and also no study participant was exposed to violence and threats, sickness absence days would have been reduced by 32%. When the calculation of the etiologic fraction was based on rate ratios adjusted for sickness absence history, etiologic fractions were only marginally different (Table III).

Mediating effect of work-related burnout

Work-related burnout was a strong predictor for sickness absence. When adjusted for all potential confounders and for the 16 psychosocial work characteristics, a one standard deviation increase in work-related burnout predicted 28% (RR = 1.28, 95% CI = 1.15, 1.43, $p < .001$) more sickness absence days at follow-up. Further adjustment for sickness absence history attenuated the effect size to 18% (RR = 1.18, 95% CI = 1.06, 1.31, $p = .003$).

Table IV shows how the associations of the psychosocial work characteristics with sickness absence days changed when the analyses were adjusted not only for potential confounders but also for work-related burnout. In general, there were weak to modest attenuations in the effect sizes of most psychosocial work characteristics. The most pronounced changes occurred for the effect sizes of emotional demands and low support from supervisors, followed by role conflicts, and high client contact. The effect size for exposure to violence and threats, conversely, remained virtually unchanged.

In contrast to the other variables, high work pace showed no attenuation, but an increase in the effect size from 0.97 to 0.86, when adjusted for burnout. The effect size for

Table III. Rate ratios (RR) and etiologic fractions for the psychosocial environment index and exposure to violence and threats in 867 human service workers.

	<i>n</i>	Model 1			Model 2		
		RR	95% CI	Etiologic fraction	RR	95% CI	Etiologic fraction
Psychosocial environment index							
1. Quartile of index (upper quartile, most favourable)	218	1	Reference		1.00	Reference	
2. Quartile of index	218	1.19	(0.91, 1.56)		1.22	(0.94, 1.58)	
3. Quartile of index	215	1.39	(1.07, 1.80)*		1.45	(1.14, 1.86)**	
4. Quartile of index (lowest quartile, most adverse)	216	1.71	(1.32, 2.21)***		1.63	(1.27, 2.08)***	
Etiologic fraction for the psychosocial work environment index ^a				24.3%			24.5%
Exposure to violence and threats							
No	700	1.00			1	Reference	
Yes	167	1.58	(1.29, 1.94)***		1.57	(1.29, 1.90)***	
Etiologic fraction for exposure to violence and threats ^b				10.0%			9.9%
Etiologic fraction: combination of the psychosocial work environment index and exposure to violence and threats ^c				31.9%			32.0%

Note: The psychosocial work environment index is based on eight psychosocial work characteristics: demands for hiding emotions, influence at work, meaning of work, possibilities for development, management quality, predictability, role clarity, and role conflicts.

Model 1: Rate ratios and the resulting etiologic fractions are adjusted for age, gender, organization, family status, children below the age of seven at home, smoking, alcohol consumption, leisure time physical activity, body-mass index, and socio-economic status. Psychosocial work environment index and exposure to violence and threats are adjusted for each other.

Model 2: Model 1 plus adjustment for sickness absence days prior to baseline measurement.

^aPercentage of sickness absence that would be prevented if all participants were to be exposed to the most favourable quartile of the psychosocial work environment index.

^bPercentage of sickness absence that would be prevented if no participant was to be exposed to violence and threats.

^cPercentage of sickness absence that would be prevented if all participants were to be exposed to the most favourable quartile of the psychosocial work environment index and no participant was to be exposed to violence and threats.

* $p < .05$; ** $p < .01$; *** $p < .001$.

quantitative demands was reversed (from 1.05 to 0.93) and also became stronger when burnout was taken into the model. When we repeated the analysis on the mediating effect of burnout while including sickness absence history, we found similar results to those reported in Table IV (data not shown).

Discussion

In this study we analysed prospectively the impact of a wide range of theory-based, defined psychosocial work characteristics, which is unusual in sickness absence research

Table IV. The mediating effect of work-related burnout on the association between psychosocial work environment characteristics and sickness absence days in 877 to 890 human service workers.

	n	Model 1	Model 2	Absolute change	Relative change
		RR	RR		
<i>Client-specific demands</i>					
High client contact	879	1.28	1.16	-0.12	-9.3%
Violence and threats from clients	890	1.60	1.57	-0.03	-1.8%
Job involves controlling clients	890	0.94	0.97	0.03	3.2%
Emotional demands ^a	889	1.11	0.99	-0.12	-10.8%
Demands for hiding emotions ^a	890	1.19	1.11	-0.08	-6.7%
<i>Demands at work</i>					
Quantitative demands ^a	890	1.05	0.93	-0.12	-11.4%
High work pace	890	0.97	0.86	-0.11	-11.3%
<i>Work organization and job content</i>					
Influence at work ^a	890	0.84	0.89	0.05	6.0%
Meaning of work ^a	886	0.87	0.92	0.05	5.7%
Possibilities for development ^a	890	0.93	0.97	0.04	4.3%
<i>Interpersonal relations and leadership</i>					
Quality of management ^a	877	0.86	0.93	0.07	8.1%
Predictability ^a	886	0.92	0.99	0.07	7.6%
Role clarity ^a	883	0.93	1.00	0.07	7.5%
Role conflicts ^a	883	1.17	1.06	-0.11	-9.4%
Low support from colleagues	890	0.90	0.93	0.03	3.3%
Low support from supervisors	890	0.93	1.03	0.10	10.8%

Model 1: Analyses adjusted for age, gender, organization, family status, children below the age of seven at home, smoking, alcohol consumption, leisure time physical activity, body-mass index, and socio-economic status.

Model 2: Model 1 plus adjustment for work-related burnout.

a = The rate ratio (RR) shows the effect of an increase of one standard deviation on the scale.

(Alexanderson & Hensing, 2004; Allebeck & Mastekaasa, 2004). Client-specific demands (violence and threats, emotional demands, demands for hiding emotions), work organization and job content (low influence at work, and low meaning of work), and interpersonal relations and leadership (low quality of management, role conflicts, and, to a lesser extent, low predictability) were prospectively associated with an increased number of sickness absence days at follow-up, after adjustment for numerous potential confounders.

Psychosocial work characteristics as predictors for sickness absence

Job control, psychological demands, and social support at work are the most well-researched psychosocial work contributors to sickness absence. However, a recent review of the literature concluded that sufficient scientific evidence exists only for a causal role of job control (Allebeck & Mastekaasa, 2004). Our findings, within the context of a human service worker population, corroborate this conclusion. Low influence at work (job control) was a strong predictor for number of sickness absence days, but there were no significant effects for the variables quantitative demands (which is closely related to the concept of psychological demands), high work pace, or social support from supervisors or colleagues. Emotional demands and demands for hiding emotions (i.e., client-specific demands), however, showed a positive association with number of sickness absence days, underlining the importance of differentiating between different dimensions of demands at work (de Jonge et al., 1999; Kristensen et al., 2004).

Role clarity and role conflicts are well-known concepts in psychosocial work environment research (Hurrell, Nelson, & Simmons, 1998). However, to our knowledge, they had not been used before in prospective analyses on sickness absence. Meaning of work and predictability, conversely, have recently been tested in the IPAW study, another prospective study on the psychosocial work environment and sickness absence in Denmark (Nielsen et al., 2004). An association between low predictability at work and sickness absence days was found among men in the IPAW study, and such an association was also suggestive in the present study. Low meaning of work was a predictor for sickness absence days only in the present study. A possible explanation could be that the main job tasks for the participants in the present study was to provide service and help to clients, whereas the IPAW population was more heterogeneous, including not only human service workers but also municipality workers who provide technical services, and employees who worked in a private business. It is possible that technical workers and employees from private businesses have different concepts from human service professionals of what makes work "meaningful," and that only the conceptualization within the context of human service work is of importance with regard to sickness absence. More research on the variable "meaning of work" and its understanding and conceptualization within different occupational groups is needed.

Exposure to violence and threats from clients during the previous 12 months was one of the strongest predictors for future sickness absence days in our study. Because sickness absence certificates with diagnoses of illness were not available, we do not know if this sickness absence was caused by physical injuries resulting from violent acts or by psychological and psychosomatic reactions to the threats and violence. Other recent research, however, indicates that psychological and psychosomatic problems are common after exposure to aggression at the workplace. Høgh and colleagues found that teasing at work prospectively increased the risk of psychological health problems (Høgh, Henriksson, & Burr, 2005) and that exposure to violence predicted fatigue (Høgh, Borg, & Mikkelsen, 2003). Wieclaw and colleagues reported that employees who worked in occupations with high exposure to violence and threats were more likely to be hospitalized for affective and stress-related disorders than employees in occupations with low exposure (Wieclaw, Agerbo, Mortensen, Burr, Tüchsen, & Bonde, 2006).

The psychosocial work environment index

When we combined 8 of the 10 psychosocial work characteristic scales into an index, we found a gradual association with future sickness absence days. This association remained strong when we adjusted for violence and threats from clients. Together, these 2 variables explained 32% of sickness absence days, after adjustment for potential confounders, including socio-economic status. In the IPAW study, which analysed fewer psychosocial work characteristics, the etiologic fraction was 29%, before and 19% after adjustment for SES. However, it has to be noted that in IPAW, the etiologic fraction was also adjusted for exposure to physical work environment characteristics, a variable that was not included in our data analysis.

To combine psychosocial work characteristics into a single index has advantages and disadvantages. Combining the different types of exposure will give a better estimate of the total burden of psychosocial work characteristics. For the purpose of designing specific workplace interventions, however, a detailed analysis of each exposure variable will be more important. One can make an analogy with the allostatic load concept from McEwen (1998), Seeman, McEwen, Rowe, and Singer (2001), and Sun, Wang, Zhang, and Li (2007). Using allostatic load as the combination of various indicators for cumulative biological burden has

produced impressively strong effect sizes with regard to mortality in recent studies (Karlman, Singer, & Seeman, 2006; Seeman et al., 2004). For reducing the risk profile of the individual, however, it is important not only to know the overall allostatic load, but also the detailed values of each risk factor (lipids, hypertension, glucose metabolism, etc.) that should be targeted.

Burnout as a mediator of the impact of psychosocial work characteristics

Adjusting for burnout resulted in a general weak to moderate decrease of the effect sizes of the psychosocial variables. This indicates that burnout might partly mediate the effects of some psychosocial work characteristics on sickness absence. However, interpretations need to be done with caution, because psychosocial work characteristics and burnout were measured at the same time (baseline). When the data from the second follow-up of the PUMA project are ready, we will study whether the effect of work characteristics measured at time 1 (baseline) on sickness absence measured at time 3 (second follow-up) is mediated by burnout at time 2 (first follow-up).

Methodological considerations

There are arguments for and against including sickness absence history in analyses on determinants of future sickness absence. Adjusting for sickness absence history ensures that the statistical association between baseline psychosocial exposures and future sickness absence was not artificially inflated by an association of previous sickness absence with both the predictor and the outcome variables. For example, suppose that employees with high previous sickness absence are closely monitored by their supervisors, and that this monitoring causes employees to report lower job control and lower quality of management. Suppose further that previous sickness absence is associated with future sickness absence (for example, because a chronic disease causes absence at both points in time). Under these conditions and without adjusting for previous sickness absence, the observed association between baseline psychosocial work characteristics and future sickness absence might be a statistical artefact.

It has to be taken into consideration that adjusting for previous sickness absence changes the outcome of the analyses. Without adjustment for sickness absence history, the outcome is future sickness absence. When sickness absence history is added, the outcome is future sickness absence that is independent of previous sickness absence. In other words, the focus of the analyses shifts from amount of sickness absence at follow-up to *changes* in the amount of sickness absence between baseline and follow-up. This is a major difference, because one can not expect that sickness absence is an ever-increasing variable and also one can not expect that the exposure towards adverse psychosocial working conditions has just started at the baseline measurement. Suppose a participant has been highly exposed to adverse psychosocial working conditions for some time prior to the baseline measurement and suppose further that this high exposure has caused a high level of sickness absence at baseline. Despite the association between previous exposure and high sickness absence, this participant would probably not show a substantial increase in sickness absence during the follow-up period, because the sickness absence level is already very high and can not be expected to increase indefinitely. In other words, by adjusting for baseline sickness absence and therefore focusing on changes in sickness absence, one would underestimate the true effect of the psychosocial work environment on sickness absence. We addressed this dilemma by presenting models with and without adjustment for previous sickness absence.

As expected, the effect sizes of most variables were attenuated when previous sickness absence was added to the analyses in model 2. However, the differences were relatively small and only one variable (high emotional demands) became statistically non-significant.

When we analysed the effects of the psychosocial workplace factors with 16 separate regression analyses (Table II), it is possible that some effect sizes became statistically significant at the .05 p -value level just by chance. Several statistical procedures to adjust for the effects of multiple testing exist, most notable the Bonferroni correction. However, these procedures have been discussed controversially (Aickin & Gensler, 1996; Morgan, 2007; Perneger, 1998). Instead of conducting such adjustments, we indicated the p -values in the table with asterisks, so the reader can see which effect sizes are statistically significant at which p -value level. For example, after adjustment for sickness absence history (Table II, model 2), a statistical significant association was found for three characteristics at the .05 level, two characteristics at the .01 level, and two characteristics at the .001 level.

It can also be debated whether the 16 psychosocial work characteristics should be adjusted for each other. Adjusting would be problematic if some work characteristics were different steps in a causal pathway. For example, low quality of management might cause a feeling of low influence in employees, which subsequently might increase the risk of sickness absence. In this case, low influence would be an intermediate step in a pathway leading from low quality of management over low influence to sickness absence. Hence, statistically adjusting for low influence would not be an appropriate confounder control, but an overadjustment that would artificially reduce the effect size of quality of management as the more distant predictor variable. Consequently, we did not adjust the 16 psychosocial work characteristics for each other. However, when we calculated the etiologic fraction, we adjusted the two variables in the model, the psychosocial work environment index, and exposure to violence and threats, for each other, in order to avoid overestimating the overall contribution of working conditions.

All analyses in this paper were adjusted for socio-economic status. This can be viewed as appropriate or inappropriate, depending on whether or not one views SES as a confounder. Some researchers have reasoned that SES might be either a more distant cause in a causal pathway that includes SES, psychosocial work environment, and health, or that SES might moderate the effects of workplace exposure (Marmot & Wilkinson, 2001; Siegrist & Marmot, 2004). However, other researchers have argued that SES causes both workplace exposure and poor health and that the apparent association between psychosocial working conditions and poor health is to a large extent caused by this confounding (Macleod & Davey Smith, 2003; Macleod, Davey Smith, Heslop, Metcalfe, Carroll, & Hart, 2001). For the present paper, we decided to use the more conservative approach: that is, to treat SES as a potential confounder and therefore to accept that our analyses might, to a certain extent, include overadjustment.

Strengths and limitations of the study

The main strengths of the study are the prospective design and the comprehensive measurement of the work environment. Most research on the impact of the psychosocial work environment on sickness absence is cross-sectional and is limited to very few predictor variables (Allebeck & Mastekaasa, 2004). By analysing a wide range of psychosocial work characteristics we were able to identify those aspects of the psychosocial work environment that need to be targeted to reduce sickness absence. By combining the separate variables into a psychosocial work environment index, we were able to quantify the overall effect of an adverse psychosocial work environment.

Another strength of the study is that analyses were adjusted for numerous covariates, including both socio-demographic variables and health-related behaviours, which have been identified as contributors to sickness absence in other studies (North, Syme, Feeney, Head, Shipley, & Marmot, 1993; Vahtera, Poikolainen, Kivimäki, Ala-Mursula, & Pentti, 2002). Hence, we could demonstrate that the effects for the psychosocial work environment variables in this study were independent of important non-work related predictors of sickness absence. The relatively long follow-up period of 3 years has the advantage of providing sufficient time of exposure to create effects on the outcome variable, but has the disadvantage that during this time period levels of exposure might have changed for some participants. Therefore, there might be non-differential misclassification of the exposure variables for a certain number of participants, which would bias our results towards an underestimation of the effect sizes.

Sickness absence days were measured by self-report. We would have preferred to use absence registries from the participating organizations, but not all organizations and employees were able or willing to provide individual data from absence registries. However, we have two reasons to believe that the self-reported sickness absence data in our study were reliable: First, other studies have shown that self-reported sickness absence is highly correlated with register-based measurements, with a tendency to under-report the actual absence days and spells (Ferrie et al., 2005; Johns, 1994; Rees & Cooper, 1993; Voss et al., 2007). Second, when we compared some of the self-reported absence data with information on absence rates from selected workplaces, we found high correlations between self-reported and company registered sickness absence. Nevertheless, we are currently planning to follow-up the study participants in the Danish social transfer payment register. This register, however, includes only sickness absence spells of 2 weeks or more because, in Denmark, municipalities reimburse companies' expenditures of sick-leave benefits for spells of longer than 2 weeks.

While we had high response rates both at baseline (80%) and at follow-up (83%), we nevertheless lost a substantial number of baseline participants because they were no longer employed at the organizations under study. Denmark has one of the most flexible labour markets in Europe, resulting in relatively high job turnover rates (Danish Ministry of Employment, 2005). The high turnover rate not only reduces the statistical power of this study, but might also have biased some of the study results. For example, it is possible that participants with high sickness absence during the follow-up period had to a greater proportion left the organizations under study, either because they had felt that they could no longer cope with the working conditions or because they had been laid off by their employers because of their high sickness absence. Although participants and non-participants did not differ on most exposure variables at baseline, higher absence rates at follow-up among those who had been lost between baseline and follow-up might still have affected effect sizes (in either direction) in the multivariate analyses. By conducting the above-mentioned follow-up of the study participants in the absence registries of the municipalities, we will be able to analyse the impact of the psychosocial work characteristics for all study participants from the baseline survey and we will investigate if there are different patterns for those who had remained and those who had left the organizations under study.

Conclusion

This study shows that psychosocial work characteristics are important contributors to sickness absence in human service workers. Our analyses indicate that adverse psychosocial work environment conditions and exposure to violence and threats accounted for 32% of all sickness absence days in this study population of human service professionals. This is a substantial proportion, which points to a significant potential for prevention, with regard to both human suffering and economic losses. Improving psychosocial working conditions might help to actualize this potential for prevention, benefiting both employees and employers.

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