

Well-being of intensive care nurses (WEBIC): a job analytic approach

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Well-being of intensive care nurses (WEBIC): a job analytic approach

Aims of the study. This paper presents the results of a validation study of the so-called well-being of intensive care nurses (WEBIC)-questionnaire that is designed to perform a detailed job analysis of intensive care unit (ICU) nurses' jobs.

Background. The WEBIC-questionnaire is based on modern sociotechnical systems theory, and distinguishes four integrated task categories: (1) operational, (2) organizing, (3) preparatory, and (4) supportive tasks. For each task, the WEBIC assesses (1) how demanding this task is, and (2) how satisfying the performance of this task is. Using the WEBIC, information is gathered about ICU nurses' qualitative workload, and typical job-related risks for ICU nurses' well-being at work can be mapped.

Methods. A cross-sectional survey on work and well-being of almost 2000 ICU-nurses in 13 different European areas was conducted. Exploratory factor analyses were performed to study the validity of the factorial structure of the WEBIC-questionnaire. The construct validity of the WEBIC-questionnaire was studied by performing hierarchical multiple regression analyses of the WEBIC-factors on two types of job-related well-being, i.e. burnout and general job satisfaction.

Results. Results of the exploratory factor analyses showed that the hypothesized four-factor structure of the WEBIC is confirmed by our data. Internal consistencies of the different factors varied from 0.77 to 0.91. Intensive care unit nurses' most central (operational) tasks turned out to pose the greatest demands, but also seemed to drive their satisfaction. With respect to the relationships between the four WEBIC-factors, and burnout and general job satisfaction, it was found that, especially for the satisfying tasks, significant relationships with these outcomes were found.

Conclusion. The reliability and construct validity of the WEBIC-questionnaire can be considered satisfactory. Furthermore, the questionnaire provides a systematical

and detailed coverage of ICU nurses' tasks. In relation to this, the questionnaire is not only useful for scientific purposes but also for practical use.

Keywords: well-being of intensive care nurses-questionnaire, job analysis, workload, burnout, job satisfaction, intensive care unit nurses

Introduction

Today, the balance of evidence indicates that intensive care units (ICUs) are a stressful work environment for nurses (Hay & Oken 1977, Cross & Fallon 1985, Kelly & Cross 1985, Dewe 1987, 1993, White & Tonkin 1991, Boumans & Landeweerd 1994, Goodfellow *et al.* 1997). In recent years, ICUs have been exposed to increased workloads because of rapidly expanding medical technology, increasing job complexity and ethical dilemmas associated with it. In addition, cost containment and re-structuring programmes restrict the resources staff has available. Finally, ICUs are confronted with new types of diseases, not only those of old age, but also new viral and infectious diseases (e.g. acquired immunodeficiency syndrome [AIDS]).

Until now, researchers have investigated stressors in ICU work by means of an array of stress audits based on self-reports including all kinds of stressors (Bailey *et al.* 1980, Boumans & Landeweerd 1994, Fornes-Vives *et al.* 1994). Interestingly, however, there has been little research concerned with the stressful aspects of ICUs based on a systematic, theoretically based, job analysis. This is the main focus of the present article. A systematic approach was used to perform a detailed job analysis of ICU nurses' jobs. For this purpose, the so-called WEBIC-questionnaire was developed. WEBIC is an acronym standing for well-being of IC-nurses. With the help of the WEBIC-questionnaire, typical job-related risks within ICUs can be mapped. Further, specific tasks experienced as 'very demanding' or 'very satisfying' can be identified as well. Finally, to evaluate content validity, these demanding and satisfying tasks can be related to several stress-reactions like occupational burnout and health complaints.

This paper has the following structure. Firstly, we will describe the background and construction of the WEBIC-questionnaire. Secondly, the results of a validation study among almost 2000 ICU-nurses from 13 different European areas will be presented. The aim of this study was twofold: (1) to explore the validity of the factorial structure of the WEBIC-questionnaire; and (2) to study the construct validity of the WEBIC-questionnaire by looking at its relationships with job-related well-being.

Well-being of intensive care nurses: background and construction

To study jobs and their relationship with employees' behaviour and attitudes effectively, we first need to conceptualize and classify particular job characteristics. In other words, we need a classification system; that is, a tool that increases our ability to interpret and predict (Fleishman 1975, Fleishman & Quaintance 1984). A powerful classification system, which is in line with the philosophy of the WEBIC, is the Task Characteristics Approach, abbreviated to TCA (Hackman & Oldham 1980). Contrary to other classification systems (e.g. the Behaviour Description Approach or the Ability Requirements Approach), the TCA is not based on the task performer, but on the task itself (de Jonge 1995). The basic assumption of the TCA is that tasks can be classified in terms of intrinsic and precise, so-called 'objective' properties of the job. A task is therefore reflected by a set of stimulus situations or antecedent conditions that elicit performance (Farina & Wheaton 1973). These conditions are imposed on the employee and exist independently from (1) the activities they may trigger; (2) the functions they may call into play; and (3) the abilities they may require. The corresponding train of thought is that job characteristics represent a potent class of predictor variables in their own right (Fleishman & Quaintance 1984, Algera 1991). Furthermore, if job characteristics are considered important determinants of workers' behaviour and attitudes, it seems necessary to classify job characteristics in quite different terms than the outcome variables (Hackman 1969). Consequently, appropriate descriptive terms are those that focus on objective as well as specific properties of the task *per se*. Otherwise, we might be faced with a big conceptual overlap between these kinds of variables and particular outcomes, such as stress-reactions, motivation and attitudes, which renders their empirical association rather trivial (Kasl 1996, Koslowski 1998). In addition, researchers have been interested in the objective work situation for practical reasons, because they want stress research to contribute to job (re)design (Frese & Zapf 1988, 1999, Theorell & Karasek 1996). In sum, it is theoretically, methodologically and practically wise to describe job characteristics in terms of intrinsic properties

of the task itself. From this perspective, the TCA offers a promising perspective because of the advantage of describing the job characteristics in terms other than the outcome variables to be predicted (Hackman 1969, Algera 1991).

However, there are a number of theoretical and practical points which have to be taken into account when one intends to develop a well-being instrument like the WEBIC based on the TCA (de Jonge 1995), for example, the (theoretical) selection of the components to be described, the relevant operationalizations of these components, and finally the type of relationships between these components and workers' attitudes and behaviour. These issues will be discussed below in more detail using sociotechnical systems theory as a conceptual framework.

Sociotechnical systems theory

The WEBIC-questionnaire is based on task categories that were identified by a sociotechnical systems approach. Modern sociotechnical systems theory studies work processes from a functional point of view (Agurén & Edgren 1982, de Sitter 1982, Pot *et al.* 1989). According to this theory, organizations or work units within organizations might be considered as open systems, with an input ('inflow of stimulation'), a throughput ('transformation'), and an output ('export of products'). Transformation processes usually consist of energy processing, matter processing or information processing (In het Veld 1998). In order to transform input into output, employees have to perform various kinds of tasks. Generally, such tasks have different functions within these transformation processes, like operational, organizing, preparatory, and supportive functions. Such a distinction can also be made for a set of interdependent tasks; that is, complete jobs. Based on sociotechnical systems theory, the WEBIC was created around four integrated tasks categories which encompass the work content and work processes of ICU nurses' jobs:

- operational tasks (the 'core' tasks of nursing and medical care of patients);
- organizing tasks (job-related cooperation and meetings, like contact with physicians);
- preparatory tasks (tasks which should be performed before the operational work can start, e.g. replenishing medical supplies);
- supportive tasks (activities that should make sure that the operational tasks can be performed without interruptions, error or disturbance, e.g. making reports).

Naturally, the first category, operational tasks, makes up the core of ICU nurses' jobs, with the three other categories contributing to the optimal flow of this core activity.

The next phase in developing the WEBIC was creating a list of particular activities (or tasks) within these four categories. Based on participant observation, study of the ICU nurses' task descriptions, and discussion with a panel of nurses (see also Reis Miranda *et al.* 1996), a list of 40 items, or tasks, was finally presented.

Next, two scoring dimensions were chosen: for each of the tasks ICU nurses have to indicate (1) how demanding this task is and (2) how satisfying the performance of such a task is. This distinction has been made on theoretical grounds. Generally, work has two fundamental characteristics: it can be a source of burden as well as a source of pleasure. This is, for instance, reflected in Karasek's (1979) Demand-Control model, which distinguishes between (1) workers' (ill) health (demanding aspects), as well as (2) workers' work motivation, job satisfaction, and learning behaviour (satisfying aspects). In work stress research, the demands of work have been over-emphasized. In recent years, the positive significance of work has been (re)discovered as a means to prevent and overcome the negative effects of work, such as burnout (Maslach & Goldberg 1998). This is in line with the so-called *positive psychology*, which emphasizes the value of positive subjective experiences in improving quality of life and preventing pathology (Seligman & Csikszentmihalyi 2000). Thus, the WEBIC tries to provide specific and systematic information about ICU nurses' experienced workload in terms of demanding and satisfying aspects.

The study

Aims

In this paper, the results of a cross-sectional study on work and well-being of almost 2000 ICU-nurses in 13 different European areas are presented and discussed. More specifically, this study was designed to answer the following questions:

- Can the theoretically based four-factor structure of the WEBIC be confirmed empirically, both for the demanding aspects (tasks) and the satisfying aspects (tasks)? This question addresses the factorial validity of the WEBIC-questionnaire.
- Can the construct validity of the WEBIC-questionnaire be established? In other words, are the different WEBIC-factors significantly and meaningfully related to relevant indicators of job-related well-being?

With respect to the first question, we expect to find the proposed four-factor structure because of the fact that the construction of the WEBIC-questionnaire is based on a theoretical framework that postulates four different types of

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job components (i.e. operational tasks, organizing tasks, preparatory tasks, and supportive tasks). The second question will be addressed by relating each of the WEBIC-factors to ICU-nurses' level of burnout and (general) job satisfaction. Based on theoretical and empirical insights, we expect the demanding aspects of the WEBIC to be positively related to burnout and negatively related to (general) job satisfaction, and the satisfying aspects of the WEBIC to be negatively related to burnout and positively related to (general) job satisfaction (cf. Spector 1997, Schaufeli & Enzmann 1998).

Method

Sample

Two questionnaires were distributed among the nursing staff of 89 different ICUs that participated in the EURICUS-I project: the WEBIC-questionnaire, and the work and well-being questionnaire. One thousand nine hundred and fifty-four nurses (response rate 67%) completed the WEBIC-questionnaire, whereas the work and well-being questionnaire was completed by 2090 nurses (response rate 72%). In Table 1, the distribution of the larger group of 2090 respondents over 13 different European areas is presented.

The sample consisted of 1618 women (77%) and 399 men (19%), while for 4% of the respondents information on their gender was missing. Age ranged from 20 to 58 years ($M = 32.5$; $SD = 7.1$). On average, these nurses had 6.5 years of working experience in an ICU ($SD = 5.6$), and 4.6% of them were nurse trainees, 87.2% were registered nurses and 4.6% were head nurses (for 8.2%, information on their current position was missing).

Table 1 Distribution of respondents ($n = 2090$)

| | Number of respondents | % |
|-----------------|-----------------------|-------|
| European area | | |
| Poland | 127 | 6.1 |
| Germany | 125 | 6.0 |
| Denmark | 163 | 7.8 |
| Finland | 163 | 7.8 |
| The 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 |

Overall, I'm satisfied with my job
Mark one of the faces below



Figure 1 Faces measure.

Instruments

In addition to performing a detailed job analysis with the WEBIC-questionnaire, data on ICU nurses' work and well-being were gathered by means of the work and well-being questionnaire. This questionnaire is composed of several scales, which have all been used and validated in earlier studies (Schaufeli & Le Blanc 1998). Three of these scales were used in the present study and are therefore described in more detail.

Burnout can be considered 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 (Schaufeli & Enzmann 1998). *Emotional exhaustion* and *depersonalization*, the two core dimensions of the burnout syndrome, were assessed with the respective subscales of the Maslach Burnout Inventory (MBI) (Maslach *et al.* 1996). Emotional exhaustion refers to the draining of emotional resources, whereas depersonalization implies a callous and cynical attitude towards patients. The emotional exhaustion scale consists of eight items ($\alpha = 0.86$), and the depersonalization scale of five items ($\alpha = 0.61$). Scores on the items range from 1 ('never') to 7 ('every day'). Previous studies with the MBI have shown that the factorial structure is invariant across samples from different nations (Enzmann *et al.* 1995).

Job satisfaction was measured with a one-item rating that is scored on a five-point faces measure (Kunin 1955) (see Figure 1). According to Wanous *et al.* (1997), an average reliability of 0.57 was assumed for such a single-item measure. This measure is also strongly correlated with a multi-item questionnaire that assesses nurses' general job satisfaction (Dunham & Herman 1975).

Results

Preliminary analysis

To establish the factorial validity of the WEBIC-questionnaire, separate factor analyses were performed on (1) the demanding aspects, and (2) the satisfying aspects.

Prior to the factor analyses, univariate normality of the 40 WEBIC-items was considered with the approximate range from -1.00 to 1.00 for both skewness and kurtosis as a criterion (Muthén & Kaplan 1985, Byrne 1991). Univariate

skewness ranged from -1.33 to 0.08, and univariate kurtosis ranged from -1.04 to 1.75. Only three items were somewhat out of range, but their scores were not too skewed to disturb the factor analyses to be performed. Given univariate skewness and kurtosis values within the range mentioned above, most items were considered to approximate a normal distribution.

In addition, multicategory items like Likert scales can spuriously influence factor analytic results (Bernstein & Teng 1989). For example, extreme differential categorization may produce false evidence for multidimensionality. Items were therefore checked for extreme item response distributions (i.e. more than 70% of the respondents score in the lowest or upper response category). In general, the results showed that less than 45% of the respondents scored in one of the extreme response scale categories. Given these approximately normal item distributions, no problems were expected with regard to performing factor analyses. Now, we will have a closer look at the exploratory factor and reliability analyses for each of the two scoring categories; that is, the demanding and satisfying aspects of nurses' tasks.

Exploratory analysis: demanding aspects

An initial unrotated principal component analysis (PCA) on the 40 demanding aspects revealed seven factors, accounting for 52.8% of the variance (based on the 'eigenvalue greater than one'-criterion). However, a closer look at the scree plot suggested a four-factor solution. Therefore, a re-run of PCA was performed specifying four factors and using oblimin rotation with Kaiser normalization, followed by item deletion whenever necessary (i.e. in case of low factor loadings or not discriminating between factors). Three items were dropped, resulting in a clear four-factor oblique structure accounting for 46.3% of the variance. The four factors could be labelled according to the four integrated tasks categories that were mentioned before: operational tasks (nine items), organizing tasks (nine items), preparatory tasks (seven items), and supportive tasks (12 items). Each factor had good levels of internal consistency (cf. Cortina 1993). Cronbach's α 's were 0.87, 0.85, 0.89 and 0.91, respectively.

Exploratory analysis: satisfying aspects

An initial unrotated PCA on the 40 satisfying aspects showed the presence of eight factors, accounting for 49.8% of the variance (based on the 'eigenvalue greater than one' criterion). Again, a look at the scree plot suggested a four-factor solution. Therefore, we performed a second PCA, and specified four factors using oblimin rotation with Kaiser

normalization, followed by item deletion whenever necessary. In this case, the same three items were dropped as in the previous analysis, resulting in a clear four-factor oblique structure, which accounted for 36.6% of the variance. These four factors were identical to the factorial structure of the demanding aspects, and had the same number of (similar) items per factor. These factors also had acceptable to good levels of internal consistency (Cronbach's α 's were 0.77, 0.78, 0.85 and 0.85).

Demands and satisfaction

After determining the factorial structure of the WEBIC-questionnaire, for each of the categories of tasks the mean demands score and the mean satisfaction score were computed (i.e. summing items). The resulting figures are presented in Table 2 for each of the groups of nurses.

From Table 2, it can be concluded that operational tasks (medical care/technical nursing activities, psychological support of patients, physical care) were perceived as most demanding, but also as most satisfying. Organizing tasks (contacts with the head nurse, with physicians, and with colleagues from your own team) were perceived as least demanding, whereas preparatory tasks (replenishing work supplies, collecting equipment) were perceived as least satisfying. When we look at the results of the three different

Table 2 Mean demands score and mean satisfaction score for each of the categories of tasks ($n = 1954$)

| Category of tasks | Demanding (1-5) | | Satisfying (1-5) | |
|--------------------------|-----------------|------|------------------|------|
| | Mean | SD | Mean | SD |
| Total group | | | | |
| Operational tasks | 3.64 | 0.73 | 4.02 | 0.54 |
| Organizing tasks | 2.80 | 0.74 | 3.54 | 0.61 |
| Preparatory tasks | 2.94 | 0.90 | 3.14 | 0.73 |
| Supportive tasks | 3.60 | 0.75 | 3.78 | 0.60 |
| Nurse trainees | | | | |
| Operational tasks | 3.66 | 0.56 | 3.93 | 0.55 |
| Organizing tasks | 2.89 | 0.77 | 3.59 | 0.61 |
| Preparatory tasks | 2.96 | 1.02 | 3.06 | 0.71 |
| Supportive tasks | 3.46 | 0.71 | 3.68 | 0.60 |
| Registered nurses | | | | |
| Operational tasks | 3.65 | 0.73 | 4.02 | 0.54 |
| Organizing tasks | 2.79 | 0.74 | 3.53 | 0.60 |
| Preparatory tasks | 2.90 | 0.88 | 3.11 | 0.72 |
| Supportive tasks | 3.60 | 0.74 | 3.75 | 0.60 |
| Head nurses | | | | |
| Operational tasks | 3.40 | 0.88 | 4.14 | 0.53 |
| Organizing tasks | 2.99 | 0.87 | 3.79 | 0.60 |
| Preparatory tasks | 3.07 | 1.02 | 3.38 | 0.78 |
| Supportive tasks | 3.80 | 0.75 | 4.05 | 0.60 |

neces- subgroups in our sample (nurse trainees, registered nurses
 · in the and head nurses) in an explorative way, we see the same
 · blique pattern of results for nurse trainees and registered nurses.
 These However, instead of operational tasks, head nurses perceived
 of the supportive tasks (training and coaching, coordinating care) as
 mular) most demanding.

Relations with burnout and job satisfaction

In order to establish the construct validity of the WEBIC-
 questionnaire, the relationship of the four WEBIC task
 categories with two relevant indicators of job-related well-
 being, that is, burnout and general job satisfaction, were
 studied. Table 3 reports Pearson's correlation coefficients
 between the demands and satisfaction scores of each of the
 four categories of tasks, and emotional exhaustion, deper-
 sonalization, and general job satisfaction.

In general, burnout and job satisfaction turned out to be
 more strongly related to the different satisfaction scores than
 to the different demands scores. Moreover, almost all corre-
 lations are in the expected direction. That is, demands scores
 correlate positively with burnout and negatively with (general)
 job satisfaction, whereas satisfaction scores correlate nega-
 tively with burnout (with the exception of the non-significant
 correlation between 'preparatory tasks' and emotional
 exhaustion), and positively with (general) job satisfaction.

In order to gain a more comprehensive picture of the
 relationship between the four different task categories (either
 demanding or satisfying) and nurses' well-being, two hierar-
 chical multiple regression analyses were performed for each
 of the three dependent variables. The independent variables
 were entered into the equation in two successive steps. In the
 first step, age, gender, number of years of ICU working
 experience, position (nurse trainee, registered nurse, or head

nurse) and (geographical) area (dummy coded) were entered
 to control for possible confounding effects (method: enter). In
 the second step, the four different demands scores or the four
 different satisfaction scores were entered (method: stepwise).
 Table 4 shows the results of the regression analyses of the
 four demands scores on each of the three dependent variables.

Only for emotional exhaustion was a significant positive
 relationship with the demands score of the operational tasks
 found. According to expectations, higher operational
 demands are associated with higher levels of emotional
 exhaustion. None of the other demands scores was related to
 any of the three dependent variables.

Table 5 presents the results of the regression analyses of the
 four satisfaction scores on each of the three dependent
 variables. The satisfaction score of the organizing tasks
 turned out to be significantly negatively related to the two
 burnout-components, and significantly positively related to
 general job satisfaction. As expected, more satisfaction with
 organizing tasks is related to lower burnout scores and to
 more satisfaction with the job in general. In addition, and
 again according to expectations, the satisfaction score of the
 supportive tasks is significantly negatively related to deper-
 sonalization, and significantly positively related to general job
 satisfaction. This implies that more satisfaction with sup-
 portive tasks is associated with lower levels of depersonal-
 ization and with more satisfaction with the job in general.
 Third, more satisfaction with operational tasks is associated
 with less emotional exhaustion. Finally, and quite surprisingly,
 the satisfaction score of preparatory tasks turned out to be
 significantly positively related to emotional exhaustion. This
 means that more satisfaction with preparatory tasks is related
 to higher (instead of lower) levels of emotional exhaustion.

To control for potential overlap of the relationships of
 the demands scores and the satisfaction scores with each of
 the three dependent variables, we finally performed three
 multiple regression analyses (one for each dependent vari-
 able) with both the demands scores and the satisfaction
 scores as predictors. The results of these analyses (which are
 available upon request from the first author) turned out to
 be exactly the same as those of the (separate) analyses
 described above.

Discussion

In this paper, the WEBIC-questionnaire, a self-report instru-
 ment designed to perform a systematic and detailed analysis
 of ICU-nurses jobs was introduced. Empirical evidence
 concerning its validity and reliability was presented using a
 large sample of ICU nurses from 13 different European areas.
 The following six conclusions can be drawn. First, the results

Table 3 Correlations of the demands scores and the satisfaction scores with burnout and job satisfaction ($n = 1954$)

| | EE | DP | SAT |
|---------------------|---------|---------|--------|
| Demands scores | | | |
| Operational tasks | 0.07 | 0.08* | -0.06 |
| Organizing tasks | 0.03 | 0.04 | -0.05 |
| Preparatory tasks | 0.10* | 0.01 | 0.00 |
| Supportive tasks | 0.09* | 0.03 | -0.01 |
| Satisfaction scores | | | |
| Operational tasks | -0.17** | -0.20** | 0.19** |
| Organizing tasks | -0.19** | -0.21** | 0.30** |
| Preparatory tasks | 0.04 | -0.04 | 0.05 |
| Supportive tasks | -0.10* | -0.21** | 0.23** |

* $P = 0.05$, ** $P = 0.01$ (two-tailed); EE = emotional exhaustion;
 DP = depersonalization; SAT = job satisfaction

| Dependent variable | EE | | DP | | SAT | |
|----------------------|----------------------|-----------------------|--------------------|-----------------------|-------------------|-----------------------|
| | β | R ² change | β | R ² change | β | R ² change |
| Age | | 0.18 | | 0.07 | | 0.05 |
| Gender | | | -0.12 [†] | | 0.11 [†] | |
| Working experience | | | | | | |
| Country | | | | | | |
| Poland | 0.23 ^{***} | | 0.06 | | 0.01 | |
| Germany | 0.13 [†] | | 0.18 ^{**} | | 0.00 | |
| Denmark | 0.27 ^{***†} | | 0.14 | | 0.03 | |
| Finland | 0.13 | | 0.10 | | -0.06 | |
| The Netherlands | -0.11 | | 0.05 | | 0.07 | |
| Belgium | -0.03 | | 0.05 | | 0.04 | |
| France | 0.12 | | 0.09 | | 0.07 | |
| Luxembourg | 0.08 | | 0.12 [†] | | -0.06 | |
| United Kingdom | 0.15 [†] | | 0.00 | | -0.10 | |
| Italy | 0.07 | | 0.05 | | 0.00 | |
| Spain-Catalonia | -0.04 | | 0.00 | | -0.01 | |
| Spain-Valencia | -0.08 | | 0.06 | | -0.04 | |
| Position | | | | | 0.13 [†] | |
| Demands scores | | 0.01 | | | | |
| Operational tasks | 0.13 [†] | | | | | |
| Organizing tasks | | | | | | |
| Preparatory tasks | | | | | | |
| Supportive tasks | | | | | | |
| F | | 5.629 ^{***} | | 1.932 [†] | | 1.434 ^{NS} |
| R ² total | | 0.19 | | 0.07 | | 0.05 |

Table 4 Hierarchical multiple regression analyses of the four demands scores on (a) emotional exhaustion, (b) depersonalization, and (c) job satisfaction (n = 1954)

[†]P = 0.05; ^{**}P = 0.01, ^{***}P = 0.001, NS = non-significant; EE = emotional exhaustion; DP = depersonalization; SAT = job satisfaction.

of (exploratory) factor analyses on the items of the WEBIC-questionnaire were in line with the theoretical framework of sociotechnical systems theory, in which a distinction is made between four integrated task categories (operational, organizing, preparatory, and supportive tasks, respectively). For both the demanding aspects (tasks) and the satisfying aspects the four-factor structure was empirically established, and the factors could be labelled according to the four categories mentioned above. Therefore, the factorial validity of the WEBIC-questionnaire was convincingly demonstrated. The reliability of the WEBIC-questionnaire also turned out to be satisfactory, as each factor had acceptable to good levels of internal consistency (ranging from 0.77 to 0.91). Therefore, research question 1 (see Aims of the study) can be answered affirmatively. Future research should be devoted to confirming the factorial structure of the WEBIC-questionnaire, as well as the internal consistencies of the different factors.

Secondly, when looking at the level of demands and amount of satisfaction associated with each of the factors, results show that ICU-nurses' most central (operational) tasks pose the greatest demands, but also seem to drive their satisfaction. This is not surprising as it is the operational tasks that are actually the 'core business' of nurses' jobs. It is

quite likely that the choice to become a nurse is directed by these kinds of core tasks. Performing operational tasks – probably at the expense of other, less central, kinds of tasks – seems to be associated with satisfaction (see also Blegen 1993).

Thirdly, when we look at the results for the different subgroups (nurse trainees, registered nurses and head nurses) we find that, instead of operational tasks, head nurses perceive supportive tasks (reporting, recording, and administrative work) as most demanding. This is not surprising because head nurses increasingly occupy middle management positions in hospitals, which involves more managerial (supportive) tasks and responsibilities at the expense of those related to direct patient care (i.e. operational tasks).

Organizing tasks (contacts with colleagues and other professionals) are seen as least demanding, whereas preparatory tasks are seen as least satisfying. Perhaps nurses perceive the latter type of tasks (replenishing supplies and collecting equipment) as 'peripheral' to their jobs. Another reason why this type of task might be perceived as not very satisfying is that the results are not directly 'visible' to nurses; satisfaction can only be derived from the (successful) performance of the operational tasks. Thus, there is quite a long

Table 5 Hierarchical multiple regression analyses of the four satisfaction scores on (a) emotional exhaustion, (b) depersonalization and (c) job satisfaction ($n = 1954$)

| Dependent variable | EE | | DP | | SAT | |
|---------------------|----------|--------------|---------|--------------|---------|--------------|
| | β | R^2 change | β | R^2 change | β | R^2 change |
| Age | | 0.18 | | 0.07 | | 0.05 |
| Gender | | | | | | |
| Working experience | | | | | | |
| Country | | | | | | |
| Poland | 0.14* | | 0.04 | | 0.05 | |
| Germany | 0.03 | | 0.08 | | 0.12 | |
| Denmark | 0.26*** | | 0.20* | | 0.00 | |
| Finland | 0.10 | | 0.08 | | -0.02 | |
| The Netherlands | -0.17* | | 0.04 | | 0.11 | |
| Belgium | -0.11 | | 0.01 | | 0.14 | |
| France | 0.03 | | 0.03 | | 0.13 | |
| Luxembourg | 0.04 | | 0.09 | | 0.00 | |
| United Kingdom | 0.06 | | -0.04 | | -0.02 | |
| Italy | 0.03 | | 0.02 | | 0.05 | |
| Spain-Catalonia | -0.17* | | -0.08 | | 0.11 | |
| Spain-Valencia | -0.02 | | 0.03 | | 0.01 | |
| Position | | | | | | |
| Satisfaction scores | | 0.07 | | 0.09 | | 0.11 |
| Operational tasks | -0.14*** | | | | | |
| Organizing tasks | -0.21*** | | -0.19** | | 0.24*** | |
| Preparatory tasks | 0.20*** | | | | | |
| Supportive tasks | | | -0.20** | | 0.17** | |
| F | | 6.861*** | | 4.061*** | | 4.098*** |
| R^2 total | | 0.25 | | 0.16 | | 0.16 |

* $P = 0.05$; ** $P = 0.01$; *** $P = 0.001$, EE = emotional exhaustion; DP = depersonalization, SAT = job satisfaction.

feedback loop between the performance of the preparatory tasks and their ultimate results.

Fourthly, some evidence concerning the construct validity of the WEBIC-questionnaire was found. This turned out to be especially true for the satisfying aspects (tasks). Generally, the amount of explained variance turned out to be not very high (ranging from 5% to 25%). However, Semmer *et al.* (1996) have argued that the upper limit of explained variance in work stress research is about 10–15%. Although most of the standard criticism on questionnaire research has attributed this to poor research instruments and designs (see Kasl 1986, 1996), the results are very consistent: the bulk of the variance remains unexplained. As a consequence, it may be tempting to dismiss these findings as theoretically significant but of little practical importance (Payne *et al.* 1999).

However, there are several reasons reported in the literature to explain why this percentage cannot be very high (Semmer *et al.* 1996, Koslowski 1998, Payne *et al.* 1999). First, there are many factors influencing nurses' (adverse) health and well-being (that is, both work and nonwork). Consequently, any given study is limited because it can only cover some of the relevant variables. Secondly, the amount of

variance explained might be attenuated by measurement error. A third reason is the healthy worker effect. There is a restriction of range in health outcomes because of ill employees who are not working at all, and as a consequence do not participate in this kind of study. Finally, specific time lags between stressors and strains could attenuate the relationships. For instance, time lags that are too short may lead to the conclusion that no relationships exist.

With respect to the demanding aspects (tasks), only the (positive) relationship between level of operational demands and emotional exhaustion turned out to be significant. This is in line with the general (theoretical) notion that feelings of exhaustion are particularly associated with high (interpersonal) demands in relationships with patients (Maslach 1982, Schaufeli & Enzmann 1998). As far as the satisfying aspects are concerned, particularly the amount of satisfaction associated with organizing tasks turned out to be (negatively) related to burnout and (positively) related to general job satisfaction. Thus, more satisfactory interpersonal contacts with colleagues and with other professionals are related to lower burnout levels and to more satisfaction with the job in general. This could be explained by the fact that these

contacts can be an important source of social support, which has shown to have beneficial direct and indirect (buffer) effects on workers' health and well-being (Cohen & Wills 1985).

Fifthly, level of satisfaction with supportive tasks is negatively associated with depersonalization and positively with general job satisfaction. Perhaps satisfaction in performing supportive tasks ensures that they are carried out well, which in turn enables the central (operational) work to be performed smoothly (without unnecessary and disturbing interruptions). Nurses then can pay full attention to their patients and provide an optimal quality of patient care (instead of treating them as 'impersonal objects'), which in turn may contribute to their general job satisfaction. This interpretation is supported by the fact that the amount of satisfaction associated with the performance of operational tasks is negatively related to nurses' level of emotional exhaustion.

Sixthly, the amount of satisfaction associated with the performance of preparatory tasks is positively related to nurses' level of emotional exhaustion. This somewhat puzzling finding can perhaps be explained by the quite long feedback loop between performance of this type of tasks and (the perception of) its results already discussed above. Thus, by the time that the performance of preparatory tasks results in feelings of satisfaction, nurses have already invested a great deal of effort in performing these tasks, and thus may feel quite exhausted. This phenomenon is also in line with the dynamic version of the Job Strain Model (Karasek & Theorell 1990, Theorell & Karasek 1996). Prolonged job stress (whether positive or negative) is associated with accumulated strain in the long run, which in turn may lead to burnout. In other words, enduring tasks may influence not only temporary moods like satisfaction but also long-term reactions like burnout. However, one could also argue that active and dedicated workers exposed to long-term strain become increasingly vulnerable to burnout (e.g. Dollard & Winefield 1998, Schaufeli & Enzmann 1998). From these results it can be concluded that, in general, the different WEBIC-factors have meaningful relationships with burnout and (general) job satisfaction. Therefore, research question 2 can also be answered affirmatively.

Study limitations

However, this study has several limitations. Construct validity of the WEBIC was tested taking only a limited number of psychological well-being variables into account. Future studies should also look at relationships between the different WEBIC-factors and other types of job-related outcomes

(physical health, absenteeism, engagement or performance). Moreover, despite our effort to formulate items as objectively and neutrally as possible, our results may partly be influenced by method variance. In addition, all study variables were measured at the same time, which implies that no causal inferences can be made. However, several longitudinal studies have shown that job characteristics had causal predominant relationships with (well-being) outcomes in such a way that the outcomes tended to occur after job perceptions, rather than vice versa (see Buunk *et al.* 1998). Finally, we did not control for moods such as negative affectivity (NA) as biasing factors that may affect subject reports of job characteristics and employee well-being. A number of researchers have concluded that controlling for NA leads to underestimation of the relation between work stress and outcomes (Dollard & Winefield 1998, Karasek *et al.* 1998, Spector *et al.* 2000). Thus, bias caused by NA seems to be not particularly troublesome in our study. Nevertheless, further research is needed to focus on the complex role of NA in the job stress process (cf. Cooper 2000).

Conclusion

Overall, it can be concluded from our results that the WEBIC-questionnaire seems to be a theoretically and methodologically sound instrument to systematically analyse ICU nurses' jobs. Besides providing detailed insight into demanding and satisfying aspects of ICU nurses' jobs, the results of this type of job analysis offer good starting points for interventions aimed at improving ICU nurses' well-being at work. When considering the nature of possible intervention strategies, nursing and hospital managers should be aware of those aspects of the work environment that give rise to the perception of stress. Therefore, worksite interventions like job redesign could improve the psychosocial, stress-inducing characteristics of nurses' jobs. For example, as the results of the present study show that operational tasks are especially perceived as very demanding, specific roster techniques like forward rotation, regularity, long-term planning, and sufficient recovery time could be applied to achieve a more adequate spread of operational activities over a certain time span (de Vries-Griever 1991, de Jonge 1995). Moreover, satisfaction with the performance of organizing tasks is significantly related to burnout as well as (general) job satisfaction, which points to the importance of good collaborative practice between professionals working in an ICU. Finally, as satisfaction with the performance of supportive tasks is negatively related to depersonalization, and positively associated with (general) job satisfaction, performance of these tasks should be facilitated as much as possible, for

example, by using standardized nursing protocols and establishing cooperative, mutually supportive, relationships between team members (cf. Carter & West 1999).

Thus, the results of a thorough job analysis based on the WEBIC-questionnaire calls attention to those categories of tasks that pose a threat to ICU nurses' well-being. Moreover, it enables nursing and hospital administrators to identify those tasks within each category that contribute most to experienced job stress. Further, all tasks that improve well-being can be identified as well. This is a major improvement in comparison to other instruments that are often used for the analysis of job risks. However, although it is possible to identify and describe four different categories of tasks theoretically as well as statistically, it is important to realize that in fact these categories are not independent of each other. Therefore, interventions affecting (the perception of) tasks belonging to one of these categories (for example, preparatory tasks) may also affect (the perception of) tasks that belong to one of the other categories (for example, operational tasks).

All in all, the present study has shown that it is possible to perform a job analysis in a more profound and systematic way than has been performed in previous research. The WEBIC-questionnaire seems to be a useful and practical tool, which not only may lead to an improved theoretically based job analysis, but also will support organization intervention efforts. That is, with more specific information about which aspects of the ICU nurses' job should be modified or improved to increase well-being and furthermore, evaluation of the results of interventions in the specific ICU setting can be studied in more detail. Thus, the WEBIC can support need assessment as well as outcome evaluation. Future WEBIC-studies might profitably show some promise in that respect.

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