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Psychosocial work environment of hospital workers: Validation of a comprehensive assessment scale

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Abstract

Background: Studies have shown that adverse workplace factors can increase the risk of ill-health in hospital workers, but more comprehensive measures of the psychosocial work environment are needed.

Objectives: To test a comprehensive and theory-based psychosocial work environment questionnaire and analyze associations with mental health in a sample of Danish hospital workers.

Design and participants: Questionnaire-based cross-sectional study with 343 female employees from a large Danish hospital, including patient care workers (nurses, nurse assistants, midwives) and laboratory technicians.

Methods: The psychosocial work environment was measured with 14 scales from the Copenhagen psychosocial questionnaire, version I, covering three main areas: demands at work, work organization and interpersonal relations at work. We further measured self-rated mental health and sociodemographic and employment characteristics of the participants. Cronbach's alphas, analyses of covariance, one-sample *t*-tests, partial correlations and linear regression models were used to analyze data.

Results: Of the 14 work psychosocial workplace scales 12 showed a satisfactory internal consistency ($\alpha > 0.70$). Patient care workers had more quantitative, emotional and cognitive demands (all *p*-values < 0.001), higher work pace ($p < 0.001$) and more role conflicts ($p = 0.01$) than laboratory technicians, but also better work organization, including more influence at work, better possibilities for development and a higher meaning of work (all *p*-values < 0.001). Both patient care workers and laboratory technicians had substantially higher scores on the demand scales and lower scores on the influence at work scale than the general Danish working population. Further analyses showed that high levels of demands at work and low levels of work organization and problematic interpersonal relations at work were associated with lower self-rated mental health.

Conclusion: The Copenhagen psychosocial questionnaire is a suitable instrument to measure the psychosocial work environment of hospital workers. The comprehensive assessment of the psychosocial work environment helps tailoring interventions to the specific needs of different occupational groups.

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Keywords: Nurses; Patient care; Mental health; Occupational health; Questionnaires

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What is already known about the topic?

- Hospital workers are at increased risk of ill-health.
- Workplace factors are associated with health of hospital workers, but more comprehensive measures of the psychosocial work environment are needed.

What this paper adds

- Shows that the Copenhagen psychosocial questionnaire is a suitable instrument for measuring the psychosocial work environment of hospital workers.
- Shows that patient care workers have a substantially different psychosocial work environment than laboratory technicians, including more demands and role conflicts, but also better work organizational factors.
- Shows that a wide range of psychosocial workplace factors are associated with mental health of hospital workers.

1. Introduction

There is accumulating evidence that hospital workers are at increased risk for ill-health including musculoskeletal disorders and mental health problems (Alexopoulos et al., 2003; Eriksen et al., 2004a, b; Escriba-Agiür and Tenias-Burillo, 2004; Rafnsdottir et al., 2004; Tomasson et al., 2004). While exposure to physical hazards (e.g., frequent patient lifting, exposure to blood and body fluids primarily by needlestick accidents) are well-known contributors to hospital workers' ill-health (Dement et al., 2004; Panlilio et al., 2004; Smedley et al., 1995; Smedley et al., 1997; Tarantola et al., 2003; Trinkoff et al., 2003), recent findings indicate that psychosocial working conditions are also of importance, both independently of and in interaction with physical hazards (Daraiseh et al., 2003; Eriksen et al., 2004a, b; Gunnarsdottir et al., 2003; Jhun et al., 2004; Violante et al., 2004; Yip, 2001).

There is now an increasing number of studies that refer to theoretical work and health models, mostly the demand–control–support model (Theorell and Karasek, 1996) and the effort–reward imbalance model (Siegrist et al., 2004), to investigate the psychosocial working conditions of hospital workers (Bourbonnais et al., 1999; Bourbonnais et al., 1998; Bourbonnais and Mondor, 2001; Jhun et al., 2004; Michie et al., 2004; van Vegchel et al., 2001). While these studies have shown that clearly defined and theory-based psychosocial factors can predict risk of ill-health in hospital workers, they have the disadvantage of focusing only on very specific aspects of the psychosocial work environment. For example, researchers have criticized that the

demand dimension in the demand–control–support model is focused primarily on task completion and quantitative demands (de Jonge et al., 1999). While this might be appropriate for research studies in industrial settings (e.g., automobile production), it is less appropriate in human service work, where, e.g. emotional demands also play an important role. Moreover, hospitals are workplaces for different occupational groups, such as physicians, nurses, laboratory technicians and janitors, who are exposed to different psychosocial workplace conditions and who would probably benefit from different workplace interventions (Gunnarsdottir et al., 2004). Consequently, researchers have called for a more comprehensive approach when studying work and health in hospital workers (de Jonge et al., 1999; Griffiths et al., 2002).

This paper aims to test an instrument for measuring the psychosocial work environment that is both theory-based and comprehensive. In a large Danish hospital, we used 14 different scales to assess three main areas of the psychosocial work environment: demands at work, work organization and interpersonal relations at work. We analyzed the distribution of the 14 workplace scales in different occupational groups and calculated associations with mental health. Specifically, this paper aims to answer two research questions:

- (1) Are the scales reliable and of relevance for hospital workers? This includes analyses of the internal consistency of the scales, as well as analyses of how well the scales reflect the work environment of different occupational groups.
- (2) Do the scales show associations with mental health and does exposure to different kinds of psychosocial working conditions explain differences in mental health across occupational groups?

2. Methods

2.1. Study design and sample

This paper is based on baseline data from an ongoing controlled intervention study at a large hospital in Denmark. In the fall of 2002, a baseline survey was carried out in 14 units of the hospital to measure employees' working conditions and health. Afterwards, workplace interventions were conducted in seven of the units. Although the data used in this paper are from the baseline survey (i.e., collected prior to any workplace interventions), analyses are adjusted for a variable indicating assignment to intervention or control group.

Employees at the 14 units were eligible for the study if they were on regular duty at the time of the baseline survey. Physicians were excluded because they were

usually assigned to more than one unit. A total of 450 employees fulfilled the eligibility criteria. Employees were informed about the study at their unit by their supervisors and also individually by mail. The informational letter and the verbal communications emphasized that participation was voluntary. The questionnaire was provided in an electronic form at a computer room of the hospital, where participants had the opportunity to complete it during their work time. If participants did not want to use the electronic version, the hospital administration sent a paper version of the questionnaire and a return envelope to the private address of the employee.

Of the 450 eligible employees, 399 participated in the study, yielding a response rate of 89%. Most respondents completed the questionnaire in the electronic form ($n = 303$, 75.9%). The vast majority of the participants were women ($n = 391$, 98.0%) and the dominant occupational group were nurses ($n = 243$, 61.2%), followed by laboratory technicians ($n = 67$, 16.9%), midwives ($n = 38$, 9.6%), nurse assistants ($n = 22$, 5.5%), social workers ($n = 17$, 4.3%), administrative assistants ($n = 9$, 2.3%) and one non-specified assistant ($n = 1$, 0.3%). Two participants failed to state their job title.

Occupational groups with less than 20 employees were excluded, because these groups would be too small for statistical analyses. We also excluded the few male participants, because previous studies have shown that men and women differ substantially in their response patterns to mental health scales (Hoeymans et al., 2004; Stansfeld et al., 1999). Hence, statistical analyses on mental health should not be adjusted for gender but stratified by gender. Stratification however, was not possible in this study, because of the low number of male participants ($n = 8$). Sociodemographic and employment characteristics of the sample are described in Table 1.

2.2. Measurement of the psychosocial work environment

The survey questionnaire was based on the Copenhagen psychosocial questionnaire, version I (COPSOQ-I) an instrument developed for the comprehensive assessment of psychosocial working conditions. The questionnaire is available in three different lengths and includes in its full version 30 dimensions of work and health with 141 items (Kristensen et al., 2005b; Kristensen et al., 2002). The COPSOQ-I has been validated in a representative sample of the Danish workforce (Kristensen et al., 2005b) and has been translated into seven different languages so far. Recently a revised version (COPSOQ-II) has been developed and tested, but results have not been published yet (Tage S. Kristensen, personal communication).

Table 1
Sociodemographic and employment characteristics of the study sample

	Mean or number	Range or percent
Age (yr)	39.69	24–66
Cohabitation		
Living with partner	262	76.4%
Living without a partner	81	23.6%
Number of children living at home	1.21	0–5
Occupational Group		
Nurses	227	66.2%
Nurse assistants	20	5.8%
Midwives	34	9.9%
Laboratory technicians	62	18.1%
Years working in the health care sector	15.17	0–43
Total working hours per week	35.74	14–47

In this study, we used 14 COPSOQ-I scales to measure the psychosocial work environment. The scales were built on 2–4 items (questions), with the exception of the “high work pace scale”, which consists of a single question. All items had 5 response categories (for example, ranging from (1) “strongly agree” to (5) “strongly disagree”). Scales were built by summing up the numerical values attached to the response categories of the items. Next, all scales were transformed to a range from 0 to 100, to make the scoring on the different scales comparable. Directions of the scores follow the label of the scale; i.e. a high score on the emotional demand scale indicates high emotional demands, a high score on the predictability scale indicates high predictability, and so on. A detailed description of the items and the scales is available elsewhere in the literature (Kristensen et al., 2005b; Kristensen et al., 2002) and on the internet at www.ami.dk/copsq.

The 14 scales cover three main areas of the psychosocial work environment: (1) demands at work, (2) work organization, and (3) interpersonal relations at work. For the demand area, we used scales on quantitative demands, emotional demands, demands for hiding emotions, sensorial demands and cognitive demands. The quantitative demands scale in our study differed from the original COPSOQ-I scale, because recent analyses on differential item function showed that items on this scale measure different aspects of demands

(Kristensen et al., 2004). After consultation with the authors of the COPSOQ, we used only four instead of seven items from the quantitative demand scale and used one of the excluded items (“Do you have to work fast?”) as a new separate scale (“high work pace”). Therefore, we have a total of six demand scales in our study.

Work organization was measured with three scales: influence at work (e.g., influence over decisions at work), possibilities for development (e.g., possibility to learn new things at work) and meaning of work (e.g., viewing one’s own work as important). Interpersonal relations at work were measured with five scales: social support (from colleagues and supervisors), role clarity, role conflict, predictability (of developments at work) and quality of leadership.

2.3. Measurement of mental health

Mental health was measured with the Danish version (Bjorner et al., 1998) of the short-form 36 (SF-36) mental health scale (Ware and Sherbourne, 1992). The scale consists of five items on the frequency of mental health problems in the past four weeks. Scores on the five items were summed up and standardized to a scale ranging from 0 to 100, with a higher value indicating better mental health.

2.4. Measurement of covariates

As covariates, we included sociodemographic variables, that is age, gender, cohabitation status, and number of children living with the respondents; and employment characteristics, i.e. occupational group, numbers of years the respondents had worked in the health care sector and total working hours per week (regular working hours plus the average number of overtime hours).

2.5. Data analysis

We calculated Cronbach’s alphas to assess the internal consistency of the work environment scales and the mental health scale. To determine differences in the 14 work environment scales between the four occupational groups, we used analysis of covariance (ANCOVAs), adjusted for sociodemographic and employment characteristics, which included age, cohabitation, number of children at home, years worked at the health care sector, total working hours per week and a variable indicating assignment to either intervention or control group.

For the next step, we collapsed the three occupational groups doing patient work (nurses, nurse assistants and midwives) to create a new dichotomous job group variable with the categories “patient care workers” and “laboratory technicians.” We compared the scores

of the work environment scales of the two groups by calculating ANCOVAs adjusted for the variables listed above. We calculated partial correlations to determine the percentage of variance for each psychosocial workplace scale that was explained by job group. In addition, we compared the scores of the two groups with the national averages of the Danish working population using a one-sample *t*-test. Data on the national average was derived from a representative sample of the Danish workforce, consisting of 1858 men and women between 20 and 60 yr of age (Kristensen et al., 2005b).

To compare the mental health score of patient care workers with laboratory technicians, and to analyze associations between psychosocial workplace factors and mental health we used a series of linear regression analyses. In the first model we included job group (patient care workers versus laboratory technicians) and the 14 psychosocial workplace factors and adjusted them for sociodemographic and employment characteristics, but not for each other. The second model included job group and the six scales on demands at work, the third model job group and the three scales on work organization and the fourth model job group and the five scales on interpersonal relations at work. In these models all variables were adjusted for each other as well as for sociodemographic and employment characteristics. The fifth model was the most complete model, including all variables from the previous models adjusted for each other.

3. Results

3.1. Means, standard deviations and internal consistency of the psychosocial work environment scales

The highest scores for the 14 scales were found for sensorial demands (85.65), meaning of work (81.52), possibilities for development (74.08) and role clarity (71.47, Table 2). The majority of the scales showed satisfying Cronbach’s alphas. Only two scales, possibilities for development ($\alpha = 0.65$) and demands for hiding emotions ($\alpha = 0.47$) had alphas of less than 0.70.

3.2. Psychosocial work environment factors across the occupational groups

Laboratory technicians reported fewer demands and role-conflicts, but also fewer positive work organizational factors than nurses, nurse aides and midwives (Table 3). Scores within the three patient-care groups were in general similar; however there was a trend towards a somewhat less favorable work environment for midwives who had had the highest scores on quantitative and emotional demands and role-conflict and the lowest scores on influence, predictability and quality of leadership.

Table 2

Number of items, means, standard deviations and Cronbach's alphas for 14 psychosocial work environment scales and mental health in 343 hospital workers

Scale	Number of items	Mean	Standard deviation	Cronbach's alpha
Demands at work				
Quantitative demands	4	49.42	15.56	0.75
High work pace	1	67.86	14.68	—
Emotional demands	3	60.11	18.71	0.85
Demands for hiding emotions	2	38.63	15.77	0.47
Sensorial demands	4	85.65	14.25	0.78
Cognitive demands	4	68.75	13.36	0.73
Work organization				
Influence at work	4	43.05	16.81	0.77
Possibilities for development	4	74.08	12.86	0.65
Meaning of work	3	81.52	13.40	0.81
Interpersonal relations at work				
Social support	4	65.80	16.11	0.74
Role clarity	4	71.47	13.31	0.82
Role conflicts	4	39.85	16.41	0.77
Predictability of work	2	57.25	18.23	0.79
Quality of leadership	4	57.69	18.30	0.87

Table 3

Psychosocial workplace factors among the four occupational groups in the study

	Nurses		Nurse assistants		Midwives		Laboratory technicians		F	p
	Mean	(SD)	Mean	(SD)	Mean	(SD)	Mean	(SD)		
Demands at work										
Quantitative demands	51	(15)	53	(14)	59	(13)	37	(12)	13.72	<0.001
High work pace	70	(14)	71	(15)	69	(14)	57	(14)	14.74	<0.001
Emotional demands	63	(17)	62	(15)	70	(14)	45	(21)	16.58	<0.001
Demands for hiding emotions	37	(14)	43	(14)	41	(15)	41	(20)	0.51	0.67
Sensorial demands	86	(15)	81	(15)	81	(14)	88	(12)	2.57	0.05
Cognitive demands	71	(13)	68	(11)	74	(11)	57	(11)	19.53	<0.001
Work organization										
Influence at work	46	(16)	40	(22)	39	(16)	37	(18)	5.88	<0.001
Possibilities for development	77	(11)	72	(13)	77	(11)	61	(13)	30.60	<0.001
Meaning of work	83	(13)	83	(13)	84	(13)	74	(14)	7.49	<0.001
Interpersonal relations at work										
Social support	65	(16)	67	(21)	68	(13)	66	(17)	0.97	0.41
Role clarity	71	(14)	75	(12)	73	(16)	71	(11)	0.86	0.46
Role conflicts	41	(16)	36	(19)	45	(16)	34	(18)	3.32	0.02
Predictability of work	58	(19)	60	(22)	50	(13)	59	(14)	1.42	0.24
Quality of leadership	57	(19)	63	(26)	55	(15)	58	(15)	0.64	0.59

Comparison between the four occupational groups are based on analyses for covariance (ANCOVA), adjusted for age, cohabitation, number of children at home, years working in the health care sector, total working hours per week, assignment to intervention or control group.

3.3. Psychosocial workplace factors in patient care workers, laboratory technicians and at the Danish national average

Compared to laboratory technicians, patient care workers had significantly higher scores on four of the six demand

scales, on all three work organization scales and on the role conflict scale in the multivariate analysis (Table 4). Working in patient care versus working as a laboratory technician explained 10% or more of the variance in possibilities for development (46%), cognitive demands (38%), emotional demands (35%), high work pace (33%),

quantitative demands (31%), meaning of work (25%), influence at work (21%) and role conflicts (15%).

Table 4 also shows the Danish national average for 12 of the 14 scales. Substantial differences from the national average (defined as 10 points or more) were found for both patient care workers and laboratory technicians. Patient care workers had higher emotional demands (+25 points) and sensorial demands (+23) and lower influence at work (−11) than the general Danish working population (all p -values <0.001). Laboratory technicians had higher demands for hiding emotions (+11) and sensorial demands (+26) and lower influence at work (−18) and possibilities for development (−11, all p -values <0.001).

3.4. Mental health in patient care workers and laboratory technicians

In a bivariate analysis patient care workers had lower mental health scores than laboratory technicians (77 vs. 82 points, coefficient = 5.47, 95% CI = 1.48–9.45, $p = 0.007$, not shown in table). The difference in mental health

between the two groups remained significant after we adjusted for age, cohabitation, number of children at home, years working in the health care sector, total working hours per week and assignment to intervention or control group ($p = 0.03$, model 1 in Table 5). When we adjusted for demands at work, the coefficient dropped substantially and the difference between the two groups became non-significant ($p = 0.51$, model 2). When we adjusted for work organization, job group was strongly related to mental health ($p < 0.001$, model 3), whereas the association was considerably lower, when adjusted for interpersonal relations at work ($p = 0.05$, model 4). In the most complete model, which was adjusted for socio-demographic and employment characteristics and for all 14 psychosocial workplace factors, job group was significantly related to mental health (4.99, 95% CI = 0.30, 9.68, $p = 0.04$, model 5).

3.5. Psychosocial work environment factors and mental health

Lower mental health was associated with higher scores on the six demand scales and the role conflict

Table 4
Psychosocial workplace factors among patient care workers and laboratory technicians in the study and at the national average in Denmark

	Patient care workers ($n = 281$)		Laboratory technicians ($n = 62$)		F	p	Explained variance (partial R^2) (%)	National average
	Mean	(SD)	Mean	(SD)				
Demands at work								
Quantitative demands	52	(15)	37	(12)	36.42	<0.001	31	NA
High work pace	70	(14)	57	(14)	41.53	<0.001	33	NA
Emotional demands	63	(17)	45	(21)	45.37	<0.001	35	38
Demands for hiding emotions	38	(15)	41	(20)	0.46	0.50	4	30
Sensorial demands	85	(15)	88	(12)	0.62	0.43	4	62
Cognitive demands	71	(12)	57	(11)	57.81	<0.001	38	63
Work organization								
Influence at work	44	(16)	37	(18)	15.46	<0.001	21	55
Possibilities for development	77	(11)	61	(13)	90.77	<0.001	46	72
Meaning of work	83	(13)	74	(14)	21.68	<0.001	25	78
Interpersonal relations at work								
Social support	66	(16)	66	(17)	0.07	0.78	1	68
Role clarity	72	(14)	71	(11)	0.77	0.38	5	76
Role conflicts	41	(16)	34	(18)	7.68	0.01	15	37
Predictability of work	57	(19)	59	(14)	0.24	0.63	3	60
Quality of leadership	58	(19)	58	(15)	0.05	0.82	1	56

Comparison between patient care workers and laboratory technicians are based on analyses for covariance (ANCOVA), adjusted for age, cohabitation, number of children at home, years working in the health care sector, total working hours per week, assignment to intervention or control group.

NA = data not available.

Table 5
Mental health scores in relation to job group and psychosocial workplace factors

	Model 1	Model 2	Model 3	Model 4	Model 5
	Coefficient (95% CI)				
Job group					
Patient care workers	1 (Reference)	1 (Reference)	1 (Reference)	1 (Reference)	1 (Reference)
Laboratory technicians	4.52 (0.40, 8.64) *	1.55 (−3.02, 6.12)	8.25 (3.80, 12.70) ***	3.98 (−0.02, 7.98)	4.99 (0.30, 9.68) *
Demands at work					
Quantitative demands	−0.28 (−0.37, −0.18) ***	−0.23 (−0.35, −0.11) ***			−0.17 (−0.29, −0.05) **
High work pace	−0.10 (−0.21, 0.01)	0.06 (−0.06, 0.19)			0.10 (−0.02, 0.22)
Emotional demands	−0.19 (−0.27, −0.11) ***	−0.09 (−0.19, 0.01)			−0.10 (−0.20, 0.00) *
Demands for hiding emotions	−0.19 (−0.29, −0.10) ***	−0.10 (−0.20, 0.01)			−0.03 (−0.14, 0.08)
Sensorial demands	−0.06 (−0.16, 0.05)	−0.04 (−0.15, 0.06)			−0.08 (−0.19, 0.02)
Cognitive demands	−0.16 (−0.27, −0.04) **	0.04 (−0.11, 0.18)			−0.12 (−0.28, 0.04)
Work organization					
Influence at work	0.19 (0.09, 0.28) ***		0.18 (0.08, 0.27) ***		0.07 (−0.03, 0.17)
Possibilities for development	0.08 (−0.04, 0.20)		0.01 (−0.13, 0.16)		0.15 (−0.01, 0.31)
Meaning of work	0.22 (0.11, 0.33) ***		0.21 (0.09, 0.34) **		0.16 (0.03, 0.29) *
Interpersonal relations at work					
Social support	0.22 (0.13, 0.31) ***			0.17 (0.06, 0.29) **	0.15 (0.04, 0.26) *
Role clarity	0.20 (0.09, 0.32) **			0.09 (−0.03, 0.21)	0.01 (−0.11, 0.14)
Role conflicts	−0.18 (−0.27, −0.09) ***			−0.12 (−0.22, −0.02) *	−0.03 (−0.14, 0.07)
Predictability of work	0.13 (0.05, 0.22) **			−0.03 (−0.14, 0.09)	−0.09 (−0.20, 0.02)
Quality of leadership	0.17 (0.09, 0.25) ***			0.06 (−0.06, 0.18)	0.00 (−0.12, 0.12)

* <0.05; ** <0.01; *** <0.001.

Model 1: variables in model are adjusted for age, cohabitation, number of children at home, years working in the health care sector, total working hours per week, assignment to intervention or control group but not for each other.

Models 2 to 5: variables in model are adjusted for age, cohabitation, number of children at home, years working in the health care sector, total working hours per week, assignment to intervention or control group and for each other.

scale and with lower scores on the other scales. Associations were statistically significant for 11 of the 14 scales, when we adjusted for sociodemographic and employment characteristics (Table 5, model 1). When we further adjusted the six demand scales for each other and for job group, only high quantitative demands remained significant ($p < 0.001$, model 2). When we adjusted all psychosocial workplace factors for job group and for each other (model 5), high quantitative demands ($p = 0.007$), high emotional demands ($p = 0.05$), low meaning of work ($p = 0.02$) and low social support at work ($p = 0.01$) were significantly associated with lower mental health.

4. Discussion

The analyses presented in this paper were directed to two research questions: (1) to test 14 scales of the COPSOQ-I in hospital workers and (2) to study the associations of these psychosocial workplace factors with mental health.

4.1. Internal consistency of the 14 scales on psychosocial workplace factors

Most COPSOQ-I scales showed good internal consistency, with Cronbach's alphas ranging from 0.73 to 0.87. While the alpha for possibilities for development ($\alpha = 0.65$) bordered the level of acceptance, which was set at 0.70, the internal consistency for demands for hiding emotions ($\alpha = 0.47$) is not acceptable. This is probably due to the different aspects raised in the two questions of this scale. While one question asks about the need to hide feelings at work ("Does your work require that you hide your feelings?"), the other question reads "Does your work require that you do not state your opinion?" thus shifting the focus from feelings to opinions. In the COPSOQ-II, which was released after this study was completed, the question about not stating opinions at work was deleted from the scale. Instead two new questions (about keeping a friendly attitude regardless of own feelings) were added to the scale, thus creating a more consistent battery of questions about demands for hiding emotions at work (Tage S. Kristensen, personal communication).

4.2. Relevance of the 14 psychosocial work environment factors

Comparing scores of the scales between the occupational groups showed distinctive differences in the psychosocial work environment. Patient care workers had significantly higher demands and more role conflicts, but on the other hand reported better work organizational factors than laboratory technicians.

Working in patient care as opposed to working as a laboratory technician explained almost half of the variance for possibilities for development and a quarter or more of the variance of cognitive demands, emotional demands, high work pace, quantitative demands and meaning of work. Hence, patient care workers have relatively high demands, but also relatively high resources in work organization, whereas laboratory technicians have relatively low demands and low resources in work organization. In terms of the demand–control–support model (Karasek and Theorell, 1990; Theorell and Karasek, 1996), and its categorization of work as "high strain", "low strain", "active" and "passive" work, laboratory technicians would tend to belong to the passive quadrant of the model. It can be discussed, if patient care workers would belong to the "high strain" quadrant (because of the relatively low scores on influence at work compared to the national average) or to the "active work" quadrant (because of the relatively high scores on the other work organization scales). Based on the occupational health literature (Nielsen et al., 2004; Rugulies and Siegrist, 2002; Schnall et al., 2000), we think that low scores on influence at work are of greater importance for health and well-being than other aspects of work organization, and therefore we regard patient care work as a high strain occupation.

The differences in the work environment within the three occupational groups involved in patient care were less pronounced than between patient care workers and laboratory technicians. However, midwives tend to have higher emotional and quantitative demands and fewer resources (influence, predictability, quality of leadership) than nurses and nurse assistants, indicating a more problematic psychosocial work environment for midwives. This is in line with findings from the Danish PUMA study, which showed that midwives had the highest level of burnout among employees in the human service sector (Borritz et al., 2006; Kristensen et al., 2005a).

4.3. Occupational group, psychosocial workplace factors and mental health

Patient care workers had significantly lower mental health scores than laboratory technicians, after adjustment for sociodemographic and employment characteristics. The difference disappeared when we further controlled for demands at work, suggesting that lower mental health in patient care workers might be mediated by their higher demands. Interestingly, the differences in mental health scores between laboratory technicians and patient care workers increased substantially when we adjusted for work organization. As noted above, patient care workers had significantly higher scores on all three scales in the area of work organization and the scales themselves were positively associated with mental

health. That adjusting for these higher resources increased the statistical difference in mental health between patient care workers and laboratory technicians indicates that without higher resources mental health in patient care workers would be even worse.

After adjustment for sociodemographic and employment characteristics, 11 of the 14 scales showed statistical significant associations with mental health (Table 5, model 1). With one exception, these associations were in the expected direction. The exception is the cognitive demands scale, for which we had expected that higher cognitive demands (i.e., a more stimulating work environment) would be associated with better mental health. An explanation could be that the scale included questions about overseeing a lot and making difficult decisions, which might be stressful tasks, especially if decision authority is relatively low.

The strongest effects on mental health were found for quantitative demands, followed by meaning of work and social support. These three scales also remained significant, when we adjusted the psychosocial scales against each other and against job group. This is in line with findings from the study of *Escriba-Agüir and Tenías-Burillo (2004)*, who showed that high psychological demands and low social support were associated with poor mental health in Spanish hospital employees.

4.4. Limitations

While we applied a theory-based instrument that measures a wide range of different aspects of the psychosocial work environment it has to be noted that even our comprehensive approach has its limitation. For example, the COPSOQ-I did not include a scale on rewards at work, a dimension, which has gained much interest in work and health research recently (*Siegrist et al., 2004*), including research among hospital workers (*McVicar, 2003; van Vegchel et al., 2001*). Fortunately, the COPSOQ-II includes a scale on rewards at work (*Tage S. Kristensen, personal communication*), so this limitation will not apply to future research.

Mental health was not assessed with a clinical-diagnostic tool but was self-reported using the mental health scale from the SF-36. In the literature this scale has been used as a measure of psychological well-being, general mental health and depressive disorders (*Grosch and Murphy, 1998; Rugulies et al., in press; Stansfeld et al., 1998*). Studies that have validated the scale against other questionnaires and clinical diagnoses indicate that the scale is a better measure of mood and mood disorders than of general mental health (*Rumpf et al., 2001; Strand et al., 2003*). However, because the scale is widely known as a “mental health” scale” we used this term in the study.

The generalization of the study findings is limited. The study sample was female only and therefore interpreta-

tion of the findings can only be made for women. Our findings can also not be generalized to occupational groups in hospitals, which were not included in this study (e.g., physicians or janitors).

Finally, it should be noted that this study relies almost exclusively on quantitative assessments of the psychosocial work environment. In a recent article, *Gordon and colleagues* laid out a great variety of qualitative approaches in an ongoing study on social gradients in health of hospital workers, which included semi-structured, open-ended and informal interviews, focus groups, participant and non-participant observations, ethnographic approaches (“belonging” or “being there”) and archival studies (*Gordon et al., 2005*). The results from these qualitative assessments will be interpreted together with findings from quantitative measurements of the psychosocial work environment (*Rugulies et al., 2004*) and observational assessments of physical exposure at work (*Janowitz et al., 2005*). This triangulation of different data sources would also have been desirable for our study, but was not feasible under the given resources. However, we included a few open questions in the survey, asking the participants about the three most positive and the three most negative aspects of their work environment. We are currently analyzing the responses to these questions and hope that this will provide us with some additional information on the work environment of the participants.

4.5. Implications for workplace interventions and further research

Research has shown that improving the psychosocial work environment (so called workplace interventions or comprehensive health promotion) has a positive effect on employees’ satisfaction, well-being and health (*Aust and Ducki, 2004; Kompier et al., 2000; Kompier et al., 1998; Kristensen, 2000*). It has been pointed out that it is crucial that these interventions are based on a comprehensive and theory-based assessment of workplace conditions (*Goldenhar et al., 2001; Kristensen, 2005a*). Based on this assessment, appropriate interventions can be planned and tailored to the specific needs of employees (*Aust and Ducki, 2004; Goldenhar et al., 2001*). Questionnaire surveys play a prominent role in this assessment process and should therefore be reliable in identifying specific and relevant areas for interventions.

In this study, we found the COPSOQ-I to be able to reflect the psychosocial work environment of different occupational groups, and to point to distinguished areas with a need for improvement. We found that 11 of the 14 psychosocial workplace factors scales were significantly associated with mental health. Associations with reduced mental health scores were particular strong (coefficients of 0.15 or above) for high quantitative,

emotional and cognitive demands, high demands for hiding emotions and high role conflict and low influence at work, low meaning of work, low social support, low role clarity and low quality of leadership. While these associations were based on cross-sectional analyses and therefore need to be confirmed in prospective studies, they suggest that workplace interventions directed to these workplace conditions might have positive effects on mental health.

Patient care workers had considerably higher demands than both laboratory technicians and the general Danish working population. High quantitative demands can be addressed by increasing number of staff, which would reduce the individual workload. High emotional demands are to a certain extent an unavoidable part of patient care work, which includes daily exposure to suffering and dying, but also sometimes very demanding and even threatening patients. It would therefore be important to help patient care workers to better cope with these emotional demands, e.g. by offering extended psychological supervision and counseling at work.

Laboratory technicians had considerably lower levels of possibilities for development and meaning of work than patient care workers. Possibilities for development might be improved by offering employees possibilities for acquiring more qualifications and by offering more career opportunities. Meaning of work might be improved by giving employees feedback about the importance of their work.

Both patient care workers and laboratory technicians scored well below the Danish national average on the influence at work scale. Low influence was significantly associated with reduced mental health in this study and has been found to predict physical and mental health disorders in other studies (Bosma et al., 1997; Rugulies et al., *in press*; Stansfeld et al., 1999). Influence at work could be improved by strengthening employees' discretion about certain parts of the work organization (e.g., work content, team constellations, assignment of shifts). Also, involving employees in discussion groups that aim to solve specific problems at work (e.g., health circles to address issues of work and health, see: Aust and Ducki, 2004) is a useful tool for increasing influence at work.

Finally, we want to emphasize that questionnaire results are important for the assessment of problems in the psychosocial work environment, but only mark the starting point for a more comprehensive assessment of psychosocial workplace problems and further on the development of interventions. Information from the psychosocial workplace scales need to be supplemented with qualitative data, e.g. from open questions and interviews with key persons (Gordon et al., 2005). Based on this information the discussion and negotiation process can start which then provides a solid basis for the development of workplace interventions. To what extent the information was actually used for the

interventions that have been carried out in the hospital and if these interventions had any effects on the psychosocial work environment and on employees' health and well-being, will be analyzed and reported in future articles.

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