

99  
D. Reis Miranda D. W. Ryan  
W. B. Schaufeli V. Fidler (Eds.)

# Organisation and Management of Intensive Care

A Prospective Study in 12 European Countries

With 46 Figures and 133 Tables

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**Table 53.** Equation number 1: dependent variable B20; performance B20\*

Variable	B	SE B	$\beta$	T	Significance T
CENTRAL	-0.14	0.066	-0.25	-0.211	0.039
UNIV	0.19	0.27	0.10	0.73	0.471
QUALIF	-3.1	0.0034	-0.01	-0.09	0.927
STAN	-0.34	0.14	-0.30	-2.51	0.015
DIFFTOT	-0.070	0.040	-0.21	-1.75	0.086
TECH	-0.23	0.10	-0.30	-2.21	0.031
SIZE	0.051	0.026	0.28	1.93	0.059
(Constant)	0.64	1.62		0.39	0.70

\* For explanation, see Text.

**Table 54.** Equation number 1: dependent variable B80; performance B80

Variable	B	SE B	$\beta$	T	Significance T
CENTRAL	-0.070	0.045	-0.20	-1.54	0.130
UNIV	0.089	0.18	0.07	0.49	0.628
QUALIF-2	-1.71	0.0023	-0.01	-0.08	0.941
STAN	-0.048	0.094	-0.07	-0.52	0.609
DIFFTOT	-0.076	0.027	-0.36	-2.78	0.008
TECH	-0.0099	0.070	-0.02	-0.14	0.888
SIZE	0.0035	0.018	0.03	0.19	0.848
(Constant)	1.95	1.11		1.76	0.085

pital). The dependent variable in the analysis is either B20 or B80. The findings of the analyses are indicated in Tables 53 and 54.

The first equation (Table 53) explains 31% of the variance of B20; the second equation (Table 54) only explains 19% of the variance of B80. Apparently, the managerial and organizational variables better explain the performance of ICUs with respect to less severely ill patients than the performance of ICUs with respect to more severely ill patients.

Using B20 as the dependent variable, it is clear that the hypotheses regarding task differentiation, centralization and standardization are confirmed. The more an ICU works with a team-like structure - indicated by less task differentiation and less centralization - the better the performance with respect to less severely ill patients. Furthermore there are separate effects upon performance with respect to the variables SIZE and TECH. In other words, as measured with the variable B20, the performance of larger ICUs with more advanced technologies is better. However, if we turn to the other measure of performance, i.e. B80, it is clear that only one determining organizational variable can be discerned (i.e. less task differentiation). Considering that there is also (although not significant) an effect of the variable centralization, one may conclude that also with respect to perfor-

mance regarding more severely ill patients, a team-like structure is a major determinant of the performance of ICUs. But apparently (considering the lower explained variance), the effect of managerial and organizational variables diminishes when medical performance of ICUs regarding more severely ill patients is taken into account. One may presume that, in this context, medical attributes of the ICU become more important.

## Conclusions

In conclusion, the findings of the substudy *Organization* once more underline the necessity to emphasize the specific nature of the ICU as a work group. The analysis showed that, in contrast to other work groups, the implementation of technologies within the ICU did not result in more centralization, more task differentiation and more standardization, but instead resulted in the development of team-like working. In the final analysis we could prove that this resulted in better medical performance of the ICUs.

## Personnel\*

W. Schaufeli and P. Le Blanc

## Introduction

### Aims of the Substudy

The EURICUS-I *Personnel* substudy was designed to study the working situation and well-being of ICU nurses, who proportionally are the largest group of employees in an ICU. The aim of this substudy is twofold: First, a detailed job analysis is performed. The jobs of nurses in the participating ICUs will be described in terms of nursing staff characteristics, job characteristics (especially nurses' workload), and nurses' level of job-related stress (burnout). Potential risk factors for ICU nurses' well-being at work as well as specific high-risk groups will be identified. Second, a model on the relationship between ICU nurses' workload (inputs), their levels of job-related stress or burnout (throughputs) and the medical performance of their ICU (outputs) will be tested both on the individual (subjective) level and on the aggregated ICU (objective) level. This research model will be expounded on below.

\* The authors would like to express their appreciation to Tom Cox (Centre for Organizational Health and Development, University of Nottingham) for his insightful comments on an earlier draft of this chapter.

## Research Model

The basic research model used in the *Personnel* substudy is depicted in Fig. 5. The main hypothesis underlying this model is that when workload is too high this will induce feelings of chronic job stress (burnout) among ICU nurses, which in turn are expected to lead to impairments in nurses' performance levels. Accordingly, nurses' performance is supposed to be influenced by their level of job demands, both directly and indirectly through the development of burnout symptoms. The latter effect is supposed to be stronger than the former. Nurse burnout was selected as the focal mediating variable since it is not only characterized by feelings of exhaustion, but also by a lack of commitment to the patients and by feelings of insufficiency and incompetence. All three aspects are expected to impair performance. Besides, burnout is a long-term stress reaction that is particularly observed in human services such as health care, in which employees do "people work" of some kind [44]. Last but not least, already more than a decade ago, burnout was viewed as one of the top research priorities for ICUs [37]; however, only few studies have been conducted since.

This basic research model has been refined in two ways. The first refinement deals with the relationship between workload and burnout. It is assumed that certain positive conditions, so-called coping resources [25], can help nurses to cope with a high workload, thereby preventing the occurrence of long-term stress reactions such as burnout. These coping resources can be characteristics of the working situation as well as personal characteristics of a nurse. An example of a situational coping resource is the level of autonomy [31] in ICU nurses' jobs. If nurses have sufficient autonomy to cope with demanding job situations (e.g. to solve problems), these situations are less likely to lead to stress reactions. An example of a personal coping resource is a high level of self-efficacy, or perceived personal competence [15]. Nurses who feel competent in their jobs will be less upset by high demands, because they can rely on their capabilities to handle them. So, high demands are only expected to lead to stress reactions such as burnout if situational or personal coping resources are lacking.

The second refinement concerns the relationship between burnout and performance. This relationship is expected to be influenced by a nurse's level of involvement in the job, i.e. the importance that she/he attaches to the job [26, 39]. Specifically, nurses with a high level of job involvement are expected to be more motivated to exert themselves under stressful circumstances than nurses with a low level of job involvement. Therefore, we assume that high levels of job involvement will prevent performance from deteriorating under stressful circumstances.

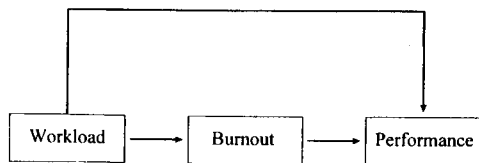


Fig. 5. Basic research model

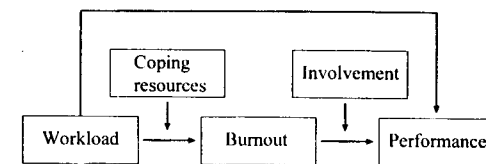


Fig. 6. Extended research model

The above-mentioned refinements lead to the extended research model that is depicted in Fig. 6. In Appendix A, a definition of all variables that are included in the extended research model is given.

## Structure of the Chapter

In the remaining part of this section, the following topics are addressed: "Method" deals with the method of data collection. First, the instruments that were used to assess the variables in our (extended) research model are presented and their psychometric properties are discussed. Second, the study sample is described in greater detail ("Respondents"). In the "Results" sections ("Job Analysis" and "Work and Well-Being Questionnaire"), results of the descriptive analyses will be presented and discussed. The results of the job analysis and the identification of risk factors for ICU nurses' well-being at work are discussed. Then, the specific subgroups are compared with respect to their scores on the key study variables in order to identify high-risk groups. In the next section ("Results: The Basic and Extended Research Models"), the basic and extended research models are tested. More particularly, results of multilevel analyses are presented, in which the total amount of variance in each variable is partitioned into variance accounted for on the individual, the ICU and the area level ("Multilevel Analysis"). Next, the basic research model (Fig. 5) is tested using subjective (individual) and aggregated objective (ICU) data ("The Basic Research Model"). Finally, the extended research model (Fig. 6) is tested at the ICU level ("The Extended Research Model").

The chapter ends with a concluding section that draws together the most important findings of the *Personnel* substudy.

## Method

In October and November 1994, two questionnaires were distributed among the nursing staff of the 89 ICUs participating in the EURICUS-I project: the so-called WEBIC questionnaire for job analysis, and the Work and Well-Being questionnaire.

## Job Analysis: The WEBIC Questionnaire

A systematic approach, based on sociotechnical systems theory (for an overview, see [46]), was used to perform a detailed job analysis of ICU nurses' jobs. For this

purpose, the so-called WEBA method (*welzijn bij de arbeid* – well-being at work [50]) was adapted for analyzing ICU nurses' jobs. The resulting instrument, the WEBIC questionnaire, is particularly tailored to the work of ICU nurses, i.e. the activities they perform. WEBIC is an acronym that stands for well-being of ICU nurses. Sociotechnical systems theory postulates that a job must integrate four categories of tasks in order to be carried out adequately and not impair the workers' well-being. These four types of tasks are:

1. Operational tasks: e.g. nursing care of patients, activating patients
2. Organizing tasks: e.g. contact with physicians, patient meetings
3. Preparatory tasks: e.g. transport of patients, replenishing medical supplies
4. Supportive tasks: e.g. writing reports, calibrating equipment

Ideally, the task mix in ICU nurses' jobs should be balanced, i.e. a nurse should perform each of these four types of tasks in order to enhance her/his well-being and performance.

As depicted in Fig. 7, operational tasks make up the core of the ICU nurses' job, with all other categories of tasks contributing to this core activity.

In the first part of the WEBIC questionnaire, a listing of about 40 tasks, or activities, is presented. This listing is based on an earlier study among Dutch ICU nurses [8]. For each of these tasks nurses have to indicate: (a) how demanding and (b) how satisfying the performance of this particular task is. Scores range from 1 (undemanding/dissatisfying) to 5 (demanding/satisfying). Accordingly, this first part provides information about ICU nurses' qualitative workload in terms of perceived demands and perceived satisfaction. In the second part of the questionnaire, ICU nurses' task mix is assessed by asking them to estimate the percentage of time they spend in performing each of the four main categories of tasks.

When carrying out the different tasks, ICU nurses may encounter several problems, e.g. unclear instructions from superiors, inadequate planning of personnel, insufficient quality of materials, becoming emotionally "touched" by the death of patients. However, these problems are only expected to lead to an impairment of well-being (e.g. by inducing psychological strain) or performance (e.g. by

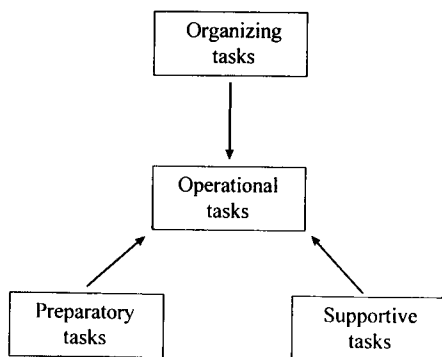


Fig. 7. Task-mix in ICU nurses' jobs

interfering with task completion) when the level of autonomy in ICU nurses' jobs is insufficient to tackle these problems. So, problems at work do not cause stress reactions per se, but only to the extent that nurses are unable to solve them because of a lack of autonomy [31]. Accordingly, as long as nurses have enough autonomy to deal with problems at work, negative effects on well-being and performance are likely to be prevented. Therefore, in the third and last part of the WEBIC questionnaire a detailed list of about 30 potential problems in ICU nurses' jobs is given, pertaining to: (1) patients, (2) norms and instructions, (3) equipment, (4) nurses' mental and physical condition, (5) supply of information, (6) feedback, (7) planning and (8) the physical working environment. This list is also based on the above-mentioned study by Reis-Miranda et al. [8]. For each of these potential problem areas, nurses are asked to indicate: (a) how often it occurs (an indicator of problem frequency) and (b) how it is usually solved (an indicator of autonomy). Scores on the frequency items range from 0 (never) to 4 (often); scores on the autonomy items range from unsolvable to solved independently.

#### Workload, Burnout and Performance: The Work and Well-Being Questionnaire

The questionnaire on work and well-being of ICU nurses is composed of several scales, corresponding to the variables in the research model. Each of these scales has been used and validated in earlier studies. First, a more detailed description of the content of each of the scales is given, followed by a discussion of their psychometric properties.

#### Workload

**Perceived Quantitative Job Demands.** This scale is derived from a Dutch version [20] of Karasek's [30] Job Content Instrument. The job demands scale is made up of four items that refer to quantitative demanding aspects of the job (e.g. time pressure, working hard). Because of a low factor-loading, one of the items of the job demands scale was removed. Items are scored on a four-point Likert scale, ranging from 1 (never) to 4 (always).

**Imbalance Patients and Imbalance Team.** In earlier studies on burnout (e.g. Van Dieren-donck et al. [49]; Schaufeli et al. [45]), it was found that a so-called negative exchange relationship with either patients or colleagues, in which a care provider continuously feels that she/he invests much more than she/he gets back, is positively related to the development of burnout. Therefore, nurses are asked to evaluate the investments (I) and outcomes (O) in the relationship with: (a) their patients and (b) their team on a 7-point Likert scale, ranging from 1 (very little) to 7 (very much). Based on this information, two ratio scores are computed ( $I_{\text{patients}}/O_{\text{patients}}$ ) and ( $I_{\text{team}}/O_{\text{team}}$ ), respectively. The higher a ratio score, the more negative or imbalanced the respective relationship with either the patients or the colleagues in the ICU is perceived.

### Stress Reactions

**Burnout.** Burnout is assessed with three subscales of the Maslach Burnout Inventory (MBI [38]): (1) emotional exhaustion (eight items), referring to the draining of emotional resources; (2) depersonalization (five items), i.e. a callous and cynical attitude towards the recipients of one's care; and (3) personal accomplishment (seven items), or feelings of work-related competence. High levels of emotional exhaustion and depersonalization and a diminished sense of personal accomplishment are indicative of burnout. Two original items of the MBI have been eliminated because of their poor factorial validity (see [17]). Scores on the items range from 1 (never) to 7 (every day).

**Job Dissatisfaction.** Nurses' overall dissatisfaction with their job is measured with a one item rating that is scored on a 5-point faces measure [34]. This measure is strongly correlated ( $r=7..75$ ) with a multi-item questionnaire that assesses nurses' general job satisfaction [18].

### Performance

**Perceived Unit Performance.** Perceived unit performance is measured by a six item scale, developed in the USA by Shortell et al. [48]. This scale has also been used in an earlier study on the effectiveness and efficiency of Dutch ICUs [32] and assesses nurses' judgement on the performance of their ICU. Items are scored on a 5-point Likert scale, ranging from 1 (strongly disagree) to 5 (strongly agree).

### Situational Coping Resources

**Autonomy.** This scale is also derived from the above-mentioned Dutch version [20] of Karasek's [30] Job Content Instrument. It includes five items concerning skill discretion (i.e. the breadth of skills used by workers in performing their job) and four items concerning decision authority (i.e. freedom of action in accomplishing the formal work task). In earlier studies, factor analyses have repeatedly demonstrated that all nine items load on one factor and can therefore be combined into one scale [21, 22, 29]. However, because of low factor-loadings, two of the items of this scale had to be removed. Items are scored on a 4-point Likert scale, ranging from 1 (never) to 4 (always).

**Leadership.** Nurses' judgement on their head nurse's leadership behaviour is measured with two different scales: (1) Social emotional leadership [40] is the degree to which the head nurse is friendly and pays attention to his or her subordinates. (2) Task oriented leadership [40] is the degree to which tasks are specified and monitored in detail by the head nurse. All items are scored on a 5-point Likert scale, ranging from 1 (never) to 5 (always).

### Personal Coping Resources

**Generalized Self-Efficacy.** Nurses' perceived personal competence [15], or "judgement of their capabilities to organize and execute courses of action required to attain designated types of performance", is measured by a 10-item scale developed by Jerusalem and Schwarzer [27]. Items are scored on a 4-point Likert scale, ranging from 1 (not at all true) to 4 (exactly true).

**Conscientiousness.** Nurses' level of conscientiousness is measured with four, 9-point self-ratings [28] reflecting: (1) responsibility, (2) accuracy, (3) efficiency, and (4) skilfulness. Conscientiousness is one of the "big five" personality characteristics that are assumed to constitute an individual's personality [23].

### Involvement

**Job Involvement.** The degree to which the job is at the centre of nurses' lives is measured with a five item scale developed by Ladewich and White [35]. Items are scored on a 5-point Likert scale, ranging from 1 (strongly disagree) to 5 (strongly agree).

**Organizational Commitment.** The strength of nurses' identification with and involvement in the ICU is measured with a five item scale developed by Shortell et al. [48]. Items are scored on a 5-point Likert scale, ranging from 1 (strongly disagree) to 5 (strongly agree).

### Psychometric Properties of the Work and Well-Being Scales

#### Internal Consistency

Table 55 presents some characteristics of the scales from the Work and Well-Being questionnaire. In general, a Cronbach's  $\alpha$  of about 0.70 or higher is consi-

**Table 55.** Internal consistency ( $\alpha$ ), range, mean and standard deviation (SD) of the Work and Well-Being Scales ( $n=2090$ )

		Number of items	$\alpha$	Range	Mean $\pm$ SD
Scale					
A1	Quantitative job demands (workload)	4	0.60	1.00–4.00	2.69 $\pm$ 0.52
A2	Imbalance patients	1	n.a.	0.29–7.00	1.52 $\pm$ 0.89
A2	Imbalance team	1	n.a.	0.25–7.00	1.25 $\pm$ 0.60
B1	Emotional exhaustion	8	0.86	1.00–6.63	2.89 $\pm$ 1.09
B1	Depersonalization	5	0.61	1.00–6.50	2.18 $\pm$ 0.95
B1	Reduced personal accomplishment	7	0.73	1.00–6.29	2.56 $\pm$ 0.92
B2	Job satisfaction	1	n.a.	1.00–5.00	3.81 $\pm$ 0.71
C1	Perceived unit performance	6	0.70	1.33–5.00	3.72 $\pm$ 0.54
D1.1	Autonomy	7	0.70	1.00–4.00	2.85 $\pm$ 0.42
D1.2	Social emotional leadership	4	0.87	1.00–5.00	3.58 $\pm$ 0.86
D2.1	Task-oriented leadership	3	0.63	1.00–5.00	3.13 $\pm$ 0.81
D2.1	Generalized self-efficacy	10	0.85	1.50–4.40	3.09 $\pm$ 0.42
D2.2	Conscientiousness	4	0.70	1.00–9.00	7.69 $\pm$ 0.84
E1	Job involvement	5	0.73	1.00–5.00	2.75 $\pm$ 0.65
E2	Organizational commitment	5	0.73	1.20–5.00	3.65 $\pm$ 0.61

n.a., not available.

dered to be acceptable [41]. Inspection of Table 55 makes clear that there are three scales which do not meet this criterion, i.e. perceived quantitative job demands, task-oriented leadership and depersonalization. The relatively low  $\alpha$  of the first two scales may be due to the small number of items (3). With respect to depersonalization, a low  $\alpha$  has also repeatedly been found in other studies [42]. Despite the relatively poor internal consistency of these scales, they are nevertheless included in the analyses since  $\alpha$  values between 0.60 and 0.70 are considered borderline [41].

### Validity

Inspection of the relationships between the variables in the research model yields some information on the validity of the scales. In Appendix B, the correlation matrix of all variables is given. For survey reasons, the intercorrelations between the variables are discussed in three steps, corresponding to the steps in the research model. However, it should be noted that, due to the large sample size, even small correlation coefficients reach statistical significance.

**Workload and Stress Reactions.** The first step deals with the relationship between workload and stress reactions, which is assumed to be moderated by situational and individual coping resources. The correlations between the variables concerned are reported in Table 56.

As expected, the relationship between quantitative job demands, and emotional exhaustion, depersonalization and dissatisfaction is positive. Higher job demands are related to higher levels of emotional exhaustion and depersonalization and to more dissatisfaction. However, the relationship of job demands to reduced personal accomplishment turns out to be significantly negative instead of positive, i.e. higher demands are associated with stronger feelings of accomplishment. The perception of imbalance in the exchange relationship with patients is positively related to all three burnout symptoms, whereas the perception of imbalance in the exchange relationship with colleagues (the team) is only positively related to emotional exhaustion. Both measures of imbalance are significantly, positively related to dissatisfaction. So, the more nurses feel that their investments in their relationships with patients or colleagues outweigh the outcomes, the more emotionally exhausted and dissatisfied they will be. The more negative the exchange relationship with patients is evaluated, the higher nurses' level of depersonalization and the lower their feelings of accomplishment. With the exception of the nonsignificant relationships between: (a) autonomy and emotional exhaustion, and (b) task-oriented leadership, and emotional exhaustion and depersonalization, respectively, all coping resources are negatively related to burnout symptoms and dissatisfaction. In general, a lack of either situational or personal coping resources increases the risk of stress reactions such as burnout and dissatisfaction. Both personal coping resources (self-efficacy and conscientiousness) are quite strongly, positively intercorrelated ( $r=0.41$ ), whereas the intercorrelations between each of the three situational coping resources (autonomy, task-oriented leadership and social emotional leadership) are much lower ( $r < 0.15$ ).

Table 56. Correlations between workload, stress, reactions and coping resources ( $n = 2090$ )

	DEM	IOP	IoT	SEL	TOL	Aut	Sef	Con	EE	DP	RPA	Dsat
DEM	1.00	0.17**	0.12**	-0.14**	0.11**	0.18**	-0.03	0.04	0.40**	0.10**	-0.09**	0.19**
IOP		1.00	0.24**	-0.07**	-0.06**	-0.01	0.03	0.03	0.16**	0.10**	0.05*	0.12**
IoT			1.00	-0.10**	-0.01	-0.01	0.02	0.04	0.14**	0.03	0.03	0.14**
SEL				1.00	0.12**	0.10**	0.12**	0.07**	-0.20**	-0.13**	-0.14**	-0.31**
TOL					1.00	-0.05*	-0.03	0.04	0.02	-0.04	-0.08**	-0.08**
Aut						1.00	0.17**	0.14**	-0.01	-0.08**	-0.28**	-0.22**
Sef							1.00	0.41**	-0.13**	-0.07**	-0.28**	-0.18**
Con								1.00	-0.11**	-0.18**	-0.28**	-0.15**
EE									1.00	0.43**	0.13**	0.47**
DP										1.00	0.24**	0.29**
RPA											1.00	0.34**
Dsat												1.00

DEM, quantitative job demands; IOP, imbalance patients; IoT, imbalance team; SEL: social-emotional leadership; TOL, task-oriented leadership; Aut, autonomy; Sef, self-efficacy; Con, conscientiousness; EE, emotional exhaustion; DP, depersonalization; RPA, reduced personal accomplishment; Dsat, dissatisfaction.

\*  $p = 0.05$ ; \*\*  $p = 0.01$ .

Finally, the relationships between the three burnout symptoms and dissatisfaction are all positive and significant, i.e. higher burnout levels are related to dissatisfaction. In conclusion: the pattern of correlations presented in Table 56 confirms the validity of the measures of job demands, stress reactions, and coping resources used in this study. Only one out of 66 correlations is significant and in the unexpected direction (i.e. job demands and reduced personal accomplishment).

**Stress Reactions and Perceived Unit Performance.** The second step deals with the relationship between stress reactions and perceived unit performance, which is assumed to be moderated by job involvement and organizational commitment. The correlations between the variables concerned are reported in Table 57.

As expected, the relationship between the three burnout components and job dissatisfaction, and perceived unit performance is significantly negative. Job involvement and organizational commitment are both positively related to perceived unit performance, but this relationship is much stronger for organizational commitment ( $r=0.47$ ) than for job involvement ( $r=0.19$ ). Both measures of psychological identification with the job are moderately, positively correlated ( $r=0.33$ ). Finally, both job involvement and organizational commitment are negatively related to burnout (with the exception of the nonsignificant relationship between involvement and emotional exhaustion) and dissatisfaction (the latter relationship is especially strong for organizational commitment). In conclusion: the pattern of correlations presented in Table 57 confirms the validity of the measures of stress reactions, involvement, commitment, and perceived performance used in this study. None of the significant correlations is in an unexpected direction.

**Workload and Perceived Unit Performance.** Finally, the relationships between the three workload measures (perceived quantitative job demands, imbalance patients and imbalance team) and perceived unit performance are all – as expected – negative and significant ( $-0.05^*$ ,  $-0.14^{**}$  and  $-0.15^{**}$ , respectively).

**Table 57.** Correlations between burnout, dissatisfaction, involvement, commitment and perceived unit performance ( $n=2090$ )

	EE	DP	RPA	Dsat	Inv	Com	Pup
EE	1.00	0.43**	0.13**	0.47**	-0.03	-0.31**	-0.18**
DP		1.00	0.24**	0.29**	-0.09*	-0.18**	-0.17**
RPA			1.00	0.34**	-0.27**	-0.24**	-0.21**
Dsat				1.00	0.26**	0.44**	0.34**
Inv					1.00	0.33**	0.19**
Com						1.00	0.47**
Pup							1.00

EE, emotional exhaustion; DP, depersonalization; RPA, reduced personal accomplishment; Dsat, dissatisfaction; Inv, job involvement; Com, organizational commitment; Pup, perceived unit performance.

\*  $p=0.05$ ; \*\*  $p=0.01$ .

**Morale and Stress Reactions.** In order to evaluate the interrelationships between the scales that measure “human resources outcomes” (i.e. burnout, dissatisfaction, involvement, commitment, perceived performance) more systematically, a principal components analysis that includes the mean scale scores has been conducted. The results of this analysis, after varimax rotation, are shown in Table 58.

As can be seen from this table, the analysis yields a clear two-component structure. The first component is made up of personal accomplishment, perceived unit performance, job involvement and organizational commitment and can therefore be interpreted as morale. The second component comprises emotional exhaustion and depersonalization and can be labeled as stress reactions. Dissatisfaction loads equally high on both factors.

### Objective Measures

In addition to the subjective data that were collected by means of the questionnaires, two objective measures were used in testing our research model. However, these objective measures were only available for 80 ICUs. First, per ICU, nurses' objective workload was assessed by the NEMS [9], a validated simplified version of the TISS [7]. NEMS scores specific nursing activities performed during the past 24 h, referring to each patient. For a period of 4 months, NEMS was scored each day for each patient that stayed in the ICU, which yielded an objective indicator of nurses' workload. Second, objective unit performance was assessed using clinical management data of 9300 patients. The ICUs were ranked according to the logits of mortality computed at two levels of severity of illness measured by SAPS-II: B20 and B80 of the distribution of SAPS-II scores in EURICUS-I. Detailed information on this issue is provided in Chap. 8 (“Analysis of ICU Performance”).

Table 59 presents the correlations between objective measures of workload and unit performance and the corresponding subjective measures of workload and (perceived) unit performance from the Work and Well-Being Questionnaire. Accordingly, Table 59 yields information about the validity of the objective and subjective data. Note that the subjective variables in this table have been aggregated at the unit level; that is, mean scores across units are used to compute the cor-

**Table 58.** Principal components analysis of scale means after varimax rotation ( $n=2090$ )

	Factor 1: morale	Factor 2: Stress reactions
Variable		
Emotional exhaustion	-0.10	0.85
Depersonalization	-0.08	0.75
Reduced personal accomplishment	-0.56	0.16
Dissatisfaction	-0.54	0.56
Perceived unit performance	0.63	-0.17
Organizational commitment	0.72	0.14
Job involvement	0.72	-0.26
Variance (%)	38.2	16.5

**Table 59.** Correlations between subjective and objective measures of workload and unit performance ( $n = 2090$ )

	NEMS	Dem	IOP	IOt	Pup	B20	B80
NEMS	1.00	0.17	0.04	0.03	-0.05	-0.23*	-0.12
Dem		1.00	0.45**	0.35**	-0.11	0.03	0.01
Iop			1.00	0.37**	-0.28*	-0.08	-0.07
Iot				1.00	0.01	-0.05	0.10
Pup					1.00	0.09	0.16
B20						1.00	0.38**
B80							1.00

Dem, quantitative job demands; IOP, imbalance patients; IOt, imbalance team; Pup, perceived unit performance; B20, SAPS-II (percentile 20); B80, SAPS-II (percentile 80).

\*  $p = 0.05$ ; \*\*  $p = 0.01$

relation coefficients. Inspection of Table 59 also makes clear that, though correlations between corresponding subjective and objective measures are all in the expected direction, only very few of these correlations reach significance. A possible explanation for this overall lack of significance is the small number of units (i.e. 80 ICUs), which reduces the statistical power of the significance test.

Though the correlations between the subjective and objective measures of workload are in the expected – positive – direction, none of these correlations is significant. The highest correlation with the objective workload measure (NEMS) is found for perceived quantitative job demands, which can probably be explained by the fact that both measures assess the quantity of work (number of activities) nurses perform. The small correlations between NEMS and the two imbalance measures can be explained as follows: Whereas the two imbalance measures (i.e. imbalance patients and imbalance team) include nurses' perception of investments and outcomes in the relationship with patients and colleagues, respectively, NEMS only refers to a specific subcategory of investments in the relationship with patients (i.e. medical care of patients). Positive, though nonsignificant, intercorrelations are also found for the subjective and objective measures of unit performance. This result can probably be explained by the fact that clinical management of patients is only one of several aspects on which nurses base their judgement of their units' performance. In general, it can be concluded that the validity of the subjective measures of workload and unit performance is confirmed by the direction of the relationships with objective measures; however, the magnitude of these relationships is somewhat smaller than expected. These small correlations can probably be explained by conceptual differences in operationalization of the subjective vs the objective measures.

#### Respondents

The WEBIC questionnaire was filled out by 1954 nurses (response rate: 67%), whereas the Work and Well-Being Questionnaire was filled out by 2090 nurses (response rate: 72%). In Table 60, the distribution of the larger group of 2090 res-

**Table 60.** Distribution of the respondents over the different areas

	Number of respondents	Percentage (%)
European area		
Poland	127	6.1
Germany	125	6.0
Denmark	163	7.8
Finland	163	7.8
Netherlands	226	10.8
Belgium	180	8.6
France	144	6.9
Luxembourg	24	1.1
United Kingdom	242	11.6
Italy	148	7.1
Spain-Catalonia	250	12.0
Spain-Valencia	179	8.6
Portugal	119	5.7
Overall	2090	100.0

pondents over the different countries is reported. The sample of 2090 nurses is made up of 1618 women (77.4%) and 399 men (19.1%); for 73 nurses (3.5%) information on their gender is missing. Ages range from 20 to 64 years, with a mean age of 32.5 years ( $SD = 7.1$ ). On average, these nurses have 6.5 years ( $SD = 5.6$ ) of ICU experience and on average they have been working on the present ICU for 5.6 years ( $SD = 5.2$ ). Some 80% of these nurses have a full-time position.

#### Results: Job Analysis (WEBIC Questionnaire)

In the first part of the WEBIC questionnaire, a distinction is made between four categories of tasks, or activities (see also "Job Analysis: The WEBIC Questionnaire"), namely:

1. Operational tasks: nursing and medical care of patients
2. Organizing tasks: job-related cooperation and meetings with others
3. Preparatory tasks: tasks which should be performed before the operational work can start
4. Supportive tasks: activities that should make sure that the operational tasks can be performed undisturbed

#### Demands and Satisfaction

First, for each of these categories the mean demands score and the mean satisfaction score were computed. These figures are presented in Table 61. Here, it can be concluded that operational tasks are perceived as the most demanding, but also



**Table 61.** Mean demands score and mean satisfaction score for each of the categories of tasks (*n* = 1954)

Category of tasks	Demanding: 1-5 (Mean $\pm$ SD)	Satisfying: 1-5 (Mean $\pm$ SD)	Correlation Demanding $\times$ satisfying
Operational tasks	3.51 $\pm$ 0.78	3.74 $\pm$ 0.69	0.41**
Organizing tasks (tot)	2.38 $\pm$ 0.76	2.95 $\pm$ 0.73	0.42**
Internal functional contacts	2.61 $\pm$ 0.88	3.47 $\pm$ 0.75	0.05*
External functional contacts	1.99 $\pm$ 0.98	2.41 $\pm$ 0.97	0.60**
Meetings	2.55 $\pm$ 1.10	2.98 $\pm$ 1.12	0.63**
Preparatory tasks	2.81 $\pm$ 0.87	2.87 $\pm$ 0.78	0.51**
Supportive tasks (tot),	2.68 $\pm$ 0.83	2.77 $\pm$ 0.79	0.71**
Supportive tasks operational work	2.80 $\pm$ 0.92	2.83 $\pm$ 0.88	0.64**
Supportive tasks organization	2.53 $\pm$ 1.01	2.71 $\pm$ 1.00	0.79**

as most satisfying. The nurses' most central (operational) tasks which pose the greatest demands seem to drive nurse satisfaction. This is not so surprising since it is the operational tasks which appear to define nursing for the general and nursing populations. Doing these tasks – probably at the expense of other tasks perceived to be less central – is associated with satisfaction. Organizing tasks are perceived as least demanding, especially external functional contacts (e.g. contact with other wards in the hospital). Supportive tasks (e.g. reporting, registering and administrative work) are seen as least satisfying.

The correlations between the demands score and the satisfaction score for each of the categories of tasks vary between 0.41 (operational tasks) and 0.71 (supportive tasks). So, for each individual category of tasks it was found that the more demanding the respective category is perceived, the more satisfying the performance of tasks belonging to this category is for ICU nurses. Only for the subcategory "internal functional contacts" (contacts with the head nurse, physicians, colleagues, or secretarial staff) was a low correlation (0.05) between the demands score and the satisfaction score found. This subcategory of tasks is evaluated as fairly undemanding but at the same time fairly satisfying. In Appendix C, the mean demands score and the mean satisfaction score for each individual task are presented.

Next, the main results are summarized for each of the four categories of tasks.

#### Operational Tasks

The tasks "psychologically supporting patients" and "activating patients" are perceived as most demanding. However, "providing for the safety and comfort of a patient" is also perceived as most satisfying. The task "assisting colleagues" is seen as least demanding, whereas "lifting/weighing patients" is perceived as least satisfying.

#### Organizing Tasks

The tasks "hand-over meetings" and "contact with physicians" are seen as most demanding. The task "contact with another ICU in the hospital" is perceived as least demanding, but also as least satisfying. Moreover, "contact with the hospital management" is also perceived as not very satisfying. Finally, "contact with colleagues from own team" is perceived as most satisfying.

#### Preparatory Tasks

The tasks "admission of new patients" and "transport of patients to and from the ICU" are perceived as most demanding. However, "admission of new patients" is also perceived as most satisfying. The task "making time tables" (planning) is seen as least demanding and least satisfying.

#### Supportive Tasks

The task "supporting a patient's direct relatives after death of a patient" is perceived as most demanding, while "recruitment and selection of new colleagues" is perceived as least demanding. However, the latter is also perceived as least satisfying. The tasks "training when implementing new equipment" and "improving one's expertise by following courses" are perceived as most satisfying.

In general, it can be concluded that the above results are in line with common sense ideas of taxing and rewarding aspects of ICU nurses' jobs. In general, psychological aspects of patient care (such as emotionally supporting patients or supporting the family after the death of a patient) as well as tasks related to communication with other disciplines are perceived as demanding. In addition, communication with the hospital management and/or with other ICUs in the hospital is perceived as fairly dissatisfying. These results can probably be attributed to the fact that most training programs for ICU nurses are more strongly oriented towards technical nursing skills than towards psychological or communicative ones. Despite the (emotional) demands associated with it, nurses do enjoy psychosocial care of patients, which is clearly not the case for administrative tasks (e.g. making time tables). Contact with colleagues from their own team is perceived as very satisfying, probably because they are an important source of work-related social support. Finally, ICU nurses' are eager to maintain their expertise, as training and following courses are perceived as fairly satisfying.

#### Task Mix

Next, nurses were asked to estimate the percentage of time they spend on performing each particular category of tasks. The results are presented in Table 62. From this table, we can conclude that ICU nurses perform activities from all of the four categories of tasks. Of course, they spend most of their working time on operational tasks (56%). The lowest percentage of time is found for preparatory tasks (10%). The figures presented in Table 62 correspond quite well to the results of an earlier time sampling study among Dutch ICU nurses [8], in which it was found that nurses spend about 55% of their working time on operational tasks and about 25% on a combination of preparatory and supportive tasks. So, the fact

**Table 62.** Mean percentage of time spent on performing each of the categories of tasks ( $n = 1954$ )

Category of tasks	Percentage of time (0%–100%; Mean $\pm$ SD)
Operational tasks	56 $\pm$ 19
Organizing tasks	23 $\pm$ 9
Internal functional tasks	10 $\pm$ 7
External functional tasks	5 $\pm$ 5
Meetings	8 $\pm$ 6
Preparatory tasks	10 $\pm$ 8
Supportive tasks	12 $\pm$ 9

that the nurses' own reports on their usage of time yield results that are quite identical to those obtained by objective assessments lends support to the validity of these self-reports.

#### Problem Situations and Autonomy

In the third and last part of the WEBIC questionnaire, the frequency of occurrence of ICU-specific problem situations was inventoried, as was the level of autonomy to solve these problem situations. For each of the different categories of problem situations, the mean frequency and the mean level of autonomy are presented (Table 63).

Overall, the frequency of problem situations is quite low: the highest frequency is found for problem situations related to norms (e.g. unclear instructions). However, nurses' level of autonomy in solving problems related to norms is quite high too, which also applies to the levels of autonomy related to the other categories of problem situations. The lowest level of autonomy is found for problem

**Table 63.** Mean frequency scores and mean autonomy scores for each of the categories of problem situations ( $n = 1954$ )

Situation category	Frequency: 1–5 (Mean $\pm$ SD)	Autonomy: 1–5 (Mean $\pm$ SD)	Correlation: Frequency $\times$ autonomy
Norms	2.03 (0.60)	3.26 (0.50)	-0.19**
Patients	1.61 (0.75)	3.01 (0.75)	-0.05
Materials	1.68 (0.66)	2.98 (0.57)	-0.17**
Personal condition	1.81 (0.58)	3.34 (0.48)	-0.23**
Information	1.75 (0.86)	2.63 (0.62)	-0.18**
Planning	1.50 (0.76)	2.56 (0.70)	-0.25**

situations related to planning, which is probably due to the relatively low predictability of work flow in ICUs. In general, it can be concluded that in this sample the stressfulness of ICU nurses' jobs is rather low, as the frequency of ICU-specific problem situations is low and the level of autonomy to solve these problems is quite high.

The correlation between the frequency score and the autonomy score for each of the categories of problem situations varies between  $-0.05$  (patients) and  $-0.25$  (planning). These negative correlations can easily be explained by the fact that for each of these categories the frequency of occurrence of problem situations is low, whereas the level of autonomy in solving these problems is rather high. Only for the subcategory "patients", dealing with the variation and complexity of nursing, was a nonsignificant correlation ( $-0.05$ ) between the frequency score and the autonomy score found. In Appendix D, the mean frequency score and the mean autonomy score for each individual problem situation are presented.

Next, the main results are summarized for each of the six problem situations.

#### Norms

The most frequent problem situations related to norms are "having to do too many things simultaneously" and "unexpected job activities interrupting the work schedule. However, mean levels of autonomy in solving these problems are high (3.16–3.43).

#### Patients

Problem situations related to patients are infrequent (1.59 and 1.64), and mean levels of autonomy in solving them are moderate (2.86 and 3.10 respectively).

#### Materials and Equipment

Problem situations related to materials are also infrequent (1.50–1.81), and again mean levels of autonomy in solving them are moderate (2.68–3.14).

#### Condition

The most frequent problem situation related to nurses' personal condition is "the idea that you are responsible for the life of your patients". Mean levels of autonomy in solving these problem situations are high (3.04–3.74).

#### Information

Problem situations related to information are infrequent (1.46–2.04), and mean levels of autonomy in solving them are moderate (2.32–2.84).

#### Planning

Again, problem situations related to planning are infrequent (1.10–2.00); however, mean levels of autonomy in solving them are relatively low (2.43–2.64).

In Tables 64 and 65, ICU nurses' opinion on feedback and their working environment is presented. Most of the complaints with respect to feedback about

Table 64. Feedback ( $n = 1954$ )

	... you do not get (%)	... you get too late (%)	... is not complete (%)	... is unreliable (%)
Feedback you would like to get from your direct superior ...	28	10	29	5
Feedback you would like to get from your colleagues ...	18	9	32	8
Feedback you would like to get from the physicians ...	39	8	23	5

Table 65. Work environment ( $n = 1954$ ).

	Climate (%)	Lighting (%)	Interior design (%)	Lack of space (%)	Noise and bustle (%)
Ward	47	35	31	66	42
Location for taking a break	30	18	35	46	25

one's performance deal with completeness. Especially feedback from the direct superior (28%) and from colleagues (32%) is considered incomplete. Moreover, 28% of the nurses indicates that they do not get the feedback they would like to have from their direct superior, whereas 39% indicate that they do not get the feedback they would like to have from physicians.

Overall, nurses report quite a lot of problem factors with respect to their work site. The major complaints with respect to the work site relate to lack of space in the ward (66%) and in the location for taking a break (46%). Other major complaints with respect to the ward deal with climate (47%) and with noise and bustle (42%).

#### Identification of Risk Factors

To identify risk factors for ICU performance we compared the 25% best performing with the 25% worst performing ICUs. As objective performance indicators, the ICU's logits of mortality at two levels of severity of illness (measured by SAPS-II) were used (see "Psychometric Properties of the Work and Well-Being Scales"). The best and worst performing ICUs were compared (by means of  $t$  tests and ANOVAs) in four aspects:

1. Demands (the mean demands score for each of the categories of tasks)
2. Satisfaction (the mean satisfaction score for each of the categories of tasks)
3. Problem situations (the mean frequency of occurrence of each of the categories of problem situations)
4. Autonomy (the mean level of autonomy in solving each category of problem-situations)

Table 66. Comparison of the 25% best performing vs the 25% worst performing ICUs

	B20 Worst	B20 Best	B80 Worst	B80 Best
Risk factor				
Demands				Operational tasks Organizing tasks
Satisfaction		Operational tasks	Operational tasks Organizing tasks	
Frequent occurring problem situations	Norms Materials Information Planning	Personal condition	Materials Information Planning	
Lack of autonomy in problem situations	Materials Information		Norms Personal condition	

All of these analyses were performed twice: first for the 25% worst performing vs the 25% best performing ICUs on B20 and then for the 25% worst performing vs the 25% best performing ICUs on B80. The results are summarized in Table 66.

#### The 25% Worst Performing vs 25% Best Performing ICUs (B20)

First of all, we did not find any significant differences between the two groups with respect to their mean demands scores for each of the categories of tasks. Quite surprisingly, operational tasks are perceived as more satisfying ( $t = 2.59$ ;  $p = 0.010$ ) by nurses in the worst performing units compared to nurses in the best performing units. With the exception of problem situations related to patients, the worst performing units significantly differ from the best performing units in all categories of problem situations. In the worst performing units, the frequency of occurrence of problem situations related to norms ( $t = 3.47$ ;  $p = 0.001$ ), materials ( $t = 2.48$ ;  $p = 0.044$ ), information ( $t = 1.98$ ;  $p = 0.048$ ) and planning ( $t = 2.73$ ;  $p = 0.007$ ) is significantly higher than in the best performing units. However, in the worst performing units, the frequency of occurrence of problem situations related to nurses' personal condition is significantly lower ( $t = -4.54$ ;  $p = 0.000$ ) than in the best performing units. Finally, in the worst performing ICUs, a significantly lower level of autonomy is found in solving situations related to materials ( $t = -2.39$ ;  $p = 0.017$ ) and problems related to information ( $t = -2.34$ ;  $p = 0.020$ ) than in the best performing units.

#### The 25% Best Performing vs 25% Worst Performing ICUs (B80)

First of all, we found significant differences between the two groups with respect to their mean demands scores for two of the categories of tasks. Operational tasks ( $t = -4.48$ ;  $p = 0.000$ ) and organizing tasks ( $t = -4.91$ ;  $p = 0.000$ ) are perceived as more demanding by nurses in the best performing units compared to nurses in the worst performing units. However, nurses in the best performing units also perceive operational tasks ( $t = -3.24$ ;  $p = 0.001$ ) and organizing tasks ( $t = -3.69$ ;  $p = 0.000$ ) as more satisfying compared to nurses in the worst performing units.

A higher frequency of problem situations related to materials ( $t=7.58$ ;  $p=0.000$ ), information ( $t=3.51$ ;  $p=0.000$ ) and planning ( $t=5.70$ ;  $p=0.000$ ) is found in the group of worst performing ICUs than in the group of best performing ICUs. In the worst performing ICUs, a significantly lower level of autonomy in solving situations related to norms ( $t=-2.61$ ;  $p=0.009$ ) and personal condition ( $t=-2.65$ ;  $p=0.008$ ) is found compared to the best performing units.

In general, the above results indicate that the number of risk factors is higher in the worst performing units than in the best performing ones (B20 and B80). Whereas some categories of tasks are perceived as more demanding in the best performing units compared to the worst performing units (B80), they are also perceived as more satisfying. Apparently, having to work very hard is rewarding for ICU nurses, a result that was also found in an earlier study among Dutch ICU nurses (De Rijk et al., submitted). When looking at the results with respect to problem situations, it can be concluded that in the worst performing units (B20 and B80) problems with respect to resources (materials, information and planning) occur more frequently. Moreover, both for B20 and B80 it was found that a lack of autonomy in solving problem situations is associated with a poorer objective performance.

## Results: Work and Well-Being Questionnaire

### Identification of High-Risk Groups

To identify high-risk groups with respect to workload and its negative consequences (burnout, dissatisfaction, poor morale), we performed  $t$  tests and ANOVAs for the following subgroups, based on:

- Gender (men vs women)
- Type of contract (part-time vs full-time)
- Age (quartiles): <27 years, 27-31 years, 31-37 years, >37 years
- Work experience (quartiles): <2.33 years, 2.33-5 years, 5-9.33 years, >9.33 years

The analyses were performed for all variables in the research model that reflect the perception of workload, its consequences (stress reactions) and individual resources to cope with (the consequences of) a high workload (efficacy and conscientiousness). Note that situational coping resources are not considered here, since they are not relevant for identifying high risk groups.

### Workload

**Perceived Quantitative Job Demands.** Perceived quantitative job demands are higher for women than for men ( $t=-3.3$ ;  $p=0.001$ ) and for full-time workers than for part-time workers ( $t=-8.8$ ;  $p=0.000$ ). Perceived quantitative job demands are highest in the age category <27 years and are lowest in the age category 31-37 years ( $F=7.3$ ;  $p=0.000$ ).

**Imbalance Patients/Imbalance Team.** Full-time workers experience their relationships with patients as more imbalanced than do part-time workers ( $t=-2.7$ ;  $p=0.007$ ). The same applies to the relationships with colleagues ( $t=-2.2$ ;  $p=0.025$ ).

### Stress Reactions

**Burnout: Emotional Exhaustion.** Emotional exhaustion is more prominent among women than among men ( $t=-2.2$ ;  $p=0.028$ ) and among full-time workers than among part-time workers ( $t=-4.7$ ;  $p=0.000$ ). Feelings of emotional exhaustion are highest in the age category 31-37 years and are lowest in the age category >37 years ( $F=2.6$ ;  $p=0.05$ ). Feelings of emotional exhaustion are highest in the category <2.33 years of ICU experience and are lowest in the category >9.33 years of ICU experience ( $F=4.5$ ;  $p=0.004$ ).

**Burnout: Depersonalization.** Depersonalization is more prominent among men than among women ( $t=3.9$ ;  $p=0.000$ ) and among full-time workers than among part-time workers ( $t=-3.7$ ;  $p=0.000$ ). Feelings of depersonalization are highest in the age category 31-37 years and are lowest in the age category >37 years ( $F=6.0$ ;  $p=0.000$ ). Feelings of depersonalization are highest in the category 5-9.33 years of ICU experience and are lowest in the category >9.33 years of ICU experience ( $F=7.0$ ;  $p=0.000$ ).

**Burnout: Reduced Personal Accomplishment.** Feelings of personal accomplishment are higher among full-time workers than among part-time workers ( $t=-4.0$ ;  $p=0.000$ ). Feelings of accomplishment are highest in the category <2.33 years of ICU experience and are lowest in the category 5-9.33 years of ICU experience ( $F=4.8$ ;  $p=0.003$ ).

**Job dissatisfaction.** Dissatisfaction is lower among women than among men ( $t=-2.1$ ;  $p=0.032$ ). Job dissatisfaction is lowest in the category <2.33 years of ICU experience and is highest in the category 5-9.33 years of ICU experience ( $F=5.0$ ;  $p=0.002$ ).

**Perceived Unit Performance.** Nurses' opinions on the performance of their unit are more positive for part-time workers than for full-time workers ( $t=-2.1$ ;  $p=0.037$ ). The highest evaluation of ICU performance is made in the category >9.33 years of ICU experience and the lowest evaluation is made in the category <2.33 years of ICU experience ( $F=3.2$ ;  $p=0.021$ ).

### Personal Coping Resources

**Efficacy.** Feelings of efficacy are higher among men than among women ( $t=5.0$ ;  $p=0.000$ ). Feelings of efficacy are lowest in the age category <27 years and are highest in the age category >37 years ( $F=17.6$ ;  $p=0.000$ ). Feelings of efficacy are lowest in the category <2.33 years of ICU experience, whereas they are highest in the category >9.33 years of ICU experience ( $F=14.4$ ;  $p=0.000$ ).

Conscientiousness. Feelings of conscientiousness are higher among women than among men ( $t = -2.5$ ;  $p = 0.012$ ). Feelings of conscientiousness are lowest in the age category  $< 27$  years, and are highest in the age category  $> 37$  years ( $F = 6.8$ ;  $p = 0.000$ ). Feelings of conscientiousness are lowest in the category  $< 2.33$  years of ICU experience, whereas they are highest in the category  $> 9.33$  years of ICU experience ( $F = 5.1$ ;  $p = 0.002$ ).

#### Involvement/Commitment

Job Involvement. The level of job involvement is higher among women than among men ( $t = -3.0$ ;  $p = 0.003$ ) and among full-time workers than among part-time workers ( $t = -8.1$ ;  $p = 0.000$ ). The level of job involvement is lowest in the age category 31–37 years and is highest in the category  $< 27$  years ( $F = 9.3$ ;  $p = 0.000$ ). The level of job involvement is lowest in the category 5–9.33 years of ICU experience, whereas it is highest in the category  $< 2.33$  years of ICU experience ( $F = 6.5$ ;  $p = 0.0002$ ).

Organizational Commitment. The level of commitment to the ICU is lowest in the category  $< 2.33$  years of ICU experience and highest in the category  $> 9.33$  years of ICU experience ( $F = 5.1$ ;  $p = 0.002$ ).

Inspection of the research literature on the relationship between these socio-demographic characteristics and each of the variables in our research model yields quite inconsistent results. Therefore, it is difficult to compare the results of this study to earlier findings. In the following, some possible explanations for the above findings will be offered. With respect to gender differences, it can be concluded that women are more at risk regarding some aspects (perceived demands, emotional exhaustion and low efficacy), whereas men are more at risk regarding others (depersonalization, dissatisfaction, low conscientiousness and low involvement). As far as burnout is concerned, it is generally found that women experience more emotional exhaustion, whereas men are more likely to depersonalize patients or clients [44]. These gender differences can be interpreted in terms of masculine and feminine sex roles, i.e. women are expected to be more nurturing, sociable and sensitive to other people's feelings, whereas men are considered to be "tougher" and less emotional. In addition, it is quite likely that gender differences in self-efficacy also boil down to differences in the upbringing of men and women, i.e. men are expected to be more self-confident and self-reliant.

With respect to differences between full- and part-time workers it can be concluded that overall part-timers are less at risk than full-timers (imbalance, emotional exhaustion, depersonalization, reduced personal accomplishment and poor perceived unit performance). This finding can probably be explained by the fact that part-timers have a reduced exposure to stress-inducing factors at work. When looking at differences between the four age categories, two groups seem to be especially at risk, those  $< 27$  years (perceived quantitative job demands, low efficacy and low conscientiousness) and 31–37 years (emotional exhaustion, depersonalization and low job involvement). Nonetheless, nurses who are  $< 27$  years show the highest level of job involvement. It is quite remarkable that for the youngest age category problems are mainly related to (coping with) de-

mands, whereas for the second age category burnout plays a more prominent role. Probably, nurses who start to work in an ICU feel overwhelmed by demands, whereas the second category feels worn out from the prolonged exposure to these same demands. Finally, nurses who are  $> 37$  years show the lowest levels of emotional exhaustion and depersonalization. This probably reflects a selection effect ("survival of the fittest" or the so-called healthy worker effect), i.e. only nurses who have developed adequate coping strategies will survive and stay healthy in a highly demanding working environment. This is also reflected by the fact that these nurses show the highest levels of efficacy and conscientiousness.

The results with respect to the four different categories of work experience are quite identical to those for the different age categories. This is not surprising, since age and work experience are highly correlated ( $r = 0.63$ ). Again two groups are at risk, those with  $< 2.33$  years of ICU experience (emotional exhaustion, perceived unit performance, efficacy, conscientiousness and commitment) and those with 5–9.33 years of ICU experience (depersonalization, personal accomplishment, satisfaction and involvement). Nurses with  $> 9$  years of ICU experience show the lowest levels of emotional exhaustion and depersonalization and the highest levels of efficacy and conscientiousness. Moreover, they have the highest score on measures of morale, such as perceived unit performance and commitment. Finally, nurses with  $< 2$  years of ICU experience again show the highest levels of job involvement.

## Results: The Basic and Extended Research Models

### Multilevel Analyses

Before testing the basic and the extended research model, multilevel analyses were performed for each of the variables in the research model. In multi-level analysis the total amount of variance in each variable is partitioned into the amount of variance that can be accounted for on the individual, the ICU, and the area levels. The results of these analyses are presented in Table 67.

For all variables there is a significant amount of variance to be explained on each of the three levels. As we are dealing with individual perceptions on work and well-being, percentages of variance are of course highest at the individual level. At the ICU level, especially high percentages of variance are found for perceived quantitative job demands, perceived unit effectiveness, task-oriented as well as social-emotional leadership and commitment to the ICU. This is to be expected, as all of these variables are more or less unit-related. At the area level, percentages of variance are high for perceived quantitative job demands, emotional exhaustion, self-efficacy and job involvement. Obviously, cross-national or cultural differences play a role here. Since the amount of variance that is explained at ICU level is statistically significant – albeit small – it makes sense to aggregate data on the ICU level. The rationale behind aggregating data on unit level is that scores on a particular variable reflect a common unit characteristic, at least to

**Table 67.** Partitioning of variance for the variables in the research model – multilevel analyses ( $n = 2090$ )

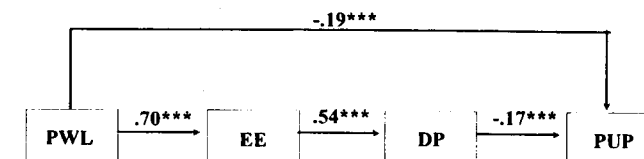
Variable	Variance individual level (%)	Variance ICU level (%)	Variance area level (%)
Perceived job demand	66	14	20
Investment patients	88	3	9
Outcomes patients	85	8	7
Investment team	92	2	6
Outcomes team	92	5	3
Emotional exhaustion	78	9	13
Depersonalization	94	4	2
Personal accomplishment	91	3	6
Perceived unit effectiveness	74	17	9
Self-efficacy	87	2	11
Autonomy	90	2	8
Task-oriented leadership	73	18	9
Social-emotional leadership	65	34	1
Job involvement	85	5	10
Organizational commitment	85	12	2

some extent. The results of the multilevel analysis support this rationale and hence provide a justification for testing the research model at unit level as well.

In analyzing the data pertaining to our research models, a stepwise approach was used. First, the basic research model (Fig. 5) was tested. In the second step, coping resources and involvement were added to the model (Fig. 6).

#### The Basic Research Model

The basic research model was tested using a so-called linear structural modeling technique with the EQS computer program [16]. This technique enables one to test how well a hypothesized model fits current empirical data. The basic model was tested on two levels, namely on the individual, or subjective, level (relating burnout to workload and unit performance as perceived by the ICU nurses themselves) and on the ICU, or objective, level (relating burnout to the objective indicators of workload and ICU performance). Because of the conceptual overlap between the burnout dimension personal accomplishment and the effect variable performance, it was decided to exclude this burnout dimension from the basic model. This overlap was demonstrated empirically by the fact that personal accomplishment loaded on the same component, termed morale, as perceived unit performance, whereas both other burnout dimensions constitute a separate component or factor (see Table 58). An additional reason is that recently the validity of personal accomplishment as an indicator of burnout has been questioned somewhat by some authors (e.g. [47, 33, 36]). These authors state that job stres-

**Fig. 8.** Workload, burnout and performance (individual level) ( $n = 2090$ )

sors (such as job demands) lead to emotional exhaustion, which in turn brings about depersonalization, suggesting that care providers attempt to gain emotional distance from recipients as a way of coping with their feelings of exhaustion. Reduced personal accomplishment, however, seems not directly related to both other burnout dimensions, but instead develops in parallel with emotional exhaustion and depersonalization.

#### Model Test at the Individual Level

The results of the model test at the individual level are presented in Fig. 8. The model is made up of four latent variables that are measured by two (emotional exhaustion, depersonalization, perceived unit performance) or three (perceived workload) manifest variables. For emotional exhaustion, depersonalization and perceived unit performance, the items of the respective scale were randomly assigned to one of the manifest variables. The three subjective indicators of workload (i.e. perceived quantitative job demands, imbalance patients and imbalance team) are significantly intercorrelated (see Table 56), therefore they are represented in the model by one latent variable (perceived workload).

The EQS program indicated that our model fit quite well to the empirical data ( $CFI = 0.95$ ). Fit indices such as the comparative fit index (CFI) should exceed 0.90 [16] in order to indicate a proper model fit. The numbers that are printed in Fig. 8 are so-called standardized path coefficients. The higher the value of these coefficients, the stronger the association that is indicated by the respective arrow. Path coefficients range from  $-1.0$  to  $+1.0$ . The results with respect to our model test can be summarized as follows: The higher the perceived workload, the poorer the performance of the ICU is evaluated by the nurses. Second, a higher perceived workload is also strongly, positively associated with emotional exhaustion: the higher the workload, the higher the level of exhaustion. As expected, high levels of exhaustion lead to depersonalization. These in turn lead to a more negative evaluation of unit performance. Thus, the subjective experience of high workload is both directly and indirectly related to poor perceived unit performance.

#### Model Test at the Unit (ICU) Level

On this level, the model was tested twice: once for B20 (Fig. 9) and once for B80 (Fig. 10). As indicated before, data with respect to burnout (emotional exhaustion and depersonalization) were aggregated at unit level, i.e. for each ICU a mean unit score on each of these variables was calculated.

The EQS program again indicated that the model fit quite well to the data ( $CFI_{B20} = 0.97$  and  $CFI_{B80} = 0.97$ ). Though all relationships in the model are again

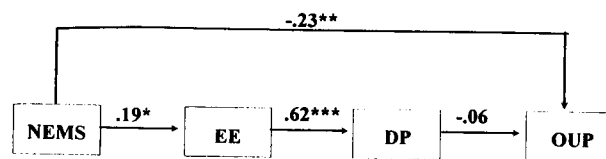


Fig. 9. Workload, burnout and performance (less severe patients; B20) at unit level ( $n = 80$ )

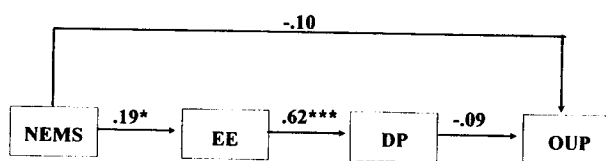


Fig. 10. Workload, burnout and performance (more severe patients; B80) at unit level ( $n = 80$ ). NEMS, Nine Equivalents Manpower Use Score; EE, emotional exhaustion; DP, depersonalization; OUP, objective unit performance (B80 reversed)

in the expected direction, not all of them reach significance. This lack of significance is most probably due to the small sample size (i.e. 80 units), which reduces the statistical power of the significance test. First, objective workload turned out to be significantly, negatively related to objective performance for B20, but not for B80. Thus, for the less severe patients a higher objective workload is related to a poorer objective unit performance. Second, the higher the objective workload, the higher the mean level of emotional exhaustion in an ICU. Higher mean levels of emotional exhaustion are associated with higher mean levels of depersonalization. Finally, higher mean levels of depersonalization are negatively, but not significantly, related to objective unit performance (B20 and B80). Accordingly, contrary to expectations, the relationship between objective workload and objective unit performance is not mediated by burnout. However, a higher objective workload is indeed significantly, positively related to emotional exhaustion.

### The Extended Research Model

Due to the nature of the variables that were added to the basic model (i.e. coping resources and involvement), the extended model can only be tested on the individual level. To test the possible moderating effects of: (a) coping resources on the workload-burnout relationship and (b) involvement on the burnout-performance relationship, hierarchical multiple regression analyses were performed (Tables 68, 69). As we found significant differences between specific subgroups in our sample with respect to workload, stress reactions, perceived unit performance and coping resources (see "Identification of High-Risk Groups"), we controlled for gender, type of assignment, area and years of ICU experience in the first step of these analyses. It should be noted that testing the effects of the different moderators in separate analyses increases the risk of chance capitalization.

Table 68. Hierarchical multiple regression analyses of job demands and: (a) job autonomy; (b) task-oriented leadership; (c) social-emotional leadership; (d) self-efficacy, and (e) conscientiousness on burnout, after controlling for gender, type of assignment, area and years of ICU experience ( $n = 2090$ )

Burnout dimension	EE					DP					PA				
	JA	SE	TL	SL	CO	JA	SE	TL	SL	CO	JA	SE	TL	SL	CO
Job demands	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
Moderator	—	—	ns	—	—	—	—	ns	—	—	+	+	+	+	+
Demands* moderator	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	+
R <sup>2</sup> (including control variances)	0.24	0.23	0.23	0.25	0.24	0.05	0.05	0.05	0.07	0.09	0.15	0.16	0.10	0.10	0.16

+ significant positive relationship ( $p \leq 0.5$ ); — significant negative relationship ( $p \leq 0.5$ ); ns, nonsignificant relationship; EE, emotional exhaustion; DP, depersonalization; PA, personal accomplishment; JA, job autonomy; SE, self-efficacy; TL, task-oriented leadership; SL, social-emotional leadership; CO, conscientiousness.

Table 69. Hierarchical multiple regression analyses of two burnout dimensions (emotional exhaustion and depersonalization) and: (a) job involvement; (b) organizational commitment on perceived unit performance, after controlling for gender, type of assignment, area and years of ICU experience ( $n = 2090$ )

Burnout dimension	EE		DP	
	INV	COM	INV	COM
Burnout dimension	—	—	—	—
Moderator	+	+	+	+
Demands moderator	ns	ns	ns	ns
R <sup>2</sup> (including control variances)	0.20	0.33	0.20	0.33

Unfortunately, very little support was found for the hypothesized moderating role of coping resources and involvement. Only in one case was a significant effect of coping resources on the relationship between job demands and burnout found, i.e. the relationship between job demands and personal accomplishment is moderated by nurses' level of conscientiousness (i.e. their level of accuracy, efficiency and skillfulness). The interaction effect of quantitative job demands and conscientiousness on personal accomplishment is graphically represented in Fig. 11.

From the figure it can be concluded that, overall, nurses scoring high in conscientiousness have stronger feelings of personal accomplishment than nurses scoring low in conscientiousness. Whereas for nurses low in conscientiousness there is no significant relationship between job demands and feelings of personal accomplishment, this relationship is positive for nurses high in conscientious-

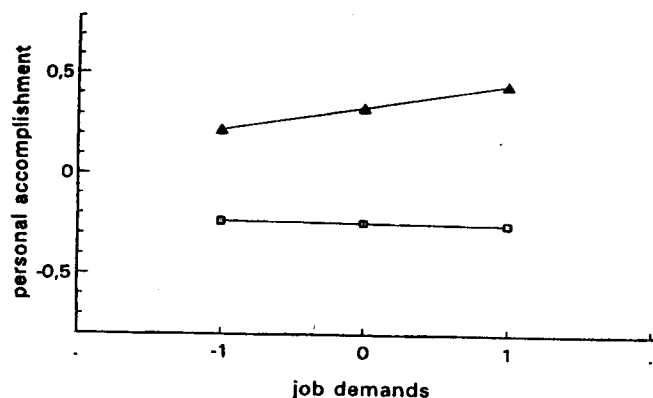


Fig. 11. The interaction effect of quantitative job demands and conscientiousness on personal accomplishment. Conscientiousness: open squares, high ( $-1$  SD); closed triangles, low ( $+1$  SD)

ness, i.e. higher demands are associated with stronger feelings of accomplishment. This positive relationship can probably be explained by the fact that, due to their high level of conscientiousness, these nurses are able to function properly even in situations with high demands, which in turn will boost their feelings of accomplishment. In addition, no significant influence of either job involvement or organizational commitment on the relationship between burnout and performance was found. However, it should be noted that some significant direct effects of coping resources as well as involvement were found (see Tables 68, 69). First, with the exception of the nonsignificant relationship between task-oriented leadership, and emotional exhaustion and depersonalization, each of the five coping resources is negatively related to emotional exhaustion and depersonalization and positively related to personal accomplishment. Thus, the more coping resources ICU nurses have at their disposal, the less burnout symptoms they report. Second, both job involvement and organizational commitment are significantly, positively related to perceived unit performance: the higher the level of psychological identification with the job and/or with the ICU, the better the performance of the ICU is evaluated by nurses.

## Conclusions

To summarize, the aim of the EURICUS-I *Personnel* substudy was twofold:

1. To perform a detailed job analysis of ICU nurses and to identify risk factors for their well-being at work as well as to identify high-risk groups
2. To test a model of the relationship between ICU nurses' workload, their stress reactions (burnout and dissatisfaction) and the performance of their ICU

For this purpose, two questionnaires were distributed among the nursing staff of the 89 ICUs participating in the EURICUS-I project, i.e. the WEBIC questionnaire

and the Work and Well-Being questionnaire. Response rates were 67% and 72%, respectively.

The job analysis revealed that, in general, having to work hard is rewarding for ICU nurses, as they consistently evaluate more demanding tasks as also being more satisfying. This applies in particular to operational tasks (nursing and medical care of patients). It was pointed out that the most central (i.e. operational) tasks are also the most satisfying ones since these define nursing. Thus, although the operational tasks are considered the most demanding, they are at the same time the most rewarding since they lay at the core of what nursing is all about. Alternatively, this finding may represent a selection effect, i.e. the decision to work in an ICU already implies a preference for demanding working situations. Looking more closely at the demands- and satisfaction scores within each of the different categories of tasks makes clear that special attention has to be paid to psychosocial aspects of patient care (including contact with relatives) and to (interdisciplinary and external) communication, as these tasks are perceived as either quite demanding or fairly dissatisfying.

With respect to ICU nurses' task mix, it was found that nurses perform activities from all of the four categories of tasks. They spend the most time on operational tasks (50%), and the least time on preparatory tasks (10%). The validity of nurses' self-reports about their usage of time was supported by the fact that similar results were obtained in a Dutch study that used an objective method (time-sampling) to assess nurses' activities.

Results with respect to ICU-specific problem situations showed that, at least in this sample, the stressfulness of ICU nurses' jobs is low, as illustrated by the low frequency of ICU-specific problem situations and the high level of autonomy to solve these problems. The most frequently occurring problems have to do with norms, and more specifically with ICU nurses' workload. This might be somewhat surprising given the generally held belief that ICU nursing is quite stressful (see [37]). However, despite these claims, that nursing in ICUs is particularly stressful and might thus cause stress reactions such as burnout or dissatisfaction, comparisons with other hospitals wards are inconclusive. Harris [24] reviewed 23 studies that compared ICUs and non-ICUs on several stress-related outcomes (e.g. job dissatisfaction, burnout, turnover, alienation, and diminished organizational commitment) that were measured with self-reports. Fifteen studies found no differences between ICUs and non-ICUs, three studies reported fewer stress reactions in ICUs, and only five studies indicated higher stress-related outcomes in ICUs. Perhaps, the fact that nurses in ICUs have a relatively high level of autonomy might explain why they do not experience their jobs as being particularly stressful.

To identify risk factors for ICU nurses' performance, the 25% worst performing units and the 25% best performing units were compared based on objective performance assessment using the SAPS-II score. Results indicated that the number of risk factors is indeed higher in the worst performing units than in the best performing ones. Especially, problems with respect to (a lack of) resources (materials, information etc.) occur more frequently in the worst performing units. Moreover, it is found that a lack of autonomy in solving problem situations is



associated with a poorer objective performance. Thus, particular risk factors are more prominent in poor performing than in well performing ICUs.

To identify high-risk groups, specific subgroups were compared. Comparison by gender made clear that women were found to be more at risk on some work-related aspects, whereas men were more at risk on others. Overall, part-timer workers were less at risk than full-time workers, which is probably due to their lower exposure to stress-inducing factors at work. The results with respect to different age categories and length of work experience were quite identical and showed that two groups were especially at risk with respect to workload and burnout symptoms: the youngest/least experienced group (< 27 years/< 2.33 years of ICU experience) and the middle group (31–37 years/5–9.33 years of ICU experience). Whereas the first group probably has to develop a repertoire in order to cope adequately with the stresses of intensive care nursing, the coping resources of the second group are likely to be depleted by the prolonged exposure to demanding working situations. Psychologically, two mechanisms might be at work here: the young and inexperienced group is going through a period of work socialization, whereas the older and more experienced group is going through a process of wearing out or erosion of their coping repertoire. Probably, the latter is also related to the more stressful off-job situation of the somewhat older group. It is reasonable to assume that many of the ICU nurses in the older age group between 31 and 37 have small children they have to care for, which adds to the demands they face on the job.

The second part of the analysis dealt with the testing of both the basic and the extended research model. The basic research model was supported at the individual level, but not at the unit level: burnout mediates the relationship between perceived workload and perceived unit performance, but this is not the case for the relationship between objective workload and objective unit performance. Whereas ICU nurses' objective workload turns out to be significantly, positively related to burnout, burnout is not significantly related to objective unit performance. Moreover, almost no support was found for the extended research model, i.e. for the moderating role of coping resources and involvement on the relationship between workload and burnout, and burnout and performance. Instead, situational and personal coping resources have a direct effect on levels of burnout; that is, self-efficacy, conscientiousness, autonomy, and social-emotional leadership are associated with low levels of burnout (emotional exhaustion, depersonalization, and reduced personal accomplishment). In addition, direct effects of involvement and commitment are observed on nurses' perceived unit performance; the more involved and committed, the higher their performance.

Finally, some limitations of this study deserve attention. First, though the way of presenting the results may suggest causality, the cross-sectional design of this study does not permit causal inferences on the relationships between the variables in the research models. Second, in the previous analyses no distinction was made between different types of ICUs (small vs large; university vs nonuniversity, etc.) or between different areas. It cannot be excluded that results may look different for various subsamples. However, for reasons of economy, in this section

a more general picture was drawn that can be used as a starting point as well as a background for more detailed analysis in particular subgroups.

The major strength of the present *Personnel* substudy is the combination of subjective questionnaire data and objective workload and performance data. As in most other studies subjective and objective indicators are relatively weakly intercorrelated. As Frese and Zapf [19] state in discussing this methodological issue: "...the use of objective judgements of work stressors leads to an underestimate of the 'true' correlation." Despite the fact that the model that assumed that burnout plays an intermediate role between objective workload and objective unit performance was not confirmed, a positive association was found at unit level between a high objective workload and burnout (i.e. emotional exhaustion). This important result is corroborated by a similar finding in a study among 20 Dutch ICUs. Schaufeli et al. [43] showed that objectively assessed workload, as measured by the percentage of patients who were mechanically ventilated, was significantly and positively related to nurses' burnout at unit level.

## Appendix A. Definition of variables in the extended research model

### Workload

Nurses' workload is assessed both subjectively (by means of self-reports) and objectively (by scoring nursing activities performed during the previous 24 h). This yields the following two measures of workload:

1. Perceived quantitative job demands (subjective workload): nurses' perception of their workload in terms of the quantity of work they have to perform
2. Qualitative job demands (objective workload): measured with NEMS (Nine Equivalents of Nursing Manpower Use Score), a validated, simplified version of TISS (Therapeutic Intervention Scoring System)

### Burnout

Burnout was selected as an indicator of ICU nurses' level of chronic stress. It can be considered a long-term stress reaction, reflecting a "wearing out" from prolonged exposure to the stresses of contact-intensive occupations, such as nursing. Burnout is assessed by means of self-reports and is characterized by three symptoms:

1. Emotional exhaustion: feeling "emotionally drained" from your work
2. Depersonalization: a callous and cynical attitude towards patients
3. Reduced personal accomplishment: feeling "incompetent" in your job

### Performance

Performance is assessed both subjectively (by means of self-reports) and objectively (by means of clinical outcome data).

1. Perceived unit performance: nurses' judgement on the performance of their ICU
2. Objective unit performance: the ratio of observed vs predicted mortality at the ICU (i.e. the Standardized Mortality Ratio) at P20 of SAPS-II and P80 of SAPS-II

### Coping Resources

1. Situational coping resources:
  - Autonomy: nurses' freedom of action in performing their work
  - Leadership: nurses' judgement on the head nurse's leadership behavior, measured with two different scales: (1) Social emotional leadership, i.e. the degree to which the head nurse is friendly and pays attention to her/his subordinates; (2) task-oriented leadership, i.e. the degree to which tasks are specified and monitored in detail by the head nurse
2. Individual coping resources
  - Self-efficacy: nurses' judgement on their personal abilities to attain goals and to overcome potential problems
  - Conscientiousness: nurses' judgement on their own level of conscientiousness

### Job Involvement

1. Job involvement: the degree to which work plays a central part in nurses' life
2. Organizational commitment: nurses' level of identification with and involvement in the ICU

**Appendix B. Correlations between variables in the extended research model**

DEM	IOP	IOt	EE	DP	RPA	Dsat	Pup	Aut	SEL	TOL	Sef	Con	Inv	Com
DEM	1.0000	0.1706**	0.1170**	0.4000**	0.1020**	-0.0928**	0.1937**	-0.0516*	0.1839**	-0.1382**	-0.0320	0.0373	0.1551**	-0.0876**
IOP	0.1706**	1.0000	0.2434**	0.1647**	0.0967**	0.0518*	0.1218**	-0.1449**	-0.0119	-0.0707**	0.0281	0.0329	-0.0257	-0.0917**
IOt	0.1170**	0.2434**	1.0000	0.1423**	0.0034	0.0287	0.1356**	-0.1454**	-0.0087	-0.1033**	-0.0113	0.0199	0.0339	-0.4112**
EE	0.4000**	0.1647**	0.1423**	1.0000	0.4345**	0.1325**	0.4733**	-0.1782**	-0.0142	-0.1961**	0.0247	-0.1264**	-0.1081**	-0.3131**
DP	0.1020**	0.0967**	0.0034	0.4345**	1.0000	0.2387*	0.2851**	-0.1662**	-0.0765**	-0.1292**	-0.0418	-0.0666**	-0.0970**	-0.1813**
RPA	-0.0928**	0.0518*	0.0287	0.1325**	0.2387**	1.0000	0.3389**	-0.2110**	-0.2836**	-0.1375**	-0.0759**	-0.2803**	-0.2670**	-0.2419**
Dsat	0.1937**	0.1218**	0.1356**	0.4733**	0.2851**	0.3389**	1.0000	-0.3411**	-0.2174**	-0.3053**	-0.0823**	-0.1519**	-0.2644**	-0.4368**
Pup	-0.0146	-0.1449**	-0.1454**	-0.1782**	-0.1662**	-0.2110**	0.3411**	1.0000	0.2110**	0.2094**	0.2070**	0.4120**	0.1195**	0.4721**
Aut	0.1839**	-0.0119	-0.0087	-0.0142	-0.0765**	-0.2836**	-0.2174**	0.2110**	1.0000	0.1019**	-0.0530*	0.1742**	0.1365**	0.2834**
SEL	-0.1382**	-0.0707**	-0.1033**	-0.1961**	-0.1292**	-0.1375**	-0.2094**	0.2094**	0.1019**	1.0000	0.1178**	0.0662**	0.1580**	0.3105**
TOL	0.1110**	-0.0633**	-0.0113	0.0247	-0.0418	-0.0759**	-0.0823**	-0.0530*	0.1178**	1.0000	-0.0329	0.0423	0.2012**	0.1561**
Sef	-0.0320	0.0281	0.0199	-0.1264**	-0.0666**	-0.2803**	-0.1840**	0.1420**	0.1178**	-0.0329	1.0000	0.4143**	0.0919**	0.1411**
Con	0.0373	0.0329	0.0431	-0.1081**	-0.1802**	-0.2830**	-0.1519**	0.1195**	0.1365**	0.0662**	0.0423	1.0000	0.1069**	0.1153**
Inv	0.1551**	-0.0257	0.0339	-0.0377	-0.0970**	-0.2670**	-0.2644**	0.1940**	0.1828**	0.2012**	0.0919**	0.1069**	1.0000	0.3277**
Com	-0.0876**	-0.0917**	-0.1442**	-0.3131**	-0.1813**	-0.2419**	-0.4368**	0.4721**	0.2834**	0.1561**	0.1411**	0.1153**	0.3277**	1.0000

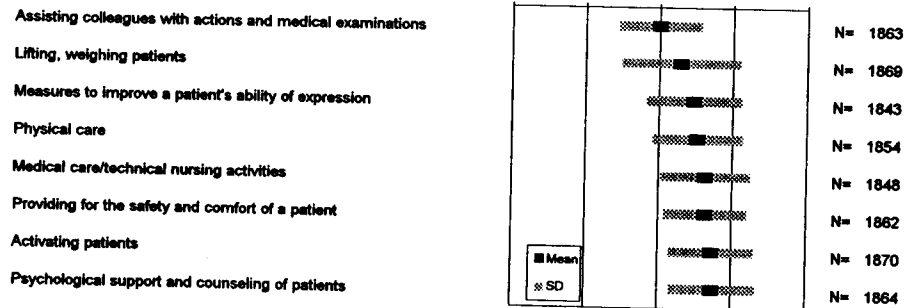
\*Significant  $\leq 0.05$ ; \*\*Significant  $\leq 0.01$  (2-tailed).

#### Legend

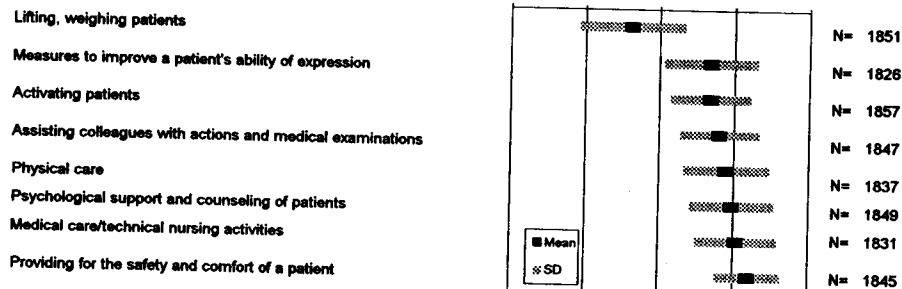
DEM: quantitative job demands; IOP: imbalance patients; IOt: imbalance team; EE: emotional exhaustion; DP: depersonalization; RPA: reduced personal accomplishment; Dsat: job satisfaction; Pup: perceived unit performance; Aut: autonomy; SEL: social emotional leadership; TOL: task oriented leadership; Sef: generalized self-efficacy; Con: conscientiousness; Inv: job involvement; Com: organizational commitment

## Appendix C. Mean demands score and mean satisfaction score for each of the WEBIC tasks

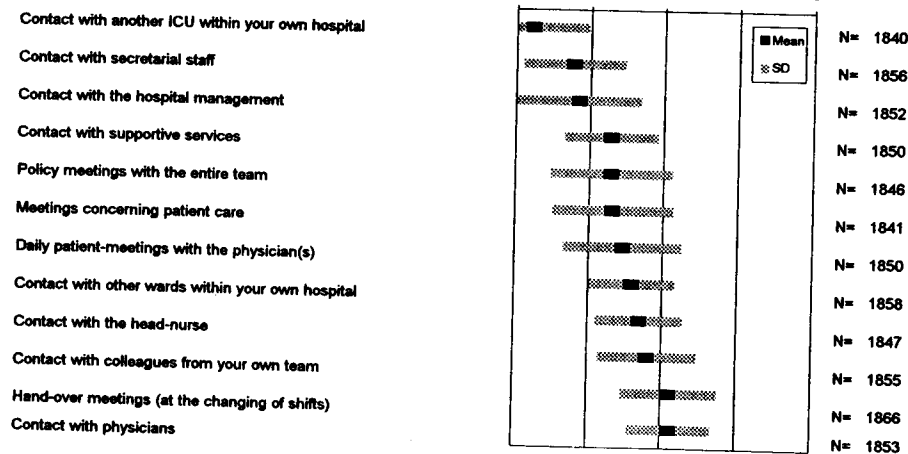
### Operational tasks: demands



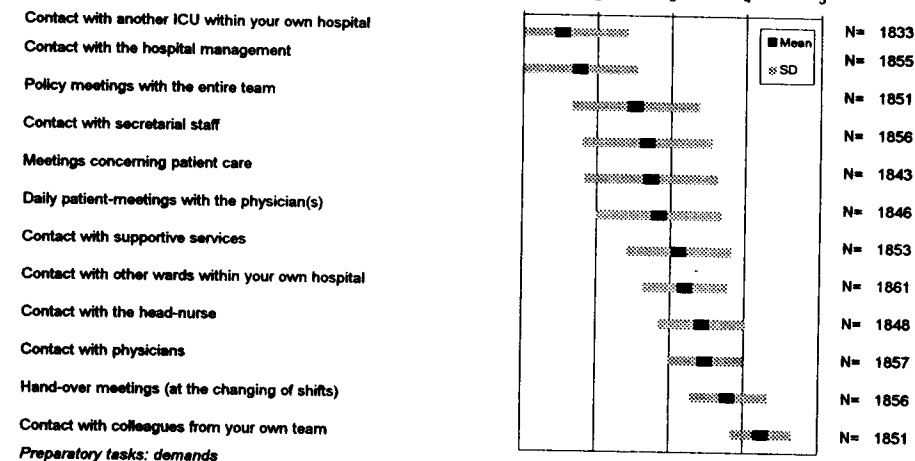
### Operational tasks: satisfaction



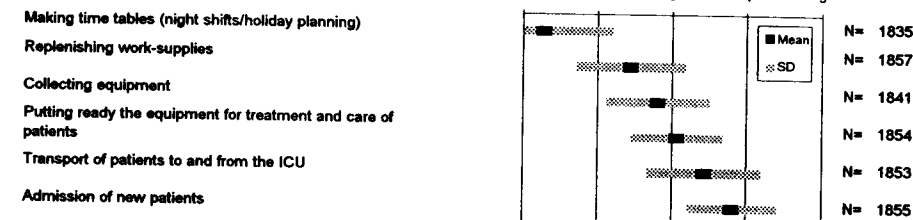
### Organising tasks: demands



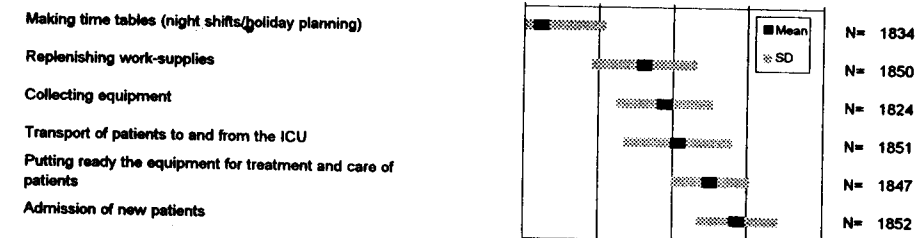
### Organising tasks: satisfaction

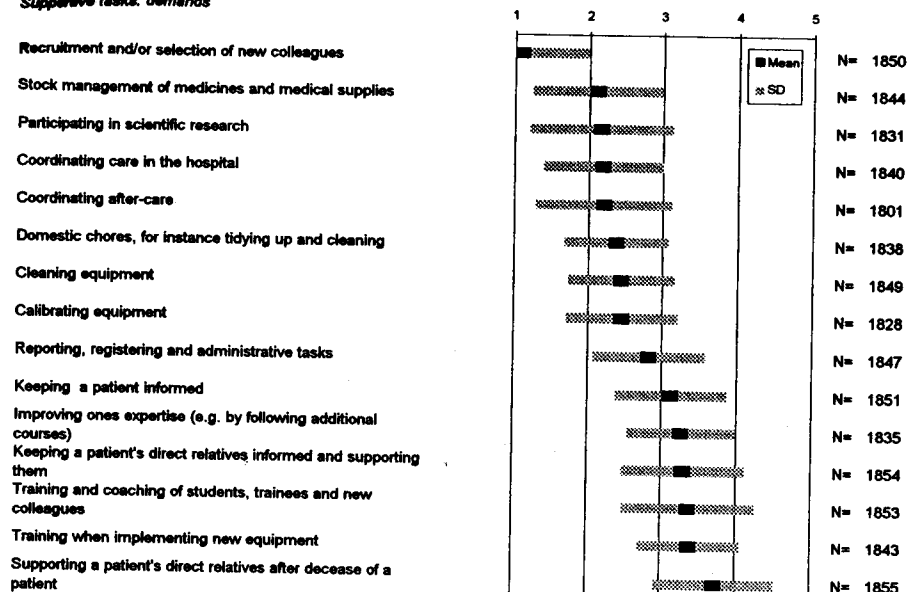
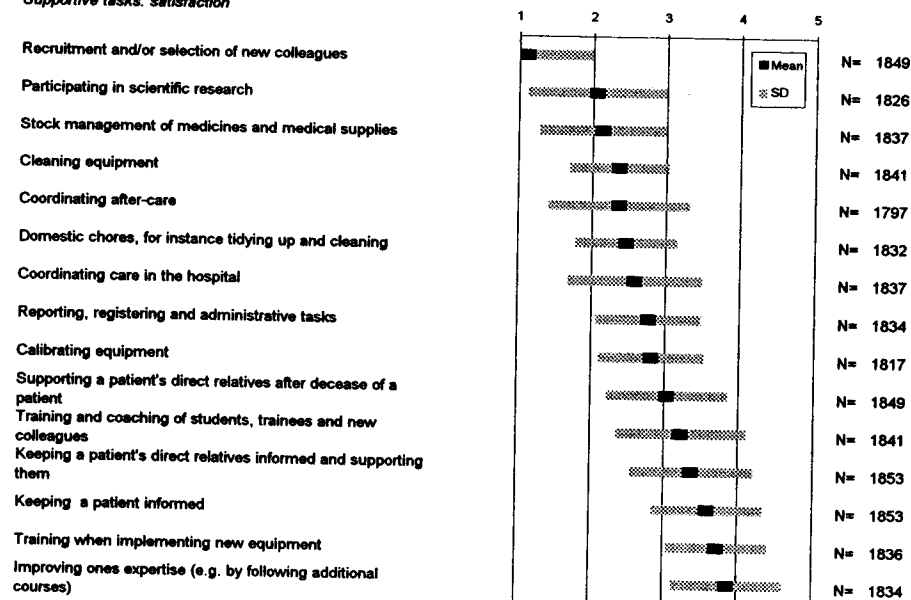


### Preparatory tasks: demands



### Preparatory tasks: satisfaction

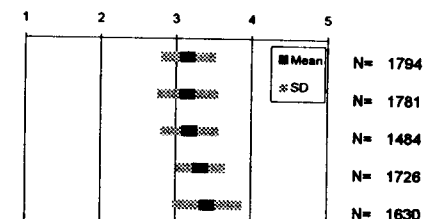


*Supportive tasks: demands**Supportive tasks: satisfaction***Appendix D. Mean frequency score and mean autonomy score for each of the WEBIC problem situation***Norms: frequency*

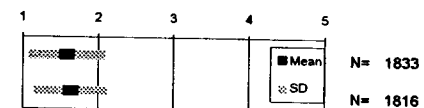
Instructions of the head-nurse are unclear  
 Instructions of the physicians are unclear  
 Paper work disturbing your work-schedule  
 Unexpected job activities interrupting your work-schedule  
 Having to do too many things simultaneously

*Norms: autonomy*

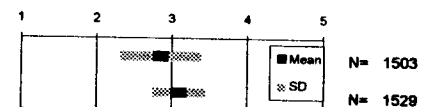
Having to do too many things simultaneously  
 Unexpected job activities interrupting your work-schedule  
 Instructions of the head-nurse are unclear  
 Instructions of the physicians are unclear  
 Paper work disturbing your work-schedule

*Patients: frequency*

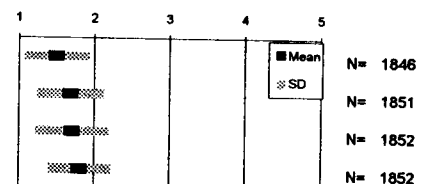
Too little variation in the nursing of patients  
 The nursing of patients is too complex

*Patients: autonomy*

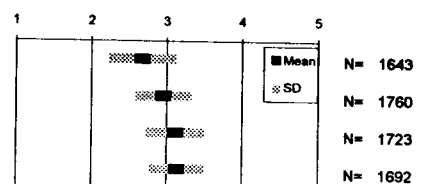
The nursing of patients is too complex  
 Too little variation in the nursing of patients

*Materials: frequency*

Insufficient quality of materials  
 Materials/equipment are not available at the ICU  
 Materials or equipment are not at the place agreed upon  
 Equipment which does not function properly or has broken down

*Materials: autonomy*

Insufficient quality of materials  
 Equipment which does not function properly or has broken down  
 Materials/equipment are not available at the ICU  
 Materials or equipment are not at the place agreed upon



## Condition: frequency

Concentration problems in your work

Lack of motivation in your work

Self-doubt about your abilities and expertise

Situations which are physically too demanding

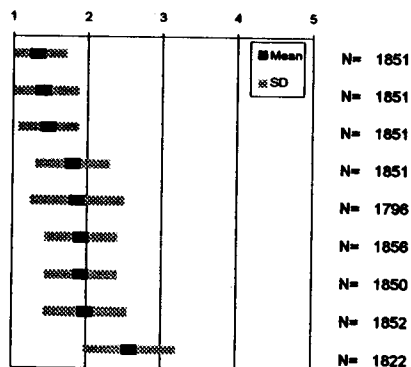
The idea that you cannot make any mistakes

Being overtired by your work

Getting emotionally touched by 'heavy' problems and disease of patients

Activities which are physically too demanding

The idea that you are responsible for the life of your patients



## Condition: autonomy

Activities which are physically too demanding

Situations which are physically too demanding

The idea that you are responsible for the life of your patients

Getting emotionally touched by 'heavy' problems and disease of patients

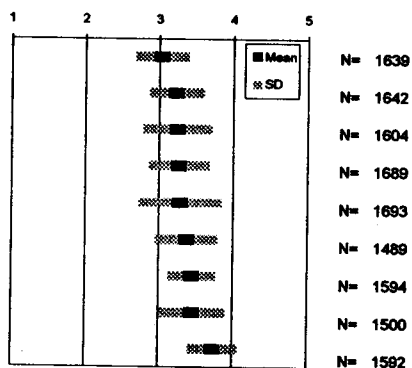
Being overtired by your work

The idea that you cannot make any mistakes

Self-doubt about your abilities and expertise

Lack of motivation in your work

Concentration problems in your work



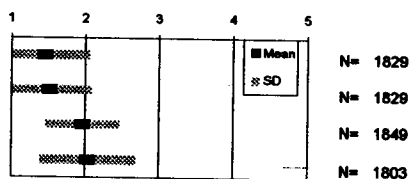
## Information: frequency

Information about your profession and about additional schooling possibilities is not present at your ICU

Information about your profession and about additional schooling possibilities reaches you too late

Information about new equipment is inadequate

The supply of information about your hospital policy with respect to your ICU is insufficient



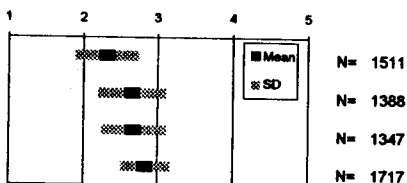
## Information: autonomy

The supply of information about your hospital policy with respect to your ICU is insufficient

Information about your profession and about additional schooling possibilities reaches you too late

Information about your profession and about additional schooling possibilities is not present at your ICU

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## Planning: frequency

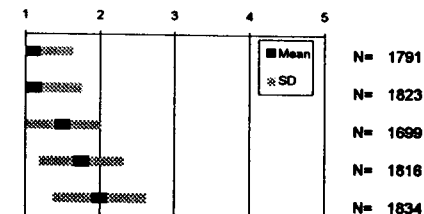
Appointments and/or agendas for meetings within the ICU are made known too late

Working overtime without being compensated for it

(Para-)medical disciplines do not keep their appointments

Inadequate planning of personnel

Working without taking breaks and not being compensated for it



## Planning: autonomy

Inadequate planning of personnel

Working without taking breaks and not being compensated for it

Working overtime without being compensated for it

(Para-)medical disciplines do not keep their appointments

Appointments and/or agendas for meetings within the ICU are made known too late

